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</tbody>
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### LEAP Lecturers

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<th>Name</th>
<th>Education</th>
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<tbody>
<tr>
<td>NL Wiles</td>
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</tr>
</tbody>
</table>

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<table>
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<tbody>
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<td>BScHons (Natal)</td>
<td>Hydrology</td>
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</tbody>
</table>
HONORARY APPOINTMENTS

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RD Diab MSc, UED (Natal), PhD (Virginia) Environmental Sciences
R Fincham BAHons, UED (Natal), MA (Western Michigan), PhD (Rhodes) Environmental Sciences
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RL Nieuwoudt BScAgric, MScAgric (Stellenbosch), MEcon (N Carolina), PhD (Natal) Agricultural Sciences
RA Preston-Whyte MA, PhD (Natal) Environmental Sciences
AH Wilson BScHons (London), BSc (Spec Hons), PhD (Rhodessa) Geological Sciences

Honorary Professor

WGM Bastiaanssen BSc (Larenstein International College), PhD (Wageningen Agricultural University) Hydrology
MC Lyne BScAgric, MScAgric, PhD (Natal) Agricultural Sciences
P Podwojewski Dr- HDR (Paris VI), MSc, PhD (Strasbourg) Hydrology

Honorary Associate Professors

V Chaplot Dr-HDR (Paris VI), BSc, MSc, PhD/ENSA Hydrology
CWS Dickens BScHons, HDE (Natal), PhD (Natal) Hydrology

Honorary Lecturer

M Paterson BScDiet (Pretoria), DiplHospDiet (Stellenbosch), MScDiet (Natal), PhD (UKZN) Agricultural Sciences

Senior Research Associates

JM Green BScHons (Stellenbosch), MSc (Natal), PhD (Oklahoma State) Agricultural Sciences
WL Nieuwoudt BScAgric (Stellenbosch), MScAgric (Pretoria), MEcon (N Carolina), PhD (Natal) Agricultural Sciences

Honorary Research Fellow

L M Bulcock BsocScHons, MSc (Natal) Hydrology
C S Everson BScAgric (Hons), MSc, PhD (Natal) Hydrology
SRD Ferrer BScAgric, PhD (Natal) Agricultural Sciences
C Fisher BScHons, PhD (Reading) Agricultural Sciences
JNU Jaganyi BScHons (Nairobi), MSc (London), PhD (Natal) Environmental Sciences
J-L Janeau MScEng (IRD) Hydrology
C Jarmain BScAgricHons, MSc, PhD (Natal) Hydrology
D Kotze BScAgricHons, PhD (Natal) Environmental Sciences
RP Kunz BScHons, MSc (Natal) Hydrology
TG Lumsden BScHons, MSc (Natal) Hydrology
N Miles BScAgric, MScAgric, PhD (Natal) Environmental Sciences
AA Mitchell BScHons MSc PhD (Rhodes) FGSA FSEG Geological Sciences
NA Rivers-Moore BScHons, MSc (Natal), PhD(UKZN) Hydrology
A Smith BScHons PhD (Natal) Geological Sciences
L Titshall BScHons, MSc (Natal), PhD (UKZN) Environmental Sciences
School of Chemistry and Physics
Dean and Head of School
Professor D Jaganyi

Senior Professors
SB Jonnalagadda BSc (Andhra), MSc PhD (Vikram)

Professors
HB Friedrich BScHons, PhD (UCT)
D Jaganyi BScHons, MSc (Nairobi), PhD (London), DIC (Imperial College)
OQ Munro BScHons, PhD (Witwatersrand)
F Petruccione Dipl. Phys. Dr rer nat Dr rer nat habil (Freiburg)
FR van Heerden BScHons, MSc, PhD (Free State), FRSSAf

Associate Professors
A Kindness BScHons, MSc PhD (Aberdeen)
T Konrad Dipl. Phys (Tübingen), MSc (Imperial College), Dr rer nat (Konstanz)
HG Kruger BScHons, MSc, PhD (PU for CHE), HDE
RL Mace BScHons, PhD (Natal)
BS Martincigh BScHons, PhD (Natal)
IV Nikolaenko BScHons, MSc, PhD (Kiev)
GT Mola BSc, MSc (Addis Ababa), PhD (Bonn)
M Porrmann Dipl. Phys (Hamburg), Dr rer nat (Göttingen)
RS Robinson BScHons, PhD (Rhodes)
S Venkataraman BSc, MSc (Bharathidasan), PhD (Sri Venkateswara)

Senior Lecturers
MD Bala BScHons (ABU), MSc (ATBU), PhD (ECUST)
PH Coombes BSc (Rhodes), BScHons, MSc (UPE), PhD (Natal)
VW Couling BScHons, MSc, PhD (Natal)
NA Koobranally BScHons, MSc, PhD (Natal)
AP Matthews BScHons (Natal), PhD (Cantab)
MK Moodley MSc (UDW), PhD (Witwatersrand)
T Moyo BSc (UNZA), PhD (Leeds)
VO Nyamori BSc (Egerton), BScHons, MSc (UPE), PhD (NMMU)
J Pierrus BScHons (Natal), MSc (Witwatersrand), PhD (Natal)
A Sergi BScHons, PhD (Messina)
C Southway BScHons, PhD (Salford)
WE van Zyl BScHons, MSc (RAU), PhD (Texas A & M)

Lecturers
M Ackerman BScHons (UKZN), MSc (UKZN)
A Bissessur BScHons, MSc (UDW)
IN Booysen BScHons, MSc, PhD (NMMU)
N Chetty BScHons (Natal), PhD (UKZN)
J Govender BScHons, STD, MSc (UDW), BScHons (Unisa), PhD (Natal)
GEM Maguire BScHons (NUI), PhD (Belfast)
A Mambanda BScHons, MSc (Zimbabwe), PhD (UKZN)
H McCreadie BScHons, PhD (LaTrobe)
B Moodley BScHons, MSc (Natal), PhD (UKZN)
M Moodley MSc (Natal), MS, PhD (Rhode Island)
S Moolla BScHons, MSc (UDW), PhD (UKZN)
JZ Msomi BScHons (UDW), MSc (Natal), PhD (UKZN) Physics
R Mukaro BScHons, MPhil (Zimbabwe) Physics
PG Ndungu BSc(Tennessee), PhD (Drexel) Chemistry
BO Owaga BSc (Egerton), BScHons, MSc, PhD (Witwatersrand) Chemistry
G Pellicane BScHons, PhD (Messina) Physics
L Pillay BScHons, MSc (UKZN) Chemistry
D Reddy BScHons, PhD (UKZN) Chemistry
S Singh BScHons, MSc (UDW), PhD (UKZN) Chemistry
S Yacoob BScHons, MSc (UCT), PhD (Northwestern) Physics
CL Zunckel BScHons (Natal), MSc (UCT), DPhil (Oxon) Physics

LEAP Lecturer
MR Semonyo BScHons, MSc (UKZN) Physics

Senior Tutors
GD Dawson BScHons, MSc (UPE) Chemistry
H Govender BSc (Unisa), BScHons (UDW) Chemistry
R Moodley BScHons (UDW), MSc (UKZN) Chemistry
SH Mthembu BScHons, MSc (UKZN) Chemistry
M Rasalanavho BSc Hons (UNIVEN), HED (Unisa), Dip Bus Management (Damelin), MSc (UKZN) Chemistry
RA Webber BScHons, HDipEd (Witwatersrand) Physics
E Zhandire BScHons (NUST), MSc(Reading) Physics

Tutors
K-L Barry BScHons, MSc (UKZN) Chemistry
WB Dlamini BScHons, MSc (UKZN) Physics
S Gumedé BSc (UKZN), BScHons(Stellenbosch) Physics
S Jaganath BScHons (UKZN) Physics
A Langlois BScHons, MSc, PhD (Natal) Chemistry
S Mthembu BScHons (UKZN) Physics
R Oosthuizen BScHons (Natal), PGCE (Unisa) Chemistry

HONORARY APPOINTMENTS

Emeritus Professors
K Bharuth-Ram BScHons, MSc (Natal), DPhil (Oxon), MASSAf Physics
OL de Lange BScHons, MSc (Witwatersrand), PhD (Clarkson) Physics
TB Doyle BScHons (Dunelm), PhD (Witwatersrand) Physics
SE Drewes BScHons, MSc (Natal), PhD (Rhodes), DSc (Natal), CChem, FRSC, FRSSAf Chemistry
TA Ford BScHons, MSc (Wales), PhD (Dalhousie), CChem, FRSC Chemistry
MA Hellberg BScHons (UCT), PhD (Cantab), FRSSAf, MASSAf Physics
JD Hey BSc (Stellenbosch), BScHons, MSc (UCT), PhD (Maryland) Physics
ARW Hughes BA, MSc (Dublin), PhD (Sheffield), FRAS Physics
MJ Laing BScHons, MSc (Natal), PhD (California) Chemistry
TM Letcher BScHons, BEd, MSc, PhD (Natal), CChem, FRSC, FRSSAf Chemistry
JF McKenzie PhD (Cantab), DSc (Strathclyde) Physics
MM Michaelis MA, DPhil (Oxon), Dipl Phys (Munich), DiplScPlasmas (Oxon) Physics
RE Raab BScHons (Natal), DPhil (Oxon) Physics
MWJ Scourfield BScHons (Keele), MSc, PhD (Calgary) Physics
ADM Walker MSc (Rhodes), PhD (Cantab), FRSSAf, MASSAf Physics

Honorary Professors
PG Andersson PhD (Uppsala) Chemistry
N Crouch  BScHons MSc PhD (Natal) Chemistry
D Mulholland BScHons MSc PhD (Natal) Chemistry
PK Shukla  PhD (Umea), PhD (Banaras Hindu University) Physics
F Verheest  MSc, PhD, DSc (Gent) Physics

Honorary Associate Professors
MJ Alport  MSc (Natal), PhD (Iowa) Physics
A Forbes PhD (Natal) Physics
S Nic Chormaic BScHons, MSc (Nat. Univ. Ireland, Maynooth), PhD (Paris VIII) Physics
S Singh PhD (Indian Institute of Technology) Physics

Honorary Senior Lecturers
AB Collier BScHons (Natal), MSc (PUCHE), PhD (KTH) Physics

Senior Research Associates
K Bharuth-Ram  BScHons, MSc (Natal), DPhil (Oxon), MASSAf Physics
SE Drewes BScHons, MSc (Natal), PhD (Rhodes), DSc (Natal), CChem, FRSC, FRSSAf Chemistry
JS Field BSc Hons, MSc (Natal), PhD (Canntab) Chemistry
TA Ford BScHons, MSc (Wales), PhD (Dalhousie), CChem, FRSC Chemistry
MA Hellberg BScHons (UCT), PhD (Canntab), FRSSAf, MASSAf Physics
JD Hey BSc (Stellenbosch), BScHons, MSc (UCT), PhD (Maryland) Physics
ADM Walker  MSc (Rhodes), PhD (Canntab), FRSSAf, MASSAf Physics

Honorary Research Fellows
K Govender  BEng (UDW), MSc(Eng), PhD (Natal) Physics
MJ Kosch  BScEng, PhD (Natal) Physics
C Ngila  BEd, MSc (KU), PhD (New South Wales) Chemistry

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School of Engineering
Dean and Head of School
Professor C Trois

Professors
S Adali  BScEng (METechU), PhD (Cornell), FRSSAf, Fellow of UKZN Mechanical Engineering
TJO Afullo  PrEng, R.Eng (Kenya), BScEngHons (Nairobi), MSEE (W. Virginia), PhD (Brussels)Electronic Engineering
G Bright  BScEng, MScEng, PhD (Natal), MBA (UKZN) Mechanical Engineering
ES Boje  PrEng, BScEng (Witwatersrand), MScEng, PhD (Natal), Dipl Data (Unisa) Electrical Engineering
CA Buckley  PrEng, BScEng, MScEng (Natal) Chemical Engineering
M Carsky  PrEng, Dipl-Ing, PhD (Prague) Chemical Engineering
SH Mneney  PrEng, BSc(Hons)Eng (Kumasi), MASc (Toronto), PhD (Dar-es-Salaam) Electrical Engineering
D Ramjugernath  BScEng, PhD (Natal) Chemical Engineering
JC Smithers  PrEng, BScEng, MScEng, PhD (Natal) Bioresources Engineering
DD Stretch  BScEng, MScEng (Natal), PhD (Canntab) Civil Engineering
J-R Tapamo  BSc MSc(Yaoundé) DEA PhD(Rouen) Computer Engineering
H Xu  BSc (Guilin), MSc (Shijiazhuang), PhD (Beijing) Electronic Engineering

Associate Professors
CN Bezuidenhout  BSc (Potchefstroom), MTechEng (Technikon Natal), PhD (UKZN) Bioresources Engineering
PR Everitt  PrEng, BScEng, MScEng (Natal) Civil Engineering
RCS Peplow  BScEng, MScEng (Natal) Electrical Engineering
M Starzak  BSc, MSc, PhD (Łodz) Chemical Engineering
Adjunct Professors

TC Haupt PhD (Florida), MPhil (Leicester), Pr. CM

Senior Lecturers

MJ Brooks PrEng, BScEng (Natal), MScEng (Stellenbosch)

E Chikuni BEng, (Sierra Leone, MSc, UMIST, Manchester), PhD (Wales), CEng (London)

G Diana BScEng (Natal)

AM Forbes BScSur, MScSur (Natal)

KM Foxon BScEng (Natal), PhD (UKZN)

FL Inambao MSc, PhD (Volgograd)

MB Jaros PrEng, BScEng(Civil) (Witwatersrand), MSc (London), DIF (Imperial College)

AL Jarvis BScEng (Natal), PhD (UKZN)

GS Mwitiha BScEng, MScEng (Nairobi), PhD (Asian Institute of Technology)

B Naidoo BScEng, MScEng (Natal)

J Pocock BEng(Hons), MPhil(Eng), PhD (Birmingham)

T Quazi BScEng, MScEng (Natal) PhD(UKZN)

A Saha BEE(India),PhD(India)

A Senzanje BScEng, MSc(Stellenbosch), PhD (Colorado State)

R Stopforth BScEng, MScEng, PhD (UKZN)

Lecturers

M Akombelwa BEng (Zambia) MSc, PhD (Nottingham)

C Baah PrEng, MSc (Lvov), MSc (Calgary)

AFC Bassa BTech (IIT, Bombay), MSc (Newcastle)

C Bemont BScEng (Natal)

E Bhero BScEng(NUST), MPhilEng(NUST)

JJ Blight PrEng, BScEng, MScEng (Witwatersrand)

LJ Butler BEng (Stellenbosch), MScEng (UKZN)

L Chetty PrEng, BScEng(UDW), MScEng(UKZN)

SM Chilufya BEng (UNZA), MSc (ITC)

D Coetsee BScEng(Natal), MScEng(UKZN)

S Davrajh BScEng, MScEng (UKZN)

E Friedrich BScHons, MScEng (Natal)

F Ghayour BSc, MSc (Isfahan University of Technology)

N Harinarain BSc, PropDevHons(QS), MSc(QS) (Natal) MCIOB, Candidiate PrQS

I Kerr BSc (Ind Chem) (Witwatersrand), MDP (UNISA), MSc(Env Biotech) (Rhodes)

SL Kiambi BScEng(Kenya), MSc, PhD (France), MIEK, Reg.Eng(K)

M Kumarasamy BE, ME, PhD (IIT Roorkee)

RA Lawrie MScEng (UKZN) (LEAP)

L Lerotholi BScEng, MScEng (UKZN)

L Maharaj BScEng, MSc (UKZN)

NO Mateete BScEng, MScEng (UKZN)

CH McLeod BScEng (Natal)

E Musonda BEng (UNZA), MSc (ITC)

C Narasigadu BScEng, MSc (UKZN)

MG Ntunka MScEng (Witwatersrand)

EM Obwaka HDip (Strathmore), BScEng, MScEng (UDW)

J Padayachee BScEng, MScEng (UKZN)

N Pillay BScEng, MScEng (Natal)

R Pillay Carpanen BEng(Hons)(Mauritius), MScEng(UKZN)
J Pitot BScEng, MScEng (UKZN) Mechanical Engineering
S Rezeno BScEng(Hons)(UZ), MScEng (UKZN) Electronic Engineering
A Singh BScEng, MScEng (UDW) Chemical Engineering
M Singh BSc, BScHons (UKZN), MSc (Witwatersrand) Land Surveying
C Venugopal B.Engg (Barathidasan,India), M.Engg (SASTRA,India) Electrical Engineering
T Walingo B Tech Elec Eng (Moi), MScEng (Natal), PhD(UKZN) Electronic Engineering
A Walker BScEng, MScEng (UKZN) Mechanical Engineering
P Zulu BScEng, MScEng (UCT) Computer Engineering

Part Time Lecturers
R Loubser PrEng, BScEng, MScEng, PhD (Natal) Mechanical Engineering

HONORARY APPOINTMENTS

Emeritus Professors
E Eitelberg PrEng, Dipl.-Ing., Dr.-Ing., Dr.-Ing. habil (Karlsruhe), LL.M. (UDW),LL.D. (UKZN) Electrical Engineering
BK Loveday PrEng, BScEng, PhD (Natal) Chemical Engineering
PW Lyne PrEng, BScEng, MScEng, PhD (Natal) Bioresources Engineering
M Mulholland PrEng, BScEng, PhD (Natal) Chemical Engineering
RG Pearl Dip(QS), MSc(QS)(UCT) Civil Engineering
GGS Pegram PrEng, BScEng, MScEng (Natal), PhD (Lancaster) Chemical Engineering
JD Raal BScEng (Witwatersrand), MSc, PhD (Toronto) Chemical Engineering
LW Roberts PrEng, BScEng, MScEng (Natal), PhD (London) Mechanical Engineering
RE Schulze BScHons, MSc, PhD (Natal), UED (Natal), FRSSAf, PH(USA) Bioresources Engineering

Honorary Professors
DR Arnold PrEng, BSc(Hons), PhD (Aston), CEng, DipBusMan, Chemical Engineering
AC Britten BScEng, MScEng (Witwatersrand), PrEng Electrical Engineering
S Chandra BE, MTech, PhD (IIT Kampur) Civil Engineering
AK Dikshit BE, MTech, PhD(USA) Civil Engineering
AC Hansen PrEng, BScEng, MScEng, PhD (Natal) Bioresources Engineering
J Rarey Diploma, PhD (Dortmund) Chemical Engineering
I Tincul BEng, MS (Timisoara), PhD (Bucharest) Chemical Engineering
SK Venayagamoorthy BScEng, MScEng(UKZN), PhD (Stanford) Civil Engineering

Honorary Associate Professors
NL Lecler BScEng, MScEng, PhD (UKZN) Bioresources Engineering

Honorary Senior Lecturers
HW Bernhardt PhD (Natal) BEd, PrEng Chemical Engineering

Honorary Lecturers
J Bindon BScEng(Pretoria), MScEng, PhD(London) Mechanical Engineering

Senior Research Associates
CJ Brouckaert BScEng (Natal) Chemical Engineering
DJ Clark BScEng, MScEng (Natal) Bioresources Engineering
R G Harley PrEng, CEng, BScEng, MScEng(Pret.), PhD(London) Electrical Engineering

Honorary Research Fellows
B Brouckaert BScEng MSc, PhD (Georgia Tech) Chemical Engineering
F Coulon MSc.(Western Britanny), PhD(Perpignan) Civil Engineering
A Garg MSc.Eng, PhD (IIT Bombay) Civil Engineering
AAE Othman BSc (Arch Eng), MSc(Heriot-Watt), PhD(Loughborough) Civil Engineering
L. Oxarango MScEng, PhD(Toulouse) Civil Engineering
School of Life Sciences
Dean and Head of School
Professor S Mukaratirwa

Senior Professors

B Pillay BScHons, MSc (UDW), Dr rer nat (Wuerzburg)  
Microbiology

Professor

RP Beckett BScHons (St Andrews), PhD (Bristol)  
Biology

THT Coetzter BScHons, MSc (Stellenbosch), PhD (Natal)  
Biochemistry

CT Downs BScHons, PhD, MEd (Natal)  
Biology

AS Gupthar BScHons (UDW), MSc, PhD (Witwatersrand), PhD (UKZN)  
Biochemistry

SD Johnson BScHons, PhD (UCT)  
Biology

KP Kirkman BScAgric, MScAgric, PhD (Natal)  
Biology

Microbiology

B Microbiology

CT Microbiology

AS Microbiology

SD Microbiology

KP Microbiology

B Microbiology

S Microbiology

R Microbiology

B Microbiology

J Microbiology

D Microbiology

MP Microbiology

Associate Professors

JF Finnie BScHons, PhD (Natal), MEd (UKZN)  
Biology

JP Goldring BSc (Dundee), DPhil (Zimbabwe)  
Biochemistry

JM Lamb MSc (Natal), PhD (Iowa)  
Biology

J Lin BSc (National Tsing Hua University), PhD (SUNY at Buffalo)  
Microbiology

A Nicholas BScHons, MSc (Natal), PhD (UDW)  
Biology

Senior Lecturers

HY Chenia BScHons, MSc, PhD (UDW)  
Microbiology

E Elliott BScHons, MSc, PhD (Natal)  
Biochemistry

TM Everson BScHons, HEd, MSc, PhD (Natal), M.G.S.S.A.  
Biolog

P Govender BScHons, MSc (UDW), PhD (Stellenbosch)  
Biochemistry

R Govinden BSc (UDW), Licence (Caen), Maitrise (Marseilles), MSc, PhD (UKZN)  
Microbiology

EB Guegium Kana MSc, PhD (Ogbomosa)  
Microbiology

A Jürgens Diplom (Giessen), PhD (Ulm)  
Biology

B Masola BScHons (Nottingham Trent), PhD (London)  
Biochemistry

Y Naidoo BScHons, MSc, PhD (UDW)  
Biology

CU Niesler BScHons (Stellenbosch), PhD (Cantab)  
Biochemistry

AO Olaniran BScHons, MSc (OAU), PhD (UKZN)  
Microbiology

T Olickers BScHons, PhD (Rhodes)  
Biology

M Singh BScHons, MSc (UDW), PhD (UKZN)  
Biochemistry

AJ Smit BScHons, MSc (UPE), PhD (UCT)  
Biology

A Vosloo BScHons, PhD (PU for CHE)  
Biology

Lecturers

SP Buthelezi BScHons, MSc (UKZN)  
Microbiology

B Bytebier MSc (Brussels), PhD (Stellenbosch)  
Biology

E Dzomba BScAgric, MScAnimSci (Zimbabwe)  
Genetics
D Glassom BSc (Witwatersrand), BScHons (UPE), MSc (UCT), PhD (Bar Ilan)  
J Hendricks BSc (UWC), BScHons, MSc (Stellenbosch)  
CH Hunter BScHons, MSc (Natal)  
MS Islam BScHons, MSc (Dhaka), PhD (Okayama, Japan)  
S Jamal MSc (Witwatersrand)  
MM Lebusa-Molapo BSc Agric Hons (Lesotho), MSc (Oklahoma)  
AHH Macdonald BA (Hawaii), PhD (UKZN)  
MS Meusel MSc, PhD (Frankfurt/Main)  
GK Moodley BScHons, MSc (UDW)  
S Naidoo BScHons, MSc, PhD (UKZN)  
MC Schoeman BScHons, PhD (UCT)  
S Shaik BPaed(Sc), BScHons, MSc (UDW), PhD (UKZN)  
A Shradar BScHons, MSc (Natal), PhD (Witwatersrand)  
P Sommer BScHons, PhD (Witwatersrand)  
RD Stone BA (California, Santa Cruz), MLA, PhD (California, Berkeley)  
D Vosloo BSc, MSc (PU for CHE), PhD (North-West)  
P Sommer BScHons, MSc, PhD (Lon)  
J van Staden BScHons, MSc (Stellenbosch), PhD (Natal), FRSSAf

LEAP Lecturers
M Nakhooda BScHons (UN), MSc (Witwatersrand)  
K Pillay BScHons, MSc (UKZN)  
M P Poswa BScHons (Transkei), MSc (Pretoria)

Senior Tutors
PA Joslin BScHons (Wales), PhD (Lancaster)  
B Keke BSc, SSTD (UNITRA), MEd (UKZN)  
S McConnachie BScHons, PhD (Witwatersrand)  
E Morillion B Tech (Technikon Natal), MSc (Natal)  
T Mwabvu BSc, MSc (Zimbabwe)  
P Seaman BScHons (Rhodes), MSc (UKZN)

HONORARY APPOINTMENTS

Emeritus Professors
CC Appleton BScHons (PU for CHE), MSc (Rhodes), PhD (Murdoch)  
M Ariatti BScHons (London), DPhil (Rhodesia)  
P Berjak BScHons (Witwatersrand), PhD (Natal), FRSSAf, OMS, FTWAS, MSAf  
R Biseswar BScHons (Unisa), MSc (UDW), PhD (UCT), HED (Unisa)  
DJ Brothers BScHons (Rhodes), PhD (Kansas)  
JA Cooke BScHons, PhD (Newcastle), CertEd(Tech) (Birmingham)  
C Dennison BScAgric, MScAgric, PhD (Natal)  
RC Hart BScHons (Natal), PhD (Rhodes), DSc (Natal)  
G Naidoo BScHons, UED (Unisa), MSc (UDW), PhD (Tennessee), PrSciNat  
N Pammenter MSc (Natal), PhD (Leeds), MASSAf  
MR Perrin BScHons (London), PhD (Exeter)  
NM Tainton MScAgric (Natal), PhD (Wales)  
A Thandar BScHons, MSc (Unisa), PhD (UDW), PrSciNat  
J van Staden BScHons, MSc (Stellenbosch), PhD (Natal), FRSSAf
FM Wallis BScAgric, MScAgric, PhD (Natal)  Microbiology

Honorary Professors
AT Forbes BScHons, MSc, PhD (Rhodes)  Biology
SM Goodman BS (Michigan), PhD (Hamburg), HDR (Orsay)  Biology
JC Manning BScHons, PhD (Natal)  Biology
D Pillay BScHons MSc PhD (UDW)  Microbiology
R van der Elst BSc(Unisa), MSc (Natal)  Biology

Honorary Associate Professors
TJ Edwards BScHons, MSc, PhD (Natal)  Biology
JC Groeneveld BSc (Stellenbosch), BScHons, MSc (Port Elizabeth), PhD (UCT)  Biology
MH Schleyer BScHons (Witwatersrand), MSc, PhD (Natal)  Biology

Honorary Senior Lecturers
DE Conlong BScHons, MSc, PhD (Natal)  Biology
ST Fennessy BSc (Natal), BScHons (UDW), PhD (Natal)  Biology
R Maharaj BScHons, MSc, PhD (Natal)  Biology
RM Miller BSc (Muskingum), MA (Kent State), PhD (lowa State)  Biology

Honorary Lecturers
D Druce BScHons, MSc (Natal), PhD (UKZN)  Biology
L Dziba BScAgric, MSc (Fort Hare), PhD (Utah)  Biology
ME Light BScHons, HDE, MSc, PhD (Natal)  Biology
BQ Mann BSc (Natal), BScHons, MSc (Rhodes)  Biology
MB Mostovski MSc (Moscow), PhD (Russian Academy of Sciences)  Biology
SJ Snyman BScHons (Witwatersrand), MSc (Natal), PhD (Stellenbosch)  Biology

Senior Research Associate
CC Appleton BScHons (PU for CHE), MSc (Rhodes), PhD (Murdoch)  Biology

Honorary Research Fellows
D Barracough BScHons, MSc (Natal), PhD (UNSW)  Biology
CD Earley BScHons, MSc, PhD (Natal), Hons B Compt (Unisa)  Biology
K Harding BScHons (Nottingham Trent), PhD (Nottingham)  Biology
DG Herbert BScHons, PhD (London)  Biology
L Hunter BScHons (Monash), PhD (Pretoria)  Biology
E Kjetland MD, PhD (Oslo)  Biology
T Lingham-Soliar BScHons, PhD (Reading)  Biology
JGH Londo BScHons, MSc, PhD (Rhodes)  Biology
CF Mackay BScHons (Rhodes), MSc, PhD (Zululand)  Biology
RL Mackey BScHons, MSc (Calgary), PhD (Ottawa)  Biology
PJ Taylor BScHons (UCT), PhD (Natal)  Biology
RH Taylor BSc (Witwatersrand), BScHons, MSc (Natal), PhD (Norwegian University Life sciences)  Biology
T Taylor BScHons (Leeds), PhD (Nottingham)  Biology
C Zachariades BSc Hons (Witwatersrand), PhD (Rhodes)  Biology

School of Mathematics, Statistics and Computer Science
Dean and Head of School
Professor KS Govinder

Senior Professors
D Baboolal BScHons (UDW), MSc, DPhil (Oxon)  Mathematics
J Banasiak MScEng (Tech Univ of Lodz), PhD (Strathclyde), DSc (Warsaw), MASSAf  Mathematics
<table>
<thead>
<tr>
<th>Name</th>
<th>Qualifications</th>
<th>Department</th>
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<tbody>
<tr>
<td>SD Maharaj</td>
<td>BScHons (UDW), MSc, PhD (Witwatersrand), FRAS, MASSAf</td>
<td>Mathematics</td>
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<tr>
<td><strong>Professors</strong></td>
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<tr>
<td>P Dankelmann</td>
<td>Dipl.Math Dr rer nat (Tech Univ of Aachen), MASSAF</td>
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<tr>
<td>KS Govinder</td>
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<tr>
<td>V Gutev</td>
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<tr>
<td>HC Murrell</td>
<td>BSc(Natal), MSc (Rhodes), PhD (Natal)</td>
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<tr>
<td>JG Raftery</td>
<td>PhD, HDE (Natal)</td>
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<tr>
<td><strong>Associate Professors</strong></td>
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<tr>
<td>GB Matthews</td>
<td>BScHons, MSc, PhD (Pretoria)</td>
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<tr>
<td>K Moodley</td>
<td>BScHons (UCT), MSc (Natal), PhD (Cantab)</td>
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<td>M Murray</td>
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<tr>
<td>HG Mwambi</td>
<td>BSc, MSc, PhD (Nairobi)</td>
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<tr>
<td>DE North</td>
<td>BScHons, MSc, PhD (Natal)</td>
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<tr>
<td>N Pillay</td>
<td>BScHons, MSc (Natal), PhD (UKZN)</td>
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<tr>
<td>S Ray</td>
<td>BSc, MSc (Calcutta), PhD (Jadavpur)</td>
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<td>BG Rodrigues</td>
<td>BScHons (Havana), MSc, PhD (Natal)</td>
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<td>P Sibanda</td>
<td>BScHons (Zimbabwe), MSc, PhD (Manchester)</td>
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<td>T Zewotir</td>
<td>BSc (Asmara), MSc (Addis Ababa), PhD (Witwatersrand)</td>
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<tr>
<td><strong>Senior Lecturers</strong></td>
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<tr>
<td>A O Adewumi</td>
<td>BScHons, MSc (Lagos), PhD (Witwatersrand)</td>
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<td>K Arunakirinather</td>
<td>BScHons (Peradenai), MSc (Edinburgh/Heriot Watt), MSc, PhD (UCT)</td>
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<td>M Govender</td>
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<tr>
<td>S Hansraj</td>
<td>JSED (Springfield), BScHons (Unisa), MSc, PhD (Natal)</td>
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<tr>
<td>M Keet</td>
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<td>S Mukwembi</td>
<td>BAHons, MPhil (Zimbabwe), PhD (UKZN)</td>
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<tr>
<td>N Parumasur</td>
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<tr>
<td>P Pillay</td>
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<tr>
<td>R Quadir</td>
<td>BScHons, MSc (Dhaka), MS, PhD (Western Ontario)</td>
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<tr>
<td>S Ramroop</td>
<td>BScHons (Natal), MSc (Unisa), PhD (UKZN)</td>
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<tr>
<td>P Singh</td>
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<td>A Udomene</td>
<td>BScHons (Nigeria), MSc (Ibadan), DICTP (Trieste), PhD (Nigeria)</td>
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<tr>
<td>R Willie</td>
<td>MSc, PhD, DSc (University Complutense of Madrid)</td>
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<tr>
<td>PA Winter</td>
<td>MSc, PhD, HDE(Post School), MEd (EdPsych) (Natal)</td>
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<td><strong>Lecturers</strong></td>
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<tr>
<td>T Achia</td>
<td>BScHons, MSc, PhD (Nairobi)</td>
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<tr>
<td>G Amery</td>
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<tr>
<td>G Barbour</td>
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<tr>
<td>O Bodhlyera</td>
<td>BScHons (Zimbabwe), MSc (Essex)</td>
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<tr>
<td>F Chirove</td>
<td>BScHons, MSc (Zimbabwe), PhD (Botswana)</td>
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<td>A Desai</td>
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<td>M Gwetu</td>
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<td>J Hammujuddy</td>
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<td>A Hazra</td>
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<td>AEM Henning</td>
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<td>C-K Huang</td>
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<tr>
<td>A Maharaj</td>
<td>BPaed (UDW), BAHons MA PhD (Unisa)</td>
<td>Mathematics</td>
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<tr>
<td>MF Mahlaba</td>
<td>BSc (Fort Hare), BScHons (UDW), MSc (Claremont Graduate, USA)</td>
<td>Mathematics</td>
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<tr>
<td>SF Melesse</td>
<td>BSc, MSc (Addis Ababa), MSc (Uasselt)</td>
<td>Statistics</td>
</tr>
<tr>
<td>S Moopanar</td>
<td>MSc, PhD (Natal)</td>
<td>Mathematics</td>
</tr>
</tbody>
</table>
### Staff of the College of Agriculture, Engineering and Science

**MJ Morgan** BMath(Hons), MMath (Waterloo)  
**D Naidoo** BScHons (UDW), MA (UCSB)  
**OK Narain** BScHons, MSc (UDW), PhD (Witwatersrand)  
**W Pillay** BPaed(Science) (UDW), Dip Datametrics, BScHons (Unisa), MSc (Natal)  
**J Ramjith** BScHons, MSc (UKZN)  
**E Ranganai** BScHons, MSc (Zimbabwe), PhD (Stellenbosch)  
**D Naidoo** BScHons, MSc (Unisa), MSc (Natal)  
**OK Narain** BScHons, MSc (UDW), MSc (Natal)  
**S Pillay** JSED (Springfield), BA, BEd (Unisa), MEd (UKZN)  
**A Safla** BScHons (Natal)  
**H Tarr** BScHons, MSc (Natal), PGCE (Unisa)  

### Senior Tutors

**Y Aungamuthu** BSc (Natal), PDHE, MEd (UKZN)  
**S Pillay** BScHons (UKZN)  
**A Safla** BScHons (Natal)  
**H Tarr** BScHons, MSc (Natal), PGCE (Unisa)  

### Tutors

**YP Latchmanan** BSc(UDW)  
**J Moodley** BScHons (UKZN)  
**M Mukamuri** BEd(Hons)(Zimbabwe), MSc(NUST)  
**S Pitts** BScHons (Natal)  

### HONORARY APPOINTMENTS

**Emeritus Professors**

**EAK Brüning** Dipl Phys Dr rer nat (Göttingen), Priv Doz (Bielefeld)  
**AI Dale** BScHons, MSc (UCT), PhD (VPI & SU), FSASA  
**PGL Leach** BSc, DipEd, BA (Melbourne), MSc, PhD (La Trobe), DSc (Natal), MANS, FRSSAf  
**J Mooro** BSc (Irun), MSc, PhD (Birmingham)  
**RG Ori** BScHons (Unisa), MSc, PhD (Colorado)  
**P Pillay** BScHons (UDW), MSc (Chicago), PhD (Witwatersrand)  
**HC Swart** DSc (Stellenbosch), FTICA, FRSSAf  
**J Swart** BScHons, MSc (Witwatersrand), PhD (Unisa)  
**JH Swart** MSc (Stellenbosch), PhD (Unisa)  

**Honorary Professors**

**NK Dadhich** MSc (Sardar Patel), PhD (Poona)  
**WM Getz** BScHons, PhD (Witwatersrand)  
**JD Key** BSc (Rand), MPhil, PhD (London)  
**MA Lachowicz** PhD, DSc (Warsaw)  
**R Maartens** BScHons, PhD (UCT)  
**TA Meyer** BScHons, MSc (RAU), PhD (Unisa)  

**Honorary Associate Professors**

**K Duffy** BScHons, MScEng (Natal), PhD (Virginia)  
**JG O’Hara** BSc(Ulster), PGCE, MSc (Belfast), PhD (Witwatersrand)  
**CJ Seebregts** BScMedHons (UCT), DiplDatametrics, BScHons (Unisa), PhD (UCT)  

**Senior Research Associate**

**JF McKenzie** PhD (Cantab), DSc (Strathclyde)
Academic Literacy and Development

Senior Lecturers

**N Powell** NTSD, HDE, BEd, MEd(Natal)  
UNITE Program

Lecturers

**R Kimmie** BA, HDE, BEd, MEd(Natal)  
UNITE Program

Senior Tutors

**D Haricharan** BAHons, (UDW), MA (UKZN)  
Academic Literacy

**F Kruger** BAHons, MPhil (UCT), MEd (UTAS, Australia)  
Academic Literacy

**V Padayachee** JSED (SCE), BAHons (Unisa), HonsBA (TESOL) (Unisa), MA (UKZN)  
Academic Literacy

**V Singh** BSc (Natal), BScHons, UPGCE (UDW), MSc (UKZN), MBA (UKZN)  
Academic Literacy

**D Varghese** BSc (KAU, India), MSc, PhD (UAS, India)  
Academic Literacy

Tutors

**S Ghebregziabher** BA (UoA, Eritrea), BAHons (Natal), MA (UKZN)  
Academic Literacy

**P Govender** BA (Natal), BAHons (UKZN)  
Academic Literacy

**VN Tutshana** STD (Clarkeburry College), BA, BEdHons (Natal)  
Academic Literacy
THE UKZN TRANSFORMATION CHARTER

OUR VISION
The vision of the University of KwaZulu-Natal (the University) is “to be the Premier University of African Scholarship”. The achievement of this vision is dependent on the transformation of the University.

The notion of transformation which the University embraces is deeper and broader than a narrow categorization based on race and gender representation. It means changing the identity and culture of the University in every aspect of its mission.

Transformation is profoundly advanced by improving the quality of human relationships, and meaningful behavioural change can best bring the identity and culture of the University into alignment with its vision.

OUR ASPIRATIONS
We ASPIRE TO BE a transformed university which:

• Heals the divisions of our nation’s past, bridges racial and cultural divides, and lays the foundations for a university that is united in its diversity;
• Promotes high quality research, excellent teaching and learning, and responsible community engagement;
• Promotes African scholarship in every discipline and uBuntu/Botho in its organisational culture;
• Embraces socially and contextually relevant curricula that reflect the University’s location in South Africa, Africa and the World;
• Recognises the importance and value of African languages as academic languages;
• Prioritises the well-being and growth of every individual student and staff member;
• Reflects race and gender representation in its management structures, personnel profile, and student population;
• Is socially cohesive and inclusive;
• Is free of discrimination on the basis of ethnicity, race, gender, class, nationality, religion, sexual orientation and disability;
• Nurtures collegiality, recognises and respects difference, and celebrates diversity;
• Reflects a new and refreshing culture of tolerance, understanding and vibrant engagement within the University community.

OUR CURRENT CONTEXT
We RECOGNISE that:
• Our transformation has already begun, and that considerable progress has been made;
• The University nevertheless still has much to achieve to realize its transformation objectives.

**OUR COMMITMENT**

We COMMIT ourselves:

• to the principles and values enshrined in the Constitution of the Republic of South Africa, notably:
  (i) Human dignity, the achievement of equality and the advancement of human rights and freedoms; and
  (ii) Non-racialism and non-sexism.
• to the principles of efficiency, integration and devolution that underpin the Statute of the University;
• to the UKZN PACT, which promotes mutual respect, responsibility, and excellence in teaching and learning;
• to work together until the objectives set out below are manifested in our University.

Therefore, we the staff and students of the University of KwaZulu-Natal adopt this Transformation Charter.

**OUR CHARTER**

The University shall be a place where:

**Research, Teaching, Learning and Scholarship are a Vocation for All**

• Access to learning will continue to be promoted to advance social transformation and redress;
• Scholars will pursue their studies in accordance with the principle of freedom of inquiry and research;
• Scholars will advance knowledge and culture through globally-competitive research and scholarship, and research-led teaching and learning;
• Research and curricula will be socially and contextually relevant;
• African languages will be promoted as academic languages;
• The University will be student-centred and provide a caring environment for every student;
A holistic approach to education, characterized by excellence in teaching and learning, will produce skilled self-confident and socially responsible graduates, conscious of their role in contributing to the national development effort and social transformation.

**Race and Gender Representation is Evident in All Structures**

- The staff profile of the University at all occupational levels will reflect the demographics of our province and country;
- Gender equity within the management levels of the University will be ensured, and women will be adequately represented in all management structures;
- The implementation of employment equity and the advancement of designated groups within the University structures will be part of the performance management requirements of all line managers;
- Mentorship programmes that develop, support and nurture black and female academic staff members will be provided;
- Mentorship and professional development programmes that attract and retain staff of the highest calibre, develop all staff to their full potential, and meet equity objectives will be developed.

**A Socially Cohesive and Inclusive Institutional Culture Thrives**

- Social cohesion will be valued and promoted through engagement and understanding, tolerance and respect for diversity in all its forms;
- Every individual will be encouraged to promote social interaction among diverse social groupings, whether among or between staff and students;
- The University will adopt, implement and monitor policies and procedures that aim to eliminate discrimination in all its manifestations including ethnicity, race, gender, nationality, class, religion, sexual orientation and disability;
- Processes will be devised in such a way as to break a code of silence around instances of discrimination in any form;
- Structures and procedures for problem-solving and dispute resolution will be strengthened to handle grievances in a fair and constructive manner;
- The University will enhance on-going education and training for staff and students that sensitises the University community to the lived experiences of its diverse constituencies. It will in this way foster understanding and tolerance, and promote the celebration of diversity;
- The social and personal well-being of staff and students, and an enabling environment for the realization of their full human potential, will be actively promoted.
Good Modes of Governance are Enshrined

- Good corporate governance will be ensured through commitment to democratic representation, devolution, consultation, accountability and transparency;
- Governance, leadership and management will be practiced in a manner that encourages and facilitates positive, proactive, and continuous institutional transformation;
- The University leadership and management will be responsible and directly accountable for creating an environment that cherishes diversity and equity, and which is conducive to respect, tolerance and understanding.

The Right to Freedom of Expression is Guaranteed

- Every individual whether student or staff is a valued member of the University community, and each voice will have the right to be heard;
- Ongoing debate and dialogue on all aspects of transformation and organisational culture will be fostered;
- The University will enhance its role as a leader in transformation by holding regular debates and discussions that will broaden understanding, and identify trends that inhibit and obstruct transformation;
- These engagements will be conducted according to commonly developed “rules of debate” appropriate to a university that espouses critical thinking and well-founded argument;
- Members of Senate will participate actively in debates and discussions and will assume a responsibility in preparing the University for the advent of the broader transformational challenges inherent in global change and the achievement of the University’s vision;
- The right to freedom of expression will be counterbalanced by responsibility, accountability and the limitations spelt out within the Constitution of the Republic of South Africa.

Advancement of the Transformation Agenda is the Responsibility of All

- All members of the University community will understand the meaning of transformation and accept individual and collective responsibility for its advancement;
- Leaders within all stakeholder groupings will play a critical role in advancing the transformation agenda;
- Leaders will develop a shared understanding of transformational leadership behaviour, and practice it;
- Key stakeholder groupings will commit to the process of transformation, and contribute actively to it by clearly defining their roles and responsibilities, and improving interpersonal stakeholder relationships at all levels;
- Academics will embrace the notion that universities are places of reflection to extend the boundaries of human existence and will acknowledge the centrality of human relationships in
meeting the challenges of our times, and in realising the vision and strategic objectives of the University;

- Students will recognise that they have individual and collective responsibilities to participate in the building of an institutional identity based on mutual respect and tolerance;
- Staff members will take pride in making the University an institution where courtesy; accountability; mutual respect and efficiency are core values.

**University of KwaZulu-Natal Pact**

We, the staff and students of the University of KwaZulu-Natal agree to treat each other with respect, to abide by the rules and regulations of the institution and to commit ourselves to excellence in research-led teaching and learning

**Isivumelwano seNyuvesi yaKwaZulu-Natali**

Thina, singabasebenzi nabafundi baseNyuvesi yaKwaZulu-Natali sivumelana ngokuthi siphathane ngenhlonipho, silandele yonke imithetho nemigomo yesikhungo futhi sizibophezela ekufundeni nasekufundiseni okuholwa uciongingo nokunobunyiningco
# SESSIONAL DATES 2012

**HOWARD COLLEGE, PIETERMARITZBURG AND WESTVILLE CAMPUSES**

<table>
<thead>
<tr>
<th>FIRST SEMESTER</th>
<th>Monday, 06 February – Saturday, 23 June</th>
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<tbody>
<tr>
<td>EASTER VACATION</td>
<td>Saturday, 31 March – Monday, 09 April</td>
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<tr>
<td>WINTER VACATION</td>
<td>Sunday, 24 June – Monday, 09 April</td>
</tr>
<tr>
<td>SECOND SEMESTER</td>
<td>Monday, 23 July – Saturday, 01 December</td>
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## PRE-SEMESTER:

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<th>Date Range</th>
<th>Event</th>
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<tbody>
<tr>
<td>Sun, 01 – Fri, 06 Jan</td>
<td>New Year's Day (Public Holiday)</td>
</tr>
<tr>
<td>Mon, 02 Jan</td>
<td>New Year’s Day Observed (Public Holiday)</td>
</tr>
<tr>
<td>Tue, 03 Jan</td>
<td>University Offices open</td>
</tr>
<tr>
<td>Mon, 09 – Fri, 13 Jan</td>
<td>Deadline for applications for re-marks</td>
</tr>
<tr>
<td>Wed, 11 Jan</td>
<td>Deadline for submission of Exclusion Appeals</td>
</tr>
<tr>
<td>Mon, 16 – Fri, 20 Jan</td>
<td>CEACOM meetings (College Exclusion Appeals Comm.)</td>
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<tr>
<td>Mon, 23 Jan</td>
<td>AEACOM meeting</td>
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<tr>
<td>Sat, 28 Jan</td>
<td>Parents' Day</td>
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<tr>
<td>Mon, 30 Jan – Sat, 04 Feb</td>
<td>Orientation and Registration of all students</td>
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## SEMESTER 1:

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<th>Date Range</th>
<th>Event</th>
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<tr>
<td>1</td>
<td>Mon, 06 – Fri, 10 Feb</td>
<td>First Semester commences</td>
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<td>Mon, 06 Feb</td>
<td>Lectures commence</td>
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<td>2</td>
<td>Mon, 13 – Fri, 17 Feb</td>
<td>Final date for submitting curriculum changes</td>
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<td>Fri, 17 Feb</td>
<td>Final date for registration – 1st Semester</td>
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<td>Final date for requests for extended DPs</td>
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<td>3</td>
<td>Mon, 20 – Fri, 24 Feb</td>
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<td>4</td>
<td>Mon, 27 Feb – Fri, 02 Mar</td>
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<td>5</td>
<td>Mon, 05 – Fri, 9 Mar</td>
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<tr>
<td>6</td>
<td>Mon, 12 – Fri, 16 Mar</td>
<td>Final day for capturing graduation decisions onto ITS (Bachelors, Honours, Diplomas and Certificates)</td>
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<td>Wed, 14 Mar</td>
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<td>7</td>
<td>Mon, 19 – Fri, 23 Mar</td>
<td>Final day for Human Rights’ Day (Public Holiday)</td>
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<td>Wed, 21 Mar</td>
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<td>8</td>
<td>Mon, 26 – Fri, 30 Mar</td>
<td>Final day for capturing graduation decisions onto ITS (Masters and Doctoral Studies)</td>
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<td>Wed, 28 Mar</td>
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<td></td>
<td>Fri, 30 Apr</td>
<td>Final date for withdrawal from a module</td>
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<tr>
<td>Date Range</td>
<td>Event Notes</td>
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<tr>
<td>Sat, 31 Mar– Mon, 31 Apr</td>
<td>Final date for withdrawal from the University (Semester 1) Final timetable for main and supplementary examinations released</td>
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<tr>
<td>Mon, 09 – Fri, 13 Apr</td>
<td>EASTER VACATION (STUDENT MID-TERM BREAK) Fri, 06 Apr Good Friday (Public Holiday) Mon, 09 Apr Family Day (Public Holiday) Thu, 12 Apr Follow Monday’s Timetable</td>
<td></td>
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<tr>
<td>Mon, 16 – Fri, 20 Apr</td>
<td>Mon, 16 – Fri, 20 Apr Graduation Ceremonies (WVL)</td>
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<tr>
<td>Mon, 23 – Fri, 27 Apr</td>
<td>Mon, 23 – Tue, 24 Apr Graduation Ceremonies (PMB) Fri, 27 Apr Freedom Day (Public Holiday)</td>
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<tr>
<td>Mon, 30 Apr - Fri, 04 May</td>
<td>Mon, 30 Apr No lectures Tue, 1 May Workers’ Day (Public Holiday)</td>
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<tr>
<td>Mon 07 – Fri, 11 May</td>
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<tr>
<td>Mon, 14 - Sat, 19 May</td>
<td>Thu, 17 May DP refusals published Fri, 18 May Lectures end Sat, 19 – Wed, 23 May Study period</td>
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<tr>
<td>Mon, 21 – Sat, 26 May</td>
<td>Tue, 22 May Final date for submission of DP Appeals to School Offices Thu, 24 May Exams commence (incl. Saturdays)</td>
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<tr>
<td>Mon, 28 May – Sat, 02 Jun</td>
<td>Exam week</td>
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<tr>
<td>Mon, 04 – Fri, 08 Jun</td>
<td>Fri, 08 Jun Exam week Exams end</td>
<td></td>
</tr>
<tr>
<td>Mon, 11 – Sat, 16 Jun</td>
<td>Sun, 09 – Wed, 13 Jun Break between exams Thu, 14 Jun 1st Semester Supplementary Exams commence Sat, 16 Jun Youth Day (Public Holiday)</td>
<td></td>
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<tr>
<td>Mon, 18 – Fri, 22 Jun</td>
<td>Fri, 22 Jun Supplementary Exams end First Semester ends</td>
<td></td>
</tr>
</tbody>
</table>

**Semester 1:**
Teaching days: Monday 12, Tuesday 13, Wednesday 13, Thursday 14, Friday 13: **65 days**
Study leave: 5 days; Examinations: 14 days; Supp exams: 7 days
<table>
<thead>
<tr>
<th>Date Range</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun, 24 Jun – Sun, 22 Jul</td>
<td><strong>MID-YEAR BREAK (Winter Vacation)</strong></td>
</tr>
<tr>
<td>Mon, 02 Jul</td>
<td>Supplementary Exam marks to be captured on SMS by 17h00</td>
</tr>
<tr>
<td>Tue, 10 Jul</td>
<td>Release of 1st semester results at 00:01 am</td>
</tr>
<tr>
<td><strong>SEMESTER 2:</strong></td>
<td></td>
</tr>
<tr>
<td>1 Mon, 23 – Fri, 27 Jul</td>
<td>Second Semester commences</td>
</tr>
<tr>
<td>Mon, 23 Jul</td>
<td>Lectures commence</td>
</tr>
<tr>
<td>Tue, 24 Jul</td>
<td>Deadline for submission of Exclusion Appeals</td>
</tr>
<tr>
<td>Tue, 26 – Fri, 27 Jul</td>
<td>CEACOM meetings (College Exclusion Appeals Committee)</td>
</tr>
<tr>
<td>2 Mon, 30 Jul – Fri, 03 Aug</td>
<td>AEACOM meeting</td>
</tr>
<tr>
<td>Wed, 01 Aug</td>
<td>Final date for registration – 2nd Semester</td>
</tr>
<tr>
<td>Fri, 03 Aug</td>
<td>Final date for submitting curriculum changes</td>
</tr>
<tr>
<td>3 Mon, 06 – Fri, 10 Aug</td>
<td>National Women’s Day (Public Holiday)</td>
</tr>
<tr>
<td>4 Mon, 13 – Fri, 17 Aug</td>
<td>Eid-Al-Fitr</td>
</tr>
<tr>
<td>5 Mon, 20 – Fri, 24 Aug</td>
<td></td>
</tr>
<tr>
<td>6 Mon, 27 – Fri, 31 Aug</td>
<td></td>
</tr>
<tr>
<td>7 Mon, 03 – Fri, 07 Sep</td>
<td></td>
</tr>
<tr>
<td>8 Mon, 10 – Fri, 14 Sep</td>
<td>Final date for withdrawal from a module</td>
</tr>
<tr>
<td>Fri, 14 Sep</td>
<td>Final date for withdrawal from the University (Semester 2)</td>
</tr>
<tr>
<td>Fri, 21 Sep</td>
<td>Final timetable for main and supplementary examinations released</td>
</tr>
<tr>
<td>9 Mon, 17 – Fri, 21 Sep</td>
<td>Rosh Hashanah (condoned absence)</td>
</tr>
<tr>
<td>Fri, 21 Sep</td>
<td>Lectures end</td>
</tr>
<tr>
<td>Sat, 22 – Sun, 30 Sep</td>
<td><strong>STUDENT MID-TERM BREAK</strong></td>
</tr>
<tr>
<td>Mon, 24 Sep</td>
<td>Heritage Day (Public Holiday)</td>
</tr>
<tr>
<td>Wed, 26 Sep</td>
<td>Yom Kippur</td>
</tr>
<tr>
<td>10 Mon, 01 – Fri, 05 Oct</td>
<td>Lectures resume</td>
</tr>
<tr>
<td>11 Mon, 08 – Fri, 12 Oct</td>
<td></td>
</tr>
<tr>
<td>12 Mon, 15 – Fri, 19 Oct</td>
<td></td>
</tr>
<tr>
<td>13 Mon, 22 – Fri, 26 Oct</td>
<td>DP Refusals published</td>
</tr>
<tr>
<td>Thu, 25 Oct</td>
<td>Eid-Al-Adhah (condoned absence)</td>
</tr>
</tbody>
</table>
### Sessional Dates

<table>
<thead>
<tr>
<th></th>
<th>Lectures end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sat, 27 – Wed, 31 Nov</td>
<td>Study period</td>
</tr>
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<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>14</td>
<td>Mon, 29 Oct – Sat 03 Nov</td>
</tr>
<tr>
<td></td>
<td>Tue, 30 Oct</td>
</tr>
<tr>
<td></td>
<td>Final date for submission of DP Appeals to School Offices</td>
</tr>
<tr>
<td></td>
<td>Wed, 31 Oct</td>
</tr>
<tr>
<td></td>
<td>Final date for submission of College handbooks for 2013</td>
</tr>
<tr>
<td></td>
<td>Thu, 01 Nov</td>
</tr>
<tr>
<td></td>
<td>Exams commence (incl. Saturdays)</td>
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<tbody>
<tr>
<td>15</td>
<td>Mon, 05 – Sat, 10 Nov</td>
</tr>
<tr>
<td></td>
<td>Exam week</td>
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<tbody>
<tr>
<td>16</td>
<td>Mon, 12 – Sat, 17 Nov</td>
</tr>
<tr>
<td></td>
<td>Tue, 13 Nov</td>
</tr>
<tr>
<td></td>
<td>Diwali/Deepavali (condoned absence)</td>
</tr>
<tr>
<td></td>
<td>Sat, 17 Nov</td>
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<td></td>
<td>Exams end</td>
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<tbody>
<tr>
<td>17</td>
<td>Mon, 19– Fri, 23 Nov</td>
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<tr>
<td></td>
<td>Sun, 18 – Thu, 22 Nov</td>
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<tr>
<td></td>
<td>Break between Exams</td>
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<tr>
<td></td>
<td>Fri, 23 Nov</td>
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<tr>
<td></td>
<td>2nd Semester Supplementary Exams commence</td>
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<tbody>
<tr>
<td>18</td>
<td>Mon, 26 – Fri, 30 Nov</td>
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<tr>
<td></td>
<td>Fri, 30 Nov</td>
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<tr>
<td></td>
<td>Last day for submission of theses/dissertations to the Post-Graduate Administrative Offices for possible April 2013 Graduation</td>
</tr>
<tr>
<td></td>
<td>Supplementary Exams end</td>
</tr>
<tr>
<td></td>
<td>Second Semester ends</td>
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</tbody>
</table>

**Semester 2:**

- Teaching days: Monday 13, Tuesday 13, Wednesday 12, Thursday 13, Friday 13: **64 days**
- Study leave: 5 days; Examinations: 14 days; Supp exams: 7 days

### YEAR-END BREAK

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<tr>
<td>Mon, 03 – Fri, 07 Dec</td>
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<tbody>
<tr>
<td>Mon, 10 – Fri, 14 Dec</td>
<td>Mon, 10 Dec</td>
</tr>
<tr>
<td></td>
<td>Supplementary marks to be captured on SMS by 17h00</td>
</tr>
<tr>
<td></td>
<td>Sun, 16 Dec</td>
</tr>
<tr>
<td></td>
<td>Day of Reconciliation (Public Holiday)</td>
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<tbody>
<tr>
<td>Mon, 17 – Fri, 21 Dec</td>
<td>Mon, 17 Dec</td>
</tr>
<tr>
<td></td>
<td>Day of Reconciliation observed (Public Holiday)</td>
</tr>
<tr>
<td></td>
<td>Wed, 19 Dec</td>
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<tr>
<td></td>
<td>Release of 2nd semester results at 00:01 am</td>
</tr>
<tr>
<td></td>
<td>Fri, 21 Dec</td>
</tr>
<tr>
<td></td>
<td>University Offices close</td>
</tr>
<tr>
<td></td>
<td>Tue, 25 Dec</td>
</tr>
<tr>
<td></td>
<td>Christmas Day (Public Holiday)</td>
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<tr>
<td></td>
<td>Wed, 26 Dec</td>
</tr>
<tr>
<td></td>
<td>Day of Goodwill (Public Holiday)</td>
</tr>
</tbody>
</table>
ACADEMIC MONITORING AND EXCLUSION

INFORMATION for STUDENTS

INTRODUCTION

The Academic Monitoring and exclusions Policy applies to all students registered in undergraduate degrees across all Colleges. An extract from the policy is included below for the information of students.

The Academic Monitoring and Exclusion Policy is based on a system of classifying student academic performance as “good academic standing”; “at risk” or “severely underperforming” with appropriate interventions and actions for each category. Every undergraduate student’s performance is assessed at the end of each semester and their status, based on their academic performance at the end of the semester or subsequent supplementary exams, is determined and reflected on the student administration system as “green”, “orange” or “red”.

The aim of this policy is to enable underperforming students to be identified early and offered academic, personal and careers counselling. Appropriate interventions and systems of support are expected to reduce dropout rates and exclusions and to improve throughputs and completion rates.

Specifically the implementation of this policy means that no academically underperforming student will be excluded from the university in their first year of study. However, it also means that if a student does not respond to support interventions and continues to underperform, s/he will be required to appeal for readmission to the same or a different College after three semesters at university. If readmitted and does not meet set probation requirement while on final probation, then the student will be excluded after four semesters and no further appeals allowed.

 Appeals are first considered at College level (CEACOM). All unsuccessful appeals will be referred to a university wide committee (AEACOM) for final decision.

 Students will finally be excluded from the university on account of poor academic performance after all other avenues have failed to restore their academic performance to the required level.

 Exclusion holds for a minimum period of one year unless otherwise stipulated. Thereafter a student may apply for admission to the same or another College at UKZN if s/he is able to demonstrate that s/he has achieved a level of competence satisfactory to the relevant College or has resolved the personal circumstances that led to poor performance. Admission or readmission will be at the discretion of the College to which the student applies and according their admission requirements. Colleges will specify broad guidelines for what will be deemed satisfactory competence level for readmission.
CLASSIFICATION OF ACADEMIC PERFORMANCE

Each College defines minimum progression requirements, either on a College-wide basis or per qualification or group of qualifications. These are used in categorising academic performance. The categories of academic performance and the consequent interventions and actions are as follows:

Good academic standing (Green)

New students who register for the first time and have not transferred from another College of the university are initially deemed to be of good academic standing and coded green. A student remains coded green provided s/he has passed at least 75% of the maximum expected credit load to date and also has passed 70% or more of the normal credit load this semester. These are regarded as acceptable performance levels; however optional counselling and support is available if requested.

At risk (Orange)

A student who is at risk is required to participate in a compulsory developmental programme including academic counselling, a possible modified curriculum as well as student counselling for personal, life skills and/or career counselling.

A student may be deemed “at risk” when:

- his/her performance is above the applicable minimum progression requirements for that qualification or College but is not at the level of “green”, that is, s/he has not passed 75% of the maximum expected credits to date;
- fewer than 70% of the normal credit load has been passed in the current semester.
- credits are below the applicable minimum progression requirements for that qualification or College but the student has been registered for 1 semester only, the student is placed on academic probation with specific and realistic conditions. Even if such a student is performing below the applicable minimum progression requirements s/he will remain at risk (orange) provided s/he continues to meet the set probation requirements which are reviewed each semester.

Underperforming (Red)

A student will be coded red when his/her performance falls below the applicable minimum progression requirements for that qualification or College and s/he has been registered for 2 semesters or more. The first time a student becomes “red” s/he is placed on strict academic probation. After compulsory academic and personal or career counselling s/he may be permitted to continue in the same qualification or may be advised to redirect to another qualification in the same or another College.

A student will become “red” for a second time if s/he does not achieve the probation conditions set in the previous semester or if, after improving performance for a period, the student again
drops below the required levels. In this case, the student must appeal to be readmitted to the same or a different qualification or College. If a student is readmitted following a successful appeal, s/he is placed on final probation with specific conditions to be met and continued academic support.

If a student who was severely underperforming (“red”) responds to interventions, achieves probation requirements and eventually works back to good academic standing (“green”), s/he will be deemed to be rehabilitated and the previous period as “red” will not be considered should s/he subsequently lapse.

If a student does not respond to such interventions and s/he continues to underperform s/he must appeal for readmission and may or may nor be readmitted on final probation. If readmitted and still does not respond to interventions while on final probation the student will be excluded. No further appeals are allowed.

Students who transfer between qualifications carry their history and academic status with them. Students will normally only be accepted into a new qualification if they are able to complete the new degree in the maximum time permitted for this degree, which includes the semesters they have already spent at UKZN and for which they may have generated credits towards the new degree.

The implementation of the policy is illustrated in the flow diagram below.
UNDERGRADUATE ACADEMIC MONITORING & EXCLUSION POLICY
(to be applied when performance in end of semester examinations is considered) (Reviewed October 2011)

Good academic standing (green):
- New student or no warning term decision codes given at least 1 ERS session
- Passed ≥70% normal credit load this semester?
  - Y: Green
  - N: Passed ≥75% max expected credits to date?
    - Y: Risk
    - N: Above min applicable progression requirements?
      - Y: FPR/R FPRD
      - N: Been registered 1 semester only?
        - Y: Risk + poss SUSP
          - Orange: Set probation conditions
        - N: Orange

At risk (orange):
- Term decision codes Risk2 given at least 1 ERS session
- Passed ≥75% max expected credits to date?
  - Y: Green
    - (rehabilitated)
  - N: Above min applicable progression requirements?
    - Y: Risk2
    - N: Achieved any probation targets?
      - Y: Previous exclusion? (not rehabilitated)
        - N: Red
          - FPR/R FPRD
        - Y: Red
          - FPR/R FPRD
      - N: Red
        - FPR/R FPRD

Under-performing (red):
- 1) On STRICT probation
   Term decision codes FPR/R FPRD or PROB given previously
- 2) On FINAL probation
   After successful CEACOM or AEACOM appeal
   Term decision codes FPMA or FPDS given previously followed by a readmission decision.
- Achieved probation targets?
  - Y: Previous appeal?
    - Y: Appeal submitted?
      - N: SUSPENDED, Must appeal or reapply.
      - Y: XAC
    - N: Final exclusion
  - N: XAC
- Above min applicable progression requirements?
  - Y: Risk2
  - N: PROB
    - Red: Continue on probation
- Final exclusion
  - Y: RSPD
  - N: On FINAL probation
    - Red: On FINAL probation
  - RACD
  - RODS
  - RAAD
  - RDBP
GENERAL INFORMATION FOR STUDENTS

Location

The **College of Agriculture, Engineering and Science** comprises the following five Schools:

- The School of Agricultural, Earth and Environmental Sciences
- The School of Chemistry and Physics
- The School of Engineering
- The School of Life Sciences
- The School of Mathematics, Statistics and Computer Science

The School of Agricultural, Earth and Environmental Sciences is located on the Westville campus and in Pietermaritzburg. However, Geology is available only in Westville while Agriculture, Dietetics and Human Nutrition are in Pietermaritzburg only. The Bachelor of Agriculture in Agricultural Extension is taught at Cedara College of Agriculture near Pietermaritzburg.

The School of Chemistry and Physics, the School of Life Sciences and the School of Mathematics, Statistics and Computer Science are on the Westville campus and in Pietermaritzburg.

The School of Engineering is based largely on the Howard College campus. Candidates wishing to study Engineering may complete their first year in Pietermaritzburg. The third and fourth years of Agricultural Engineering are in Pietermaritzburg only.

 Degrees and Diplomas

The College offers a wide range of undergraduate and postgraduate qualifications. These are described in the Rules and Syllabi sections of this handbook, which contain the details of each programme and qualification offered in the College.

 Entrance Requirements for Bachelor’s Degrees

Entry requirements are dealt with in the Rules section. These vary from one qualification to another and some qualifications demand a higher standard in Mathematics and/or Physical Science.

Entry to undergraduate qualifications for candidates with National Senior Certificate are covered in Rules AES-B1 – AES-B3, while entry requirements for applicants with matric qualifications prior to the NSC or foreign qualifications are dealt with in the Rule AES-B5.

Please note that in all College entrance requirements Mathematics Literacy at any level will not act as a substitute for Mathematics.
Alternative Entry Routes

The College’s Access programmes consist of the two BSc4 streams, the BSc4(Augmented) and the BSc4/Foundation, which operate in both Pietermaritzburg and Westville, and the University of KwaZulu-Natal Intensive Tuition for Engineers (UNITE) programme at Howard College.

Applicants who have had a disadvantaged school background and who do not meet the normal entry requirements may be considered for admission to the College through one of these three routes:

Further details may be found in the Rules section.

Postgraduate Study

An applicant may be admitted to postgraduate study in any of the areas of specialisation in the College of Agriculture, Engineering and Science provided that the applicant holds an acceptable primary qualification, and provided also that the standard of proficiency previously attained in the intended area is sufficiently high.

Calculation of Points for the National Senior Certificate

Points for the NSC are calculated according to the table below:

<table>
<thead>
<tr>
<th>NSC Rating</th>
<th>NSC Percentage</th>
<th>NSC Points Rating for UKZN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90% to 100%</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>80% to 89%</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>70% to 79%</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>60% to 69%</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>50% to 59%</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>40% to 49%</td>
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</tr>
<tr>
<td>2</td>
<td>30% to 39%</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0% to 29%</td>
<td>1</td>
</tr>
</tbody>
</table>

Note that the points will be calculated from six Subjects excluding Life Orientation.

In all College entrance requirements Mathematics Literacy at any level will not act as a substitute for Mathematics.
GENERAL ACADEMIC RULES FOR DEGREES, DIPLOMAS AND CERTIFICATES

(These Rules have been made by the Senate and approved by the Council in terms of the Higher Education Act (Act No. 101 of 1997), as amended.)

PREAMBLE:
(a) The Council and/or the Senate may from time to time amend, alter or delete any rule, whether a General Rule or a rule relating to a specific module or qualification.

(b) Where applicable, the interpretation of these Rules is informed by the Definitions of Terms preceding them.

(c) The provisions of these Rules, as applied in particular colleges, may be restricted in circumstances provided for in the rules of those colleges as approved under Rule GR4.

(d) Except as otherwise stated or prescribed by the Senate and the Council, Rules GR1 to GR33 shall be applicable to every student of the University of KwaZulu-Natal (hereinafter referred to as “the University”).

Definitions of Terms

“academic exclusion” means termination of a student’s registration on academic grounds, resulting in exclusion from the university.

“admission” means the act by which the university admits person to study, after acceptance by an applicant of an offer of a place at the University.

“ancillary module” means a module required as a corequisite or prerequisite to a proposed module. All such modules must have been passed before the relevant qualification may be awarded. Note: if module A is an ancillary for module B and B is an ancillary for C, then A is necessarily an ancillary for C.

“assessment” means the evaluation and grading of work, supervised or unsupervised, carried out by a student in satisfying the requirements of a module.

“credit points” are a measure of the volume of learning required for a qualification, quantified as a number of notional study hours.

“credit-weighted average” is the average mark of a set of modules weighted in proportion to the credit value of the modules concerned.
“college academic affairs board” means the board established in each college as provided for in the statute and is responsible for the academic and research functions of the school in the college.

“corequisite module” means a module for which a student must register in the same semester as the proposed module, unless the ancillary module has already been passed or attempted with satisfaction of the DP requirements.

“Council” means the Council of the University of KwaZulu-Natal.

“coursework modules” refers to the taught components of all coursework degrees specified in the curriculum and does not include the dissertation or project modules.

“curriculum” means the combination of modules which together comprise the programme of study leading to a qualification. An individual student's curriculum refers to the specific selection of modules within the broad framework of the curriculum prescribed for a qualification, which enables the student to meet the requirements for the qualification.

“degree credits” are used to satisfy the requirements for qualifications. Unless otherwise stated “credits” means degree credits and the term “degree credits” is used only when it is necessary to distinguish them from foundation credits.

“dissertation” means a work involving personal research, that is (a) capable of being recorded in any form or medium, and (b) capable of being evaluated, that is submitted for a degree and satisfies degree specific requirements (for doctoral degrees, see “thesis”).

“duly performed (DP) requirements” means those college-approved requirements for a module which must be met to permit a student to be eligible for final assessment in that module.

“elective module”, means a module that a student selects according to preference from a specified list of module options.

“examination” means a formal assessment, conducted within an officially designated examination session, usually invigilated, and bound by time constraints.

“exit-level module” means a module at the highest level required by the Higher Education Qualifications Framework (HEQF) for a qualification.

“external examination” means examination by a person, external to the university, who has not been involved with teaching including supervision at the University during the previous three (3) years.

“foundation credits” are a measure of the amount of formal foundational material in the curriculum, and may not be used in lieu of degree credits to satisfy the requirements of qualifications.

"independent moderation" means examination by a person, internal or external to the university, who has not been involved with the teaching of the relevant module in that
“internal examination” means examination by a person or persons involved with the teaching of the relevant module in that semester or, in the case of postgraduate qualifications, is a member of the University academic staff including persons who hold honorary appointments in the University other than the supervisor(s).

“major” means completion of at least 64 credits at exit level and at least 32 credits in the preceding year in that discipline or in any other closely related specified discipline.

“matriculation certificate” means evidence to the satisfaction of Senate of having obtained a National Senior Certificate (NSC) endorsed for Bachelors degrees OR a Matriculation Certificate of the Matriculation Board OR a Matriculation Board Certificate stating that the candidate has satisfied the conditions prescribed by the Board for exemption from the Matriculation Examination.

“module” means any separate course of study for which credits may be obtained and may comprise a dissertation or thesis.

“qualification” means a degree, diploma or certificate.

“prerequisite module” means a module which must have been passed, with at least the minimum mark required, before registration for the proposed module is permitted.

“prerequisite requirement” means that requirement, whether a prerequisite module, a specified mark in a module or any other condition, which must have been met before registration for the proposed module is permitted.

“programme” means a purposeful and structured curriculum leading to a qualification.

“project” means a substantial assignment, whether comprising a single module or part of a module, and which requires research or equivalent independent work by a student.

“registered student” means a student who is registered to study in one or more modules offered by the University. Such registration will lapse on the date of the following registration session or earlier should the student cease to be an admitted student.

“registration” means completion by a student, and acceptance by the University, of a registration form, physical or electronic, and compliance with such other conditions as are required for entitlement to a current student card.

“Senate” means the Senate of the University of KwaZulu-Natal.

“special examination” means an examination awarded by the Senate to a student who has not been able to attempt or complete the original examination by reason of illness or any other reason deemed sufficient by the Senate. Only the component of the examination which has not been attempted or completed, shall be re-written.

“student” means a person who has been admitted to the University for the purpose of
studying or who has registered for a qualification. A student remains a student until such time as that person graduates or otherwise completes studies, or withdraws from the University, or fails to attend or register in any semester, or is excluded and all appeal processes for readmission have been exhausted.

“supplementary examination” means an examination awarded by the Senate to a student, based on the student’s performance in the original module assessment. All examination papers which constitute the module shall be re-written.

“suspended registration” means an agreement by which the University holds a student’s registration in abeyance for a specified period of time.

“tertiary institution” means any institution that provides post-school education on a full-time, part-time or distance basis.

“thesis” means a work involving personal research, that is (a) capable of being recorded in any form or medium, and (b) capable of being evaluated, that is submitted for a doctoral degree and satisfies the requirements specified in the relevant rules.

“The University” means the University of KwaZulu-Natal.

“year of study” means the level at which undergraduate students are registered academically.

(a) foundation year: applies to students who are registered in the first year of a foundation programme for a preparatory certificate

(b) first year of study: applies to students who have not yet obtained at least 96 (degree) credits

(c) final year of study: applies to students in a programme who have registered for such modules as will, if passed, lead to the completion of the qualification.

“working days” means any day of the week but excluding Saturdays, Sundays and public holidays.

**General Rules**

**GR1 Changes in rules**

(a) The University may revise or add to its rules from time to time, and any such alteration or addition shall become binding upon the date of publication or upon such date as may be specified by the Council and the Senate, provided that no change in rules shall be interpreted so as to operate retrospectively to the prejudice of any currently registered student.

(b) Any authority granted to colleges under these rules may be further delegated.
GR2 Degrees, diplomas and certificates

The University may confer or award such degrees, diplomas and certificates as approved by the Senate and the Council.

Note: (a) The list of degrees, diplomas and certificates is available from the Registrar’s Office on request.

(b) Rules for specific qualifications will be found in the relevant college handbooks.

GR3 Approval of curricula

The Senate, after consultation with the relevant college academic affairs board, shall approve the curricula for all qualifications of the University.

GR4 College rules

Subject to the provisions of the Higher Education Act, the Statute of the University, and the following Rules, the Senate may make or amend rules for each college relating to:

a) the eligibility of a student as a candidate for any qualification and/or module, which may include recognition of prior learning (RPL);

b) the selection process;

c) the period of attendance;

d) the curriculum, work and other requirements for each qualification;

e) progression and academic exclusion; and

f) any other matter relating to the academic functions of the University.

GR5 Application to study

a) Applications to study must be made in such manner as prescribed, and must include presentation of the Matriculation Certificate where this is required.

b) An applicant who has studied at any other tertiary education institution must, in addition, present an academic record and a certificate of conduct from that institution.

GR6 Selection requirements

All applicants shall produce evidence satisfactory to the Senate of their competence to work for the qualification sought. The Senate may decline to admit as a candidate for the qualification any person whose previous academic attainments are, in its opinion, not sufficiently high to warrant such admission.

GR7 Selection for postgraduate studies

a) Graduates of any other recognised university (whether in the Republic of South Africa or elsewhere) may, for the purpose of proceeding to a postgraduate qualification of the University, be admitted by the Senate to a status in the University equivalent to that which
they possess in their own university by virtue of any degree held by them.

b) An applicant who has graduated from another tertiary institution or who has in any other manner attained a level of competence which, in the opinion of the Senate, is adequate for the purpose of postgraduate studies or research, may be admitted as a student of the University.

**GR8 Exemption from a module**

a) Exemption from a module may be granted without credit, where an applicant can demonstrate an equivalent level of competence through prior learning.

b) Exemption and credit for a module may be granted where an applicant has already obtained credit for an equivalent module at this or another university.

c) Credit cannot be obtained for more than one module where the contents of the modules overlap or are partially or substantially the same.

**GR9 Registration**

a) In order to pursue their studies in any semester, all students of the University shall complete the applicable registration procedure, thereby affirming their acceptance of the rules of the University.

b) The Council, on the recommendation of the Senate, may impose conditions for the registration of any student.

c) Except as provided for hereunder, a student shall register in consecutive semesters.

(i) On application in advance to the relevant college and with the approval of the college academic affairs board, a student's registration may be suspended for a period of time not exceeding 2 semesters. Under exceptional circumstances, a further such suspension of 2 semesters may subsequently be applied for and approved.

(ii) The deputy vice chancellor and head of college may require that a student suspend his/her studies for a maximum of 1 semester should the student be unable to register for a valid curriculum that will allow satisfactory progress to be made towards the attainment of the qualification.

(iii) A student with a suspended registration remains subject to the rules of the University, and may return to register before or at expiry of the period of suspension. The period during which registration is suspended shall not be included in and calculation towards the minimum and maximum periods prescribed for any qualification in terms of Rule GR12, nor for the evaluation of eligibility for the award of degrees *cum laude* or *summa cum laude* in terms of Rules BR6, HR8, CR17 and MR13.

d) Should a student fail to register for a semester:

(i) In the case of a postgraduate student who has not been granted suspension as
provided for in (c) (i) or (ii) above the student must apply to the relevant college for readmission should she/he subsequently wish to return to resume studies. Such readmission shall only be approved under the conditions, rules and curricula applicable at the time of readmission and, in the case of a postgraduate research student, provided that supervisory capacity is available.

(ii) In the case of an undergraduate student, should the break in studies exceed one semester and the student has not been granted suspension as provided for in (c)(i) or (ii) above, the student must apply to the relevant college for readmission should he/she subsequently wish to return to resume studies. Such readmission shall only be approved under the conditions, rules and curricula applicable at the time of readmission.

GR10 Payment of fees

a) Save by special permission of the Senate and the Council:
   (i) An applicant shall not be registered until all relevant prescribed fees are paid;
   (ii) A student shall not be entitled to admission to an examination, nor to receipt of examination results, until all relevant prescribed fees are paid.

b) A student shall not be entitled to the conferral or award of a qualification until all monies due to the University have been paid.

GR11 Concurrent registration

Save by special permission of the Senate:

a) no student shall be registered for more than one qualification at the same time; nor

b) shall any student, while registered at any other tertiary institution, be registered concurrently at the University.

GR12 Period of attendance

Every candidate for a qualification shall meet the relevant attendance and performance requirements for each module and qualification as prescribed by the relevant college and approved by the Senate, in order to obtain the requisite credit.

GR13 Module registration

a) Subject to Rule GR14, no student shall be registered for any module unless his or her curriculum has been approved by the Senate. An approved curriculum may be modified only with the consent of the Senate.

b) Save by special permission of the Senate, no student may attend a module for which he or she is not registered.
GR14 Ancillary, prerequisite and corequisite requirements

a) A college may prescribe ancillary modules in any curriculum.
b) A college may specify the attainment of a minimum mark of more than 50% in a prerequisite module, a specified mark in a module or any other requirement before registration for the proposed module is permitted.
c) Registration for a module will be conditional on meeting all corequisite and prerequisite requirements for that module.

GR15 Obsolete modules

In readmitting a student, the Senate may withhold recognition, for the purposes of a qualification, of credits previously obtained in modules which have subsequently become obsolete.

GR16 Duly Performed (DP) certification

a) Students shall not present themselves for examination in any module unless the module co-ordinator / lecturer has certified that they have met the DP requirements for the specified module.
b) Such DP certification shall be valid only for the examinations, including supplementary examinations, of the semester in which it is issued.
c) With the consent of the school board concerned, in exceptional circumstances, the DP certification may be extended to the relevant subsequent semester, in which case the board may allow the student to retain the relevant class mark.
d) The DP requirements for each module shall be published in the college handbook and in any other manner deemed appropriate by the college.
e) Save as may otherwise be provided by the college, for each module a list of those students refused DP certification shall be published, in a manner deemed appropriate by the college on or before the last day of teaching in each semester.

GR17 DP certification - right of appeal

a) Students have the right to appeal against the refusal of a DP certification in terms of Rule GR16.
b) An appeal must be lodged with the relevant school, in the prescribed manner, on or before the date specified in the sessional dates which shall be no less than three (3) working days after the last day of notification of DP refusals.
c) Such appeal shall be considered by an appropriate committee, the composition of which shall be approved by the Senate.
d) The decision of the committee shall be final.
GR18 Examinations

a) An examination may be written and/or oral, and may include practical work.
b) With the approval of the college academic affairs board, a written examination may, for a particular student, be replaced or supplemented by an oral examination.

GR19 External examination and moderation

a) Except with the permission of the Senate, all modules, other than exit-level modules, shall be subject to internal examination and independent moderation.
b) Except with the permission of the Senate, all exit-level modules shall be subject to internal and external examination.
c) The portion of the total assessment subject to independent moderation or external examination, in terms of (a) or (b) above, shall be at least 50%.

GR20 Examination scripts

a) To aid academic development, students may view their examination scripts under supervision.
b) (i) A student may, on formal application and after payment of the applicable fee, have all his/her examination scripts for a module re-marked, normally by the original examiners, in accordance with the policies approved by the Senate and the Council.
   (ii) Such application shall be lodged with the relevant school office, in the prescribed manner, on or before the date specified in the sessional dates which shall be no less than ten (10) working days after the date of the official release of results.
   (iii) The student’s final mark for the module shall be that determined by the re-mark.
   (iv) The fee shall be refunded only if the re-mark causes an improvement in the class of result as reflected in Rule GR29(a).
c) Re-marking as contemplated in (b) above shall not be permitted for honours and equivalent projects, master’s dissertations and doctoral theses.
d) Examination scripts shall be stored by the University for a maximum period of one (1) year or such longer period required by contractual or professional obligations.

GR21 Examination sessions

All examinations shall be held in the prescribed sessions approved by the Senate.

GR22 Supplementary examinations

Supplementary examinations may be awarded in terms of these rules and the relevant college rules. Supplementary examinations shall not be awarded for any continuously assessed modules or components of modules.
GR23 Special examinations

a) An undergraduate student who elects not to write a final examination paper in a module for any reason will, on application, be allowed to write a special examination during the next applicable supplementary examination session, provided that such a supplementary examination is scheduled.

b) A student who has not been able to complete the original final examination by reason of illness or any other reason deemed sufficient by the Senate, may, on application, be granted permission to sit a special examination, during the next applicable supplementary examination session.

c) An application for a special examination shall be made on the prescribed form, accompanied by all relevant documentation, and lodged in the relevant college within five (5) working days of the date of the examination concerned. It is the responsibility of the student to ascertain whether or not the special examination has been granted.

d) If an application for a special examination is approved, the examination result, if any, from the original examination shall be regarded as null and void. If such an application is not approved the original examination result shall stand.

GR24 Standard of supplementary and special examinations

To pass supplementary and special examinations, students must demonstrate a level of academic competence equivalent to that required in the original examination.

GR25 Limitation on awarding supplementary and special examinations

a) A supplementary or special examination shall not be granted in respect of any supplementary examination awarded in terms of Rule GR22.

b) A supplementary or special examination shall not be granted in respect of any special examination awarded in terms of Rule GR23.

GR26 Completion of modules

Every module shall be completed by passing the Senate-approved assessment in that module.

GR27 Pass mark

The pass mark for all modules in the University shall be 50%, provided that any sub-minima required in certain components of the Senate-approved assessment have been met.

GR28 Completion requirements

Save by special permission of the Council, upon the approval of the Senate, a qualification shall not be conferred or awarded until:

a) credit has been obtained for all prescribed modules, including prerequisite and
corequisite modules;
b) all other Senate and college requirements have been met; and
c) all monies due to the University have been paid.

**GR29 Classification of results**

a) Results may be classified as follows:
   - 75% upward = 1st class;
   - 70 – 74% = 2nd class, upper division;
   - 60 – 69% = 2nd class, lower division;
   - 50 – 59% = 3rd class;
   - less than 50% = fail.

b) On the recommendation of the school board, a module may be passed with such distinctions as may be prescribed by the Senate.

c) On the recommendation of the college academic affairs board, a qualification may be conferred or awarded with such distinctions as may be prescribed by the Senate.

**GR30 Academic exclusion**

a) The Council may, with the approval of the Senate, after each examination session exclude or refuse to renew or continue the registration of a student who has failed to meet the academic requirements for continued registration.

b) The Senate may cancel the registration of a student in all or one or more of the modules for which the student is registered in a semester if, in the opinion of the Senate, the academic achievement of the student is such that the student may not at the end of the semester obtain credit in such module or modules.

c) The Council may, with the approval of the Senate, refuse readmission to a student who fails to satisfy the minimum requirements for readmission.

d) Subject to Rule GR31, students excluded or refused re-registration may not be readmitted to the University until they are able to demonstrate that they have achieved a level of competence satisfactory to the relevant college and the Senate.

**GR31 Academic exclusion – right of appeal**

a) Students have the right to a single appeal against academic exclusion in terms of Rule GR30.

b) Such appeal shall be lodged with the college of registration, in the prescribed manner, on or before the date specified in the sessional dates which shall be no less than ten (10) working days after the date of the official release of results.

c) The process for consideration of such an appeal shall be approved by the Senate.
GR32 Ethics

All academic activities and research in particular, shall comply with the relevant University policies on ethics and any related requirements as determined by the Senate and the Council.

GR33 Reproduction of work

Subject to the provisions of the University’s policy on intellectual property rights and any limitations imposed by official contractual obligations:

a) In presenting an assignment, prescribed project, dissertation, thesis or any such work for assessment, a student shall be deemed by so doing to have granted the University a perpetual, non-exclusive, royalty-free licence to digitise, reproduce, share, disseminate and/or publicly distribute copies thereof for research and study purposes only, in whole or in part and in any format the University deems fit, provided that the University may waive its rights under this licence if the work in question has been or is being published in a manner satisfactory to the University.

b) Students shall forward master copies and electronic copies of all treatises, dissertations and theses to the University libraries by the date, in the numbers and in the format stipulated by the libraries in their policies existing at the time of creation of the treatise, dissertation or thesis concerned.

c) The work of students shall not be included in publications by academic staff without their express permission and acknowledgement; provided that such work may be included and acknowledged if all reasonable attempts to trace such students have been unsuccessful.

Rules for Bachelors Degrees

Note: The following Rules are additional to the preceding General Rules GR1 – GR33.

BR1 Applicability

The following Rules, BR2 to BR6 inclusive, shall be applicable to every candidate for a Bachelors Degree.

BR2 Criteria for admission to study

a) Applicants for a first or primary degree for which the Matriculation Certificate is a prerequisite, shall produce evidence to the satisfaction of the Senate that they have obtained such a certificate, or obtained a certificate of conditional exemption issued by the Matriculation Board to applicants from countries outside the Republic of South Africa, or satisfied the conditions of any alternative admission process approved by the Senate.

b) In addition to the requirements of a) above, the minimum requirements for admission to study in any college may include the requirement to have attained such minimum standard in a specified subject or subjects or such aggregate of points scored according
to subjects passed in the Matriculation Examination, or in an examination recognised for the purpose by the Matriculation Board, or such other qualifications as may be prescribed. The selection process will be based on these requirements and may include academic ranking and other criteria as approved by the Senate and the Council.

**BR3 Periods of attendance**

Every candidate for a first or primary degree, shall be registered as a matriculated student, except as provided in Rule BR2, and have completed subsequent to the date of validity of the Matriculation Certificate or of the certificate of full exemption from the matriculation examination issued by the Matriculation Board, the minimum period of attendance prescribed by the rules of the relevant college.

**BR4 Recognition of attendance**

For the purpose of Rules GR12 and BR3, the Senate may accept as part of the attendance of a student for a degree of Bachelor, periods of attendance as a registered matriculated student at any other university or tertiary institution or in any other college in the University: provided that students shall not have the degree of Bachelor conferred unless:

a) their periods of attendance are together not less than the complete period prescribed for such degree; and

b) they attended at the University:

   (i) for a degree of Bachelor, the term of which is six semesters, at least three semesters which shall include the completion of at least half of the total number of credits prescribed for the degree and which, except with the approval of the Senate, shall include all those at the exit level; or

   (ii) for a degree of Bachelor, the term of which is eight semester, at least four semesters which shall include the completion of at least half of the total number of credits prescribed for the degree and which, except with the approval of the Senate, shall include all those at the exit level; or

   (iii) for a degree of Bachelor, the term of which is ten or twelve semesters, at least six semesters which, except with the approval of the Senate, shall include the completion of all modules prescribed for the final six semesters of the curriculum.

**BR5 Progression under conditional exemption**

Applicants who are accepted with an ordinary conditional exemption that requires completion of additional credits to qualify for exemption, shall not be permitted to register for any module at level 3 or above before the requirements for exemption have been satisfied.

**BR6 Supplementary examinations**

Provided that the rules of any college do not prohibit this for a particular module:
a) a student who fails a module with a mark of at least 40%, or who obtains a passing mark less than that prescribed for registration for another module, shall be awarded a supplementary examination;
b) under exceptional circumstances, and with the permission of the college academic affairs board, a student who has failed a module with a mark of less than 40% may be awarded a supplementary examination.

BR7 Award of degree *cum laude* and *summa cum laude*

a) A degree of Bachelor may be conferred *cum laude* in accordance with the rules of the relevant college, provided that, subject to exceptions as approved by the college academic affairs board, the student has:
   (i) obtained a credit-weighted average of at least 75% in those modules required for the qualification; and
   (ii) successfully completed all modules in the curriculum at the first attempt and without recourse to supplementary examinations; and
   (iii) completed the degree in the prescribed minimum time.

b) A degree of Bachelor may be conferred *summa cum laude* in accordance with the rules of the relevant college, provided that, subject to exceptions as approved by the college academic affairs board, the student has:
   (i) obtained a credit-weighted average of at least 80% in those modules required for the qualification; and
   (ii) successfully completed all modules in the curriculum at the first attempt and without recourse to supplementary examinations; and
   (iii) completed the degree in the prescribed minimum time.

BR8 Deans Commendation

A student who is registered for the full load required for that qualification in a particular semester and passes all these modules at the first attempt, with no individual module mark of less than 60% and a credit-weighted average mark of at least 75%, will be awarded a Dean’s commendation for that semester.

Rules For Honours Degrees

*Note: The following Rules are additional to the preceding General Rules GR1 – GR33.*

HR1 Applicability

The following Rules, HR2 to HR8 inclusive, shall be applicable to every candidate for a degree of Honours.
HR2 Criteria for admission to study

a) Applicants may be registered for the qualification of Honours provided that they have:
   (i) completed a Bachelors degree regarded as appropriate by the college concerned; or
   (ii) been admitted to the status of that degree in terms of Rule GR7(a); or
   (iii) attained a level of competence as defined in Rule GR7(b).

b) A college may prescribe further minimum criteria for admission to study.

HR3 Attendance

a) Every student for a qualification of Honours shall attend an approved course of study as a registered student of the University for a period of at least two consecutive semesters after admission in terms of Rule HR2.

b) Except with by permission of the college academic affairs board, all modules shall be completed at the University.

HR4 Curriculum

The curriculum for a qualification of Honours shall include a prescribed research project as one of the modules which shall account for a minimum of 25% of the credits for the degree.

HR5 Supplementary examinations

Provided that the rules of a college do not prohibit this for a particular module:

a) a student who fails a module other than the research prescribed project with a mark of at least 40% shall be awarded a supplementary examination; and

b) under exceptional circumstances, and with the permission of the college academic affairs board, a student who has failed a module other than the research project with a mark of less than 40% may be awarded a supplementary examination.

HR6 Re-examination of prescribed project

Provided that the rules of a college, do not prohibit this, a research project that is assessed as unsatisfactory may be referred back once for revision and resubmission before the last day of examinations in that semester.

HR7 Progression

a) A student may repeat a failed module not more than once, provided that this does not apply to the prescribed project described in Rule HR4 and HR6 above.

b) A student who, after four semesters as a fulltime student or six semesters as a part-time student, has not completed the requirements for the degree, shall be excluded.
HR8 Award of degree *cum laude* and *summa cum laude*

a) A degree of Honours may be conferred *cum laude* in accordance with the rules of the relevant college, provided that, subject to exceptions as approved by the college academic affairs board, the student has:
   (i) obtained a credit-weighted average of at least 75% in those modules required for the qualification; and
   (ii) a mark of at least 75% for the prescribed project; and
   (iii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and
   (iv) completed the degree in the prescribed minimum time.

b) A degree of Honours may be conferred *summa cum laude* in accordance with the rules of the relevant college, provided that, subject to exceptions as approved by the college academic affairs board, the student has:
   (i) obtained a credit-weighted average of at least 80% in those modules required for the qualification; and
   (ii) a mark of at least 80% for the prescribed project; and
   (iii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and
   (iv) completed the degree in the prescribed minimum time.

**Rules for Postgraduate Diplomas**

Note: The following Rules are additional to the preceding General Rules GR1 – GR33.

**PR1 Applicability**

The following Rules, PR2 to PR8 inclusive, shall be applicable to every candidate for a Postgraduate Diploma.

**PR2 Criteria for admission to study**

a) Applicants may be registered for the qualification of Postgraduate Diploma provided that they have:
   (i) completed a Bachelors degree regarded as appropriate by the college concerned; or
   (ii) been admitted to the status of that degree in terms of Rule GR7(a); or
   (iii) attained a level of competence as defined in Rule GR7(b).

b) A college may prescribe further minimum criteria for admission to study.

c) A college may provide in its rules for an appropriate Advanced Diploma to be accepted for entry to a Postgraduate Diploma in accordance with the HEQF.
PR3 Attendance

a) Every student for the qualification of Postgraduate Diploma shall attend an approved course of study as a registered student of the University for a period of at least two consecutive semesters after admission in terms of Rule PR2.

b) Except with the permission of the college academic affairs board, all modules shall be completed at the University.

PR4 Curriculum

The curriculum for the Postgraduate Diploma will contain advanced reflection, practice and research methods in the area of specialisation and may include a sustained research project in accordance with college rules.

PR5 Supplementary examinations

Provided that the rules of a college do not prohibit this for a particular module:

a) a student who fails a module other than the research prescribed project with a mark of at least 40% shall be awarded a supplementary examination; and

b) under exceptional circumstances, and with the permission of the college academic affairs board, a student who has failed a module other than the research project with a mark of less than 40% may be awarded a supplementary examination.

PR6 Re-examination of research project

Provided that the rules of a college do not prohibit this, a research project that is assessed as unsatisfactory may be referred back once for revision and resubmission before the close of the applicable supplementary examination session.

PR7 Progression

a) A student may repeat a failed module not more than once, provided that this does not apply to the research project described in Rule PR4 and PR6 above.

b) A student who, after four semesters as a full-time student or six semesters as a part-time student, has not completed the requirements for the diploma, shall be excluded.

PR8 Award of diploma with distinction

A qualification of Postgraduate Diploma may be conferred with distinction in accordance with the rules of the relevant college, provided that, subject to exceptions as approved by the college academic affairs board, the student has:

(i) obtained a credit-weighted average of at least 75% over all modules required for the qualification; and

(ii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and

(iii) completed the diploma in the prescribed minimum time.
Rules for Masters Degrees by Coursework

Note: The following Rules are additional to the preceding General Rules GR1 – GR33.

CR1 Applicability

The following Rules, CR2 to CR17 inclusive, shall be applicable to every candidate for a degree of Master by coursework.

CR2 Criteria for admission to study

a) An applicant shall not be registered for the degree of Master by coursework unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the college concerned; or
   (ii) been admitted to the status of that degree in terms of Rule GR7(a); or
   (iii) attained a level of competence as defined in Rule GR7(b).

b) A college may prescribe further minimum criteria for admission to study.

CR3 Recognition of examinations

The Senate may accept examinations passed or certificates of proficiency completed in any module by a student of the University or of any other university or institution recognised by the Senate for this purpose, or accept demonstration of an equivalent level of competence through prior learning, in terms of Rule GR7(b), as exempting the student from examination in module(s) prescribed for a degree of Master by coursework, provided that:

a) no more than 50% of the required credits for the degree may be so exempted, provided that such credits shall be awarded for coursework modules only; and

b) students shall not have the degree of Master conferred unless the conditions laid down in Rules CR4 and CR5 are satisfied.

CR4 Periods of registration

A student registered for the degree of Master by coursework shall be so registered for a minimum period of two consecutive semesters for full-time students or four consecutive semesters for part-time students before the degree may be conferred.

CR5 Recognition of attendance

The Senate may accept as part of the attendance of a student for a degree of Master by coursework, periods of attendance as a registered or graduated student at any other university or institution or in any other college, provided that students shall not have the degree of Master conferred unless:

a) their periods of attendance are together not less than the complete period prescribed for conferral of the degree; and

b) the research component is completed at the University.
CR6 Curriculum

a) A student shall complete all prescribed modules, at least one of which shall be a dissertation module comprising research on a particular topic approved by the college academic affairs board, and comply with such other conditions as may be prescribed by the Senate and the rules of the college concerned.

b) Except with the permission of Senate, the dissertation module shall comprise 33% to 50% of the total credits for the degree.

CR7 Proposed research topic

a) The college academic affairs board may, at its discretion, decline to approve a research topic if in its opinion:
   (i) it is unsuitable in itself; or
   (ii) it cannot effectively be undertaken under the supervision of the University; or
   (iii) the conditions under which the student proposes to work are unsatisfactory.

b) Ethical approval in terms of Rule GR32 is required where applicable.

CR8 Supervision

The school board shall, in terms of the policies of the Senate, appoint one or more appropriate supervisors, at least one of whom shall be a member of the University academic staff, to advise a student whose research topic is approved, and the student shall be required to work in such association with the supervisor or supervisors.

CR9 Supplementary examinations

Provided that the rules of a college do not prohibit this for a particular module:

a) a student who fails a module other than the dissertation with a mark of at least 40% shall be awarded a supplementary examination;

b) under exceptional circumstances, and with the permission of the college academic affairs board, a student who has failed a module other than the dissertation with a mark of less than 40% may be awarded a supplementary examination.

CR10 Failed coursework modules

Failed coursework modules may not be repeated, except with the permission of the college academic affairs board and then not more than once.

CR11 Progression

A student who, after six semesters as a full-time student or ten semesters as a part-time student, has not completed the requirements for the degree shall be required to apply for re-registration, which will only be permitted on receipt of a satisfactory motivation.
CR12 Submission of dissertation

At least three months before the dissertation is to be submitted for examination, a student shall give notice, in writing, of their intention to submit such dissertation and the title thereof, provided that, in the event of a student failing to submit the dissertation for examination within six months thereafter, the notice will lapse and a further notice of intention shall be submitted.

CR13 Format of dissertation

a) Every dissertation submitted shall include a declaration to the satisfaction of the Senate stating that it has not previously been submitted for a degree in this or any other university, and that it is the student's own original work.

b) Every dissertation submitted shall be in such format as prescribed by the Senate and the rules of the relevant college; provided that each dissertation shall include an abstract in English not exceeding 350 words.

c) A dissertation may comprise one or more papers of which the student is the prime author, published or in press in peer-reviewed journals approved by the relevant college academic affairs board, accompanied by introductory and concluding material.

d) A dissertation submitted under (c) above shall include a detailed description of the student's own distinct contribution to the papers.

e) All dissertations are subject to full examination in terms of these rules, the rules of a college and the normal policies and procedures applicable to dissertations.

CR14 Supervisor’s report

Upon submission of the dissertation, the supervisor or supervisors shall furnish a report on the conduct of the student's work; the report shall not include an evaluation of the quality of the dissertation.

CR15 Examination of dissertation

a) The college academic affairs board shall appoint for each dissertation two examiners, at least one of whom shall be responsible for external examination.

b) A supervisor or co-supervisor shall not be appointed as an examiner.

c) The names of the examiners shall not be known to either the candidate or to one another.

CR16 Re-examination of dissertation

A failed dissertation may not be re-examined.

CR17 Award of degree cum laude and summa cum laude

The degree of Master by Coursework may be awarded cum laude or summa cum laude on the recommendation of the examiners of the dissertation and, in accordance with rules of the college provided that, subject to exceptions approved by the college academic affairs board,
a) For *cum laude*:
   i) the student has obtained a credit weighted average of at least 75% in the coursework component of the degree at the first attempt and without recourse to supplementary examinations; and
   ii) the degree was completed in the prescribed minimum time plus two semesters.

b) For *summa cum laude*:
   i) the student has obtained a credit weighted average of at least 80% in the coursework component of the degree at the first attempt and without recourse to supplementary examinations; and
   ii) the degree was completed in the prescribed minimum time.

**Rules for Masters Degrees by Research**

*Note: The following Rules are additional to the preceding General Rules GR1 – GR33.*

**MR1 Applicability**

The following Rules, MR2 to MR13 inclusive, shall be applicable to every candidate for a degree of Master by research.

**MR2 Criteria for admission to study**

a) An applicant shall not be registered for the degree of Master by research unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the college concerned; or
   (ii) been admitted to the status of that degree in terms of Rule GR7(a); or
   (iii) attained a level of competence as defined in Rule GR7(b).

b) A college may prescribe further minimum criteria for admission to study.

**MR3 Periods of registration**

A student registered for the degree of Master by research shall be so registered for a minimum period of two semesters for full-time students or four semesters for part-time students before the degree may be conferred.

**MR4 Curriculum**

a) A student for the degree of Master by research shall be required to pursue an approved programme of research on some subject falling within the scope of the studies represented in the University.

b) A student shall also comply with such other conditions as may be prescribed by the Senate and the rules of the college concerned.
MR5 Proposed subject of study

a) Before registration, an applicant for the degree of Master by research shall submit for the approval of the college academic affairs board a statement of the proposed subject of study.

b) The college academic affairs board may, at its discretion, decline to approve such subject if, in its opinion:
   (i) it is unsuitable in itself, or
   (ii) it cannot profitably be studied or pursued under the supervision of the University, or
   (iii) the conditions under which the applicant proposes to work are unsatisfactory.

c) Ethical approval in terms of Rule GR32 is required where applicable.

MR6 Supervision

The school board shall, in terms of the policies of the Senate, appoint one or more appropriate supervisors, at least one of whom shall be a member of the University academic staff, to advise a student whose research topic is approved, and the student shall be required to work in such association with the supervisor or supervisors.

MR7 Progression

A student who, after six semesters as a full-time student or ten semesters as a part-time student, has not completed the requirements for the degree shall be required to apply for re-registration, which will only be permitted on receipt of a satisfactory motivation.

MR8 Submission of dissertation

a) Every student for the degree of Master by research shall be required to submit a dissertation embodying the results of their research.

b) At least three months before the dissertation is to be submitted for examination, a student shall give notice, in writing, of their intention to submit such dissertation and the title thereof, provided that, in the event of a student failing to submit the dissertation for examination within six months thereafter, the notice will lapse and a further notice of intention shall be submitted.

MR9 Format of dissertation

a) Every dissertation submitted shall include a declaration to the satisfaction of the Senate stating that it has not previously been submitted for a degree in this or any other university, and that it is the student's own original work.

b) Every dissertation submitted shall be in such format as prescribed by the Senate and the rules of the relevant college; provided that each dissertation shall include an abstract in English not exceeding 350 words.
A dissertation may comprise one or more papers of which the student is the prime author, published or in press or in manuscripts written in a paper format, accompanied by introductory and concluding integrative material.

d) A dissertation submitted under (c) above shall include a detailed description of the student’s own distinct contribution to the papers.

e) All dissertations are subject to full examination in terms of these rules, the rules of a college and the normal policies and procedures applicable to dissertations.

**MR10 Supervisor’s report**

Upon submission of the dissertation, the supervisor or supervisors shall furnish a report on the conduct of the student's work; the report shall not include an evaluation of the quality of the dissertation.

**MR11 Examination**

a) The college academic affairs board shall appoint for each dissertation two examiners, at least one of whom shall be responsible for external examination.

b) A supervisor or co-supervisor shall not be appointed as an examiner.

c) the names of the examiners shall not be known to either the candidate or to one another.

**MR12 Re-examination of dissertation**

A failed dissertation may not be re-examined.

**MR13 Award of degree *cum laude* and *summa cum laude***

The degree of Master by research may be awarded *cum laude* or *summa cum laude* on the recommendation of the examiners, and in accordance with rules of the relevant college provided that the degree was completed:

a) For *cum laude*: in the prescribed minimum time plus two semesters.

b) For *summa cum laude*, in the prescribed minimum time.

**Rules for the Doctoral Degree by Research**

**Note:** The following Rules are additional to the preceding General Rules GR1 – GR33.

**DR1 Applicability**

The following rules, DR2 to DR13 inclusive, shall be applicable to every candidate for a Doctoral degree.

**DR2 Criteria for admission to study**

a) An applicant shall not be registered for a Doctoral degree unless the applicant has:
General Academic Rules

(i) satisfied the requirements for a relevant prerequisite degree as specified in the college concerned; or
(ii) been admitted to the status of that degree in terms of Rule GR7(a); or
(iii) attained a level of competence as defined in Rule GR7(b).

b) A college may prescribe further minimum criteria for admission to study.

c) Candidates, registered for a research Masters degree, who have completed the requirements for the Masters degree, may apply to have their registration converted to a Doctoral degree registration before the Masters degree is awarded. The time allowed for the Doctoral degree would be reduced by two semesters. The material from the Masters dissertation may then be used towards the Doctoral degree. If the Doctoral degree is not completed, the Masters degree will be awarded.

DR3 Periods of registration

A student registered for a Doctoral degree shall be so registered for a minimum period of four semesters for full-time students or eight semesters for part-time students before the degree may be conferred.

DR4 Curriculum

a) A student for a Doctoral degree shall be required to pursue an approved programme of research on some subject falling within the scope of the studies represented in the University.

b) Such programme shall make a distinct contribution to the knowledge or understanding of the subject and afford evidence of originality shown either by the discovery of new facts and/or by the exercise of independent critical power.

c) A student shall also comply with such other conditions as may be prescribed by the Senate and the rules of the college concerned.

DR5 Proposed subject of study

a) Before registration, an applicant for a Doctoral degree shall submit for the approval of the college academic affairs board a statement of the proposed subject of study.

b) The Senate may, at its discretion, decline to approve such subject if, in its opinion:
   (i) it is unsuitable in itself, or
   (ii) it cannot profitably be studied or pursued under the supervision of the University, or
   (iii) the conditions under which the applicant proposes to work are unsatisfactory.

c) Ethical approval in terms of Rule GR32 is required where applicable.

DR6 Supervision

The school board shall appoint one or more appropriately qualified supervisors, at least one of
whom shall be a member of the University staff, to advise a student whose research topic is approved, and the student shall be required to work in such association with the supervisor or supervisors.

**DR7 Progression**

A student who, after eight semesters as a full-time student or twelve semesters as a part-time student, has not submitted a thesis for examination shall be required to apply for re-registration, which will only be permitted on receipt of a satisfactory motivation.

**DR8 Submission of thesis**

a) Every student for a Doctoral degree shall be required to submit;
   (i) a thesis embodying the results of their research, together with
   (ii) one (1) published paper or an unpublished manuscript that has been submitted to an accredited journal, arising from the doctoral research unless the thesis is in the format as described in DR9 c).

b) At least three months before the thesis is to be submitted for examination, a student shall give notice, in writing, of their intention to submit such thesis and the title thereof, provided that, in the event of a student failing to submit the thesis for examination within six months thereafter, the notice will lapse and a further notice of intention shall be submitted.

**DR9 Format of thesis**

a) Every thesis submitted shall include a declaration to the satisfaction of the Senate stating that it has not previously been submitted for a degree in this or any other university, and that it is the student's own original work.

b) Every thesis submitted shall be in such format as prescribed by the Senate and the rules of the relevant college; provided that each thesis shall include an abstract in English not exceeding 350 words.

c) A thesis may comprise one or more original papers of which the student is the prime author, published or in press in peer-reviewed journals approved by the college academic affairs board, accompanied by introductory and concluding integrative material.

d) A thesis submitted under c) above shall include a detailed description of the student's own distinct contribution to the papers.

**DR10 Supervisor’s report**

Upon submission of the thesis, the supervisor or supervisors shall furnish a report on the conduct of the student's work; the report shall not include an evaluation of the quality of the thesis.
**DR11 Examination**

a) The college academic affairs board shall appoint for each thesis three examiners, at least two of whom shall be responsible for external examination.

b) Except with the permission of the college academic affairs board, at least one of the external examiners shall be based external to the country.

c) A supervisor or co-supervisor shall not be appointed as an examiner.

d) The names of the examiners shall not be known to either the candidate or to one another.

**DR12 Defence of thesis**

As part of the examination process, a student may be required to defend a thesis.

**DR13 Re-examination of thesis**

A failed thesis may not be re-examined.

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**Rules for Senior (Unsupervised) Doctoral Degrees**

**Note:** The following Rule is additional to the preceding General Rules GR1 – GR33.

**DS1 Applicability**

a) The following rules, DS2 to DS7 and DR 12 and DR13 inclusive shall also be applicable to every candidate for a senior (unsupervised) Doctoral degree.

b) Additional rules governing the requirements for senior Doctoral degrees in particular colleges may be prescribed by the Senate and the Council.

**DS2 Criteria for admission**

a) An applicant shall not be registered for the Senior (unsupervised) Doctoral degree through research unless the applicant:
   
   (i) has a doctoral degree, and
   
   (ii) is a graduate of this or another University of not less than 10 years standing.

b) With the permission of the college academic affairs board, a candidate who does not meet the requirements in a) above may be admitted in terms of Rule GR7(b).

c) A college may prescribe further minimum criteria for admission.

**DS3 Period of registration**

A candidate for the degree of Senior Doctoral must register for at least two semesters.

**DS4 Subject of study**

a) A candidate for the senior (unsupervised) Doctoral degree shall submit for the approval of
the college academic affairs board a summary in not more than 500 words, specifying the field of research covered by the published works and their appropriateness for the degree.

b) The senate may, at its discretion, decline to accept the published works if, in its opinion:
   (i) they are unsuitable in themselves, or
   (ii) the published work does not fall within the colleges of the University.

**DS5 Submission of thesis**

a) Every candidate for the senior (unsupervised) Doctoral degree through research shall be required to submit a thesis or a portfolio embodying a collection of published work, representing a significant contribution of knowledge and showing evidence of originality and clarity of thought, and of application of research methods appropriate to the particular field of study.

b) The published work submitted by a candidate may range over a number of different topics, but these should normally relate in a coherent way to a body of knowledge within a field recognized by the college. The amount of work submitted should be substantial, and concluded over a significant period of time having regard to the contribution to the discipline.

c) Candidates may not submit work previously submitted as a thesis for the Doctoral degree.

d) The college academic affairs board may appoint an appropriately qualified academic who is a member of the University staff, to advise the candidate on how to present the material for submission.

**DS6 Format of thesis**

a) Every thesis submitted shall include a declaration to the satisfaction of the Senate stating that it has not previously been submitted for a degree in this or any other university.

b) Every thesis submitted shall be in such format as prescribed by the Senate and the rules of the relevant college; provided that each thesis shall include an introduction in English linking the published work and explaining its significance and coherence.

c) Every thesis submitted shall include a signed statement indicating the level of contribution to each publication and role of the candidate as sole author, senior/principal author or co-author.

d) A thesis may comprise of published books and monographs, chapters in books, edited works, refereed conference proceedings, papers in peer-reviewed journals, accompanied by a comprehensive concluding integrative chapter.

**DS7 Assessment**

a) The Senate shall appoint for each thesis five persons to act as examiners, at least three
of whom shall be responsible for external assessment.
b) Except with the permission of the Senate, at least two of the external examiners shall be based external to the country.

Rules for Certificates and Diplomas

Note: The following Rules are additional to the preceding General Rules GR1 – GR33.

CD1 Applicability

The following Rules, CD2 – CD3 inclusive, shall be applicable to every candidate for a Certificate and/or Diploma.

CD2 Admission

Applicants may be registered for a Certificate or Diploma provided that they have met the minimum criteria for admission to study as prescribed by the college.

CD3 Award of Certificate or Diploma with distinction

A qualification of Certificate or Diploma may be conferred with distinction in accordance with the rules of the relevant College, provided that, subject to exceptions as approved by the College Academic Affairs Board, the student has:

(i) obtained a credit-weighted average of at least 75% over all modules required for the qualification; and
(ii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and
(iii) completed the certificate or diploma in the prescribed minimum time.
RULES FOR DEGREES AND DIPLOMAS IN THE COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE

The General Academic Rules of the University shall, where applicable, also apply to the qualifications offered in this College.

Students are advised that as a result of directives from the Council for Higher Education (CHE) and the South African Qualifications Authority (SAQA), established in terms of Act 58 of 1995, not all qualifications or programmes may be on offer.

The inclusion of any programme, course of study or module in this Handbook does not imply that the College of Agriculture, Engineering and Science and is compelled to offer it.

Definition of Terms

College: The College of Agriculture, Engineering and Science (AES).

College Academic Affairs Board (CAAB): The College of Agriculture, Engineering and Science Academic Affairs Board.

Foundation Credits: Foundation credits are calculated on the basis of notional study hours in the same way as Degree Credits, and are a measure of the amount of formal ‘Foundation’ material in the curriculum. Students in the BSc4 (Foundation) Programme earn Foundation credits in addition to Degree credits. Foundation credits may not be used in lieu of Degree credits for the purpose of qualification for a degree in the College.

Module Level: Modules are designated as being at Level 0, usually taken in an access programme at the University, Level 1 (first year), Level 2 (second year), Level 3 (third year), Level 4 (fourth year in Engineering), Level 7 (Honours or fourth year in Agriculture), Level 8 (Masters) and Level 9 (Doctoral). The Level of a module may be read from its module code (see the section “Introduction to Syllabuses”). It is given by the first numeric character in that code.

Year of Study: the level at which undergraduate students are registered academically.
(a) Foundation year: applies to students who are registered the first year of the BSc4 (Foundation Stream) or the University of KwaZulu-Natal Intensive Tuition for Engineers (Unite) Programme.
(b) First year of study: applies to students who have not yet obtained at least 96 (degree)
(c) Second year of study:
(i) in three-year programmes this applies to students who have obtained at least 96 (degree) credits, but have not yet registered for such modules as will, if passed, lead to the completion of the degree
(ii) in four-year programmes this applies to students who have obtained at least 96 (degree) credits, but have not yet obtained 50% of the credits needed for the qualification.

(d) Third year of study:
(i) in three-year programmes this applies to students who have registered for such modules as will, if passed, lead to the completion of the qualification.
(ii) in four-year programmes this applies to students who have obtained at least 50% of the credits needed for the qualification, but who have not yet registered for such modules as will, if passed, lead to the completion of the qualification.

(e) Fourth year of study: this applies to students in four-year programmes who have registered for such modules as will, if passed, lead to the completion of the qualification.

See also definitions in General Academic Rules

General Rules in College of Agriculture Engineering and Science

AES-G1 Degrees and Diplomas Awarded

Bachelor’s Degrees
Bachelor of Agricultural Management BAgriMgmt
Bachelor of Agriculture in Agricultural Extension BAgri
Bachelor of Science BSc
Bachelor of Science in Agriculture BScAgric
Bachelor of Science in Dietetics BScDiet
Bachelor of Science in Engineering BScEng
Bachelor of Science in Human Nutrition BScHumNutr
Bachelor of Science in Land Surveying BScSur
Bachelor of Science in Property Development BScPropDev

Post Graduate Diplomas
Postgraduate Diploma in Community Nutrition PGDipComNutr
Postgraduate Diploma in Dietetics PGDipDiet
Postgraduate Diploma in Food Security PGDipFS

Honours Degrees
Bachelor of Agriculture Honours BAgriHons
Bachelor of Agricultural Management Honours BAgriMgmtHons
Bachelor of Science Honours BScHons
Bachelor of Science in Property Development Honours (Construction Management)  BScPropDevHons(CM)
Bachelor of Science in Property Development Honours (Quantity Surveying)  BScPropDevHons(QS)

**Master's Degrees**
- Master of Agricultural Management  MAgricMgmt
- Master of Agriculture  MAgric
- Master of Environmental Management  MEnvMan
- Master of Science  MSc
- Master of Science (Construction Project Management)  MSc(ConstProjMan)
- Master of Science in Agriculture  MScAgric
- Master of Science in Construction Management  MScConstMan
- Master of Science in Dietetics  MScDiet
- Master of Science in Engineering  MScEng
- Master of Science in Human Nutrition  MScHumNutr
- Master of Science in Land Surveying  MScSur
- Master of Science in Quantity Surveying  MScQS

**Doctoral Degrees**
- Doctor of Philosophy  PhD
- Doctor of Science  DSc
- Doctor of Science in Agriculture  DScAgric
- Doctor of Science in Construction Management  DScConstMan
- Doctor of Science in Engineering  DScEng
- Doctor of Science in Land Surveying  DScSur
- Doctor of Science in Quantity Surveying  DScQS

See also General Rule GR14 Ancillary, prerequisite and corequisite requirements

**AES-G2 Excluded Students**
Students excluded by the College shall not be permitted to register for any module in the College, including modules taken for non-degree purposes, unless required by the programme for which they are now registered.

See also General Academic Rule GR31 Academic exclusion - right of appeal.

**AES-G3 Supplementary Examinations**
In addition to the University-wide rules on supplementary examinations, the following shall hold:
(a) A student who passes a module, shall be permitted to write a supplementary examination in that module in order to fulfil a sub-minimum pre-requisite requirement for another module.
(b) Certain modules, identified in the Syllabus Section, do not have supplementary
examinations.

See also General Academic Rules GR22, BR6, HR5, PR5 and CR9.

The University of KwaZulu-Natal Intensive Tuition for Engineers (UNITE)

UNITE Programme – Preparatory Certificate in Engineering

The University of KwaZulu-Natal Intensive Tuition for Engineers (Unite) Programme provides an additional, alternative access route into the Bachelor of Science in Engineering and Bachelor of Science in Land Surveying degrees for prospective candidates who have had a disadvantaged educational background. Applications for admission to the Preparatory Certificate in Engineering offered by the UNITE Programme must be made directly to the Central Applications Office. During the selection process, consideration is given to the academic record and personal circumstances of the applicant. Aptitude or other testing is frequently used, and the applicant may be required to attend an interview. Applicants for admission to the UNITE Programme may make funding applications directly to sponsoring companies or may approach the UNITE Programme for a referral to potential sponsors, if financial support is required. It must be noted that the UNITE Programme does not provide bursaries or financial aid.

AES-U1 Unite Admission Requirements

To be considered for admission to the UNITE program, applicants must have a National Senior Certificate for Degrees and must have obtained a level 4 (50%) for Mathematics, Physical Science and English as a Home Language or First Additional Language.

AES-U2 Unite Curriculum

UNITE candidates shall obtain credit for the following modules in the course of one academic year. Numbers in brackets indicate the number of credits.

Preparatory Certificate in Engineering

<table>
<thead>
<tr>
<th></th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation Credits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENUN0M1 UNITE Mathematics A</td>
<td>(8)</td>
<td>ENUN0DM UNITE Eng. Design &amp; Materials</td>
</tr>
<tr>
<td>ENUN0P1 UNITE Engineering Physics A</td>
<td>(8)</td>
<td>ENUN0M2 UNITE Mathematics B</td>
</tr>
<tr>
<td>ENUN0TC UNITE Tech. Comm &amp; Drawing</td>
<td>(8)</td>
<td>ENUN0P2 UNITE Engineering Physics B</td>
</tr>
<tr>
<td>ENUN0UA UNITE A</td>
<td>(DP)</td>
<td>ENUN0UB UNITE B</td>
</tr>
<tr>
<td><strong>Degree Credits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENCH1TC Technical Communication</td>
<td>(8)</td>
<td>ENAG1DE Engineering Design</td>
</tr>
<tr>
<td>ENME1DR Engineering Drawing</td>
<td>(8)</td>
<td>ENME1EM Intro to Engineering Materials</td>
</tr>
</tbody>
</table>
AES-U3 Progression in the UNITE Programme
To proceed to Semester 2, students must pass all foundation (Level 0) modules and may fail at most one Level-1 module, provided that the final mark in the failed module is at least 40%.

AES-U4 Conditions for Award of Preparatory Certificate in Engineering
In order to qualify for a ‘Preparatory Certificate in Engineering’ a candidate must pass all modules during a single year.

AES-U5 Admission to the BScEng Degree
(a) Students who have obtained the Preparatory Certificate in Engineering qualify to enrol for a BScEng or BScSur degree, although not necessarily to the programme of their choice.
(b) Students who have not passed the Preparatory Certificate in Engineering but who have a credit weighted average above 60% and no individual module below 40% may apply to be considered for admission to a BScEng or BScSur under Rule GR6a.

AES-U6 Admission to other Degrees
Students who have obtained the Preparatory Certificate in Engineering will be admitted, on application, to the degrees of Bachelor of Science, Bachelor of Science in Agriculture, Bachelor of Agriculture or Bachelor of Agricultural Management, although not necessarily to the programme of their choice.

Bachelor’s Degrees

AES-B1 Admission to Bachelor’s Degrees
Subject to additional requirements for specific degree programmes given in the table below, applicants shall be eligible to apply to register for undergraduate qualifications in the College provided they satisfy the University-wide entrance requirements and have a full National Senior Certificate for Degrees (NSC Deg).

<table>
<thead>
<tr>
<th>Programme</th>
<th>NSC Points</th>
<th>Mathematics</th>
<th>Other Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Agriculture</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science or Agricultural Science 4 (50%)</td>
</tr>
<tr>
<td>BSc (LES Stream)</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science or Agricultural Science 4 (50%)</td>
</tr>
<tr>
<td>BSc (M Stream)</td>
<td>30</td>
<td>5 (60%)</td>
<td>Physical Science, Life Science or Agricultural Science 5 (60%)</td>
</tr>
<tr>
<td>BSc Agriculture</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science or Agricultural Science 4 (50%)</td>
</tr>
<tr>
<td>BSc Agriculture (Agricultural Economics)</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science, Agricultural Science or Economics 4 (50%)</td>
</tr>
<tr>
<td>Bachelor of Agricultural Management</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science, Agricultural Science or Economics 4 (50%)</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----</td>
<td>---------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>BSc Dietetics</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science or Agricultural Science 4 (50%)</td>
</tr>
<tr>
<td>BSc Engineering</td>
<td>33</td>
<td>6 (70%)</td>
<td>Physical Science 6 (70%) and either English as Home Language or as First Additional Language (4) 50%</td>
</tr>
<tr>
<td>BSc Human Nutrition</td>
<td>28</td>
<td>4 (50%)</td>
<td>Physical Science, Life Science or Agricultural Science 4 (50%)</td>
</tr>
<tr>
<td>BSc Land Surveying</td>
<td>33</td>
<td>6 (70%)</td>
<td>Physical Science 6 (70%) and either English as Home Language or as First Additional Language (4) 50%</td>
</tr>
</tbody>
</table>

Applicants who are accepted into one programme may apply to change to another programme only if they meet the entrance requirements of that programme.

All of the above is subject to the availability of places.

**In all College entrance requirements Mathematics Literacy at any level will not act as a substitute for Mathematics.**

**AES-B2 Admission to the BSc4 (Augmented Stream)**

(a) Applicants who have had a disadvantaged school background (as defined by Senate) who satisfy the University-wide entrance requirements and who

(i) have a full NSC Deg with at least 22 points (excluding Life Orientation), and

(ii) have obtained a Level 3 (40%) in Mathematics and a Level 3 (40%) in Physical Science or Life Science or Agricultural Science, and

(iii) have not otherwise met the requirements set out in AES-B1,

may apply to be registered for the BSc4 Augmented stream. This leads to the completion of a degree, usually in not less than four years.

(b) Students who have attended the University or any other university, whether in a degree or access programme of any kind, for a complete semester will not be admitted to the BSc4 Augmented Stream.

**AES-B3 Admission to the BSc4 (Foundation Stream)**

(a) Applicants who have had a disadvantaged school background (as defined by Senate) who satisfy the University-wide entrance requirements and who

(i) have a full NSC Deg with at least 16 points (excluding Life Orientation), and

(ii) have obtained a Level 2 (30%) in Mathematics and a Level 2 (30%) in Physical Science or Life Science or Agricultural Science, and

(iii) have not otherwise met the requirements set out in AES-B1 or AES-B2,

may apply to be registered for the BSc4 Foundation stream. This leads to the completion of a degree in not less than four years.

(b) Students who have attended the University or any other university, whether in a degree or access programme of any kind, for a complete semester will not be admitted to the BSc4 Foundation Stream.
AES-B4 Transfers into Engineering and Land Surveying Degrees

In order to gain entry to Engineering or Land Surveying from a BSc or BSc-4 (Augmented), a credit weighted average of 65% and 65% for each of Mathematics, Chemistry and Physics, and no failed modules, is required.

AES-B5 Applicants with Matric and Foreign Qualifications

(a) In order to establish whether they are eligible to apply, applicants with matric and foreign qualifications: (A, A/S, O -levels, International Baccalaureate, HIGCSE, and IGCSE) should use the table below to obtain NSC equivalent point scores. The points score will be scaled to be equivalent to 6 subjects if fewer subjects are used to gain Matric exemption.

(b) Applicants with other foreign qualifications will be considered on a case-by-case basis.

(c) Admission is subject to College and HESA approval.
### Admission to Bachelor’s Degree Programmes for Selected Foreign Qualifications

<table>
<thead>
<tr>
<th>Points</th>
<th>A Level (England)</th>
<th>AS Level (England)</th>
<th>IB</th>
<th>HIGCSE</th>
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<td></td>
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<td>12</td>
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<tr>
<td>11</td>
<td>B</td>
<td>B</td>
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<tr>
<td>10</td>
<td>C</td>
<td>C</td>
<td>7</td>
<td>30-100</td>
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<tr>
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<td>8</td>
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<td>7</td>
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<tr>
<td>4</td>
<td>C</td>
<td>C</td>
<td>4</td>
<td>30-39</td>
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<td>D</td>
<td>D</td>
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<td>E</td>
<td>2</td>
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<tr>
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<td>F</td>
<td>F</td>
<td>1</td>
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<tr>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
AES-B6 Bachelors Degrees Registration

(a) The normal load is 64 credits per semester except in Engineering, Land Surveying and Property Development, where it is 72 credits per semester.

(b) In the first two semesters of registration, a student may register for no more than the normal load. Subsequent to the first two semesters of registration, a student who is in good academic standing (not “at risk” or “on probation” as defined “Academic Monitoring and Exclusion”) may register for up to 80 credits per semester. Students who are at risk or on probation may not register for more than a normal load.

(c) Students will not be allowed to register for two or more modules that have clashes in the time-table and will normally be required to register for the lower level of such clashing modules. If a timetable clash is identified after registration, the student will have to de-register the 'higher level' module in favour of the 'lower level' module.

(d) Subject to (b), students must register for all outstanding compulsory modules at the level of the lowest academic year that is not completed at the time of registration.

(e) Students registered for degrees in the College may not

(i) proceed to any Level-2 module until they have been previously registered for at least two semesters and have obtained at least 64 credits at Level 1 including at least 32 credits which are compulsory for the programme or major for which they are registered; nor

(ii) proceed to any Level-3 module until they have been previously registered for four semesters and have obtained at least 144 credits including 32 credits at Level 2 and have passed all Level-1 modules which are compulsory for the programme or majors for which they are registered.

(f) In exceptional circumstances and based on a full motivation, the Dean may relax the registration rules for a particular student.

AES-B7 Bachelors Degrees Progression

(a) The minimum College progression requirements referred to in the University Exclusions Policy are tabulated below.

<table>
<thead>
<tr>
<th>No of semesters completed</th>
<th>BSc, BScAgric, BAgric, BScDiet, BAgriMgmt, BScHumNut</th>
<th>BScEng BScSur BScPropDev</th>
<th>BSc4 (degree credits only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Augmented stream</td>
<td>Foundation stream</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>48</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>96</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>96</td>
<td>144</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>144</td>
<td>192</td>
<td>112</td>
</tr>
<tr>
<td>3</td>
<td>176 (at least 16 at Level 2)</td>
<td>240</td>
<td>144</td>
</tr>
<tr>
<td></td>
<td>224 (at least 64 at Level 2)</td>
<td>288</td>
<td>192 (at least 32 at Level 2)</td>
</tr>
<tr>
<td>4</td>
<td>256 (at least 96 at Level 2 or 3)</td>
<td>336</td>
<td>224 (at least 64 at Level 2)</td>
</tr>
<tr>
<td>5</td>
<td>304 (at least 96 at Level 2 and 48 at Level 3)</td>
<td>384</td>
<td>256 (at least 96 at Level 2 or 3)</td>
</tr>
</tbody>
</table>
(b) Foundation credits are not included in these calculations.
(c) For students who have transferred from other programmes, exempted credits and the corresponding period of study will be taken into account.

AES-B8 Bachelor Degrees Supplementary Examinations
In addition to the provisions of rules BR6 and AES-G3, students may apply to write a supplementary exam in a single module under one of the following conditions.

(a) Students who can be registered within the normal load so as to be able to complete their degree in the current or next semester (provided they pass all modules), may be awarded a supplementary in a single module for which their mark below 40%. The application to write this supplementary exam must be made to the College Office at least 2 working days before it is due to be written.

(b) A student who was not at risk or on probation in the previous semester and who has a credit weighted average of at least 60%, may apply to write a supplementary in a single module for which their mark was below 40% in the main exam if this is in a subject in their lowest remaining year of study. This does not apply to students in their first semester.

AES-B9 Minor Substitutions in Curriculum
The relevant School Board may permit minor substitutions in the modules prescribed for any Bachelor’s degree.

Degree of Bachelor of Science
AES-BS1 Structure of the Degree
The following applies to degrees based on majors (see Rule AES-BS4) and on Focussed Programmes (see Rule AES-BS5):
(a) the minimum duration for the qualification is 6 semesters;
(b) the qualification requires that a set of modules with a total credit value of at least 384 be passed, subject to the following conditions:
   (i) at least 128 credits shall be at Level 3;
   (ii) at least 96 credits shall be at Level 2;
   (iii) at least 96 credits shall be at Level 1; and
   (iv) the unspecified credits may include elective modules with a combined credit value not exceeding 32, offered in any School within the University, subject to approval of the Dean and Head of School offering the module. These external credits shall be counted at Level 1.

AES-BS2 Common Curriculum
All students enrolled in any Bachelor of Science programme must follow a common curriculum in the first semester of their first year. This is further divided into two broad groupings:

- **Life and Earth Sciences (LES) stream**, which encompasses programmes and majors within the Life Sciences, Geology, Geography and Environmental Sciences; and
- **Mathematical Sciences (M) stream**, which encompasses programmes and majors within the disciplines of Computer Science, Mathematics, Physics and Statistics.

Chemistry can fit into either grouping depending on the choice of a second major.

The modules for the first semester are as follows:

### LES stream

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM110</td>
<td>16</td>
</tr>
<tr>
<td>MATH130 or MATH150</td>
<td>16</td>
</tr>
</tbody>
</table>

and two further modules selected from

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL101</td>
<td>16</td>
</tr>
<tr>
<td>PHYS131 or PHYS110</td>
<td>16</td>
</tr>
<tr>
<td>GEOL101</td>
<td>16</td>
</tr>
<tr>
<td>GEOG110</td>
<td>16</td>
</tr>
</tbody>
</table>

**M stream**

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH130</td>
<td>16</td>
</tr>
</tbody>
</table>

and three further modules selected from

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM110</td>
<td>16</td>
</tr>
<tr>
<td>COMP100</td>
<td>16</td>
</tr>
<tr>
<td>ECON101</td>
<td>16</td>
</tr>
<tr>
<td>PHYS110</td>
<td>16</td>
</tr>
<tr>
<td>STAT130</td>
<td>16</td>
</tr>
</tbody>
</table>

**Notes:**

(i) *In majors and programmes in the LES stream MATH150 may be replaced by MATH130. Moreover PHYS131 may be replaced by PHYS110. Some programmes may require one or both of these replacements.*
(ii) Other combinations of electives may be permitted at the discretion of the School.

AES-BS3 Structure of the Degree based on Majors

In addition to Rules AES-BS1 and AES-BS2, the following applies to degrees based on majors:

(a) no more than 64 credits may be specified at Level 2, of which at least 32 and no more than 48 shall be in modules specified for a primary major subject (from List A below); the balance of the Level-2 modules may be from subjects given in Lists A, B or C.

(b) at least 64 and no more than 80 credits at Level 3 shall be in modules specified for primary major subject from List A below, with the balance from modules in other subjects given in Lists A, B or C;

(c) except as provided for in (d) below, all Level-1 and Level-2 modules shall come from disciplines in Lists A or B, or modules mentioned in List C;

(d) the unspecified credits points may, subject to the approval of the Dean and Head of School, contain elective modules with a combined credit value not exceeding 32, offered in any college. (These external credits shall be counted at Level 1.); and

(e) students may major in more than one subject. In that case, no more than 16 credits at exit level may be counted towards both majors.

List A (primary major subjects):

- Applied Mathematics
- Biochemistry
- Biology
- Cellular Biology
- Chemistry
- Computer Science
- Ecology
- Genetics
- Geophysics
- Hydrology
- Mathematics
- Microbiology
- Physics
- Plant Pathology
- Soil Science
- Statistics

List B (other major subjects):

- Economics
- Information Systems and Technology (only for continuing third year students)
- Psychology (Pietermaritzburg only).

List C (other recognised modules):

- any module specified for a particular programme in which the student is registered;
- Any module in a subject offered in the College, for which the pre-requisites have been met.

AES-BS4 Rules of Combination for Majors

The tables below give the modules needed to major in a particular discipline. Numbers in parentheses denote the number of credits for a module. The remaining credits (to ensure that
Rule AES-BS1 is satisfied) must be drawn from other modules in accord with Rules AES-BS2 and AES-BS3.

Please note that this Handbook contains only modules to be taught in 2012. The modules listed in first year are for first-year students, those for second year are for second-year students and so on. Students in first year should not assume that the modules listed below will be the same by the time they reach second and higher years.

Please note also that electives in the first Semester of first year must accord with Rule AES-BS2. Students may be required to register for focussed programmes if their combinations of major subjects are available within a focussed programme.

1. Applied Mathematics (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>MATH130(16), 140(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>MATH212(16), 251(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>Pietermaritzburg: MATH324(16), 331(16), 334(16), 16C from (MATH301(16), 322(16), 323(16), STAT350(16))</td>
</tr>
<tr>
<td></td>
<td>Westville: MATH334(16), 356(16), 32C from (MATH301(16), 310(16), 327(16), 338(16), 340(16), 342(16), 343(16), 344(16), 346(16), 347(16))</td>
</tr>
</tbody>
</table>

2. Biochemistry (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>BIMI120(16), BIOL101(16), CHEM110(16), 120(16), MATH150(16), PHYS131(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>Pietermaritzburg: BIOC201(16), 212(16), CHEM220(16), RDNA202(16)</td>
</tr>
<tr>
<td></td>
<td>Westville: BIOC201(16), 202(16), CHEM220(16), RDNA202(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>Pietermaritzburg: BIOC300(16), 311(16), 315(16), 316(16)</td>
</tr>
<tr>
<td></td>
<td>Westville: BIOC307(16), 308(16), 315(16), 316(16)</td>
</tr>
</tbody>
</table>

3. Biology (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>BIOL101(16), 102(16), CHEM110(16), MATH150(16), STAT130(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>BIOL211(16), 213(16), 16C from (BIOL204(16), 205(16), 222(16))</td>
</tr>
<tr>
<td>Year 3</td>
<td>BIOL303(16), 304(16), 315(16), 324(16)</td>
</tr>
</tbody>
</table>

4. Cellular Biology (Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>BIOL101(16), 102(16), CHEM110(16), MATH150(16), STAT130(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>(BIOC201(16) or BIOC203(16) or BIOL204(16)), BIOL205(16), 234(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>BIOL316(16), 345(16), 350(16), (BIOL304(16) or 347(16))</td>
</tr>
</tbody>
</table>

5. Chemistry (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>Pietermaritzburg: CHEM110(16), 120(16), MATH130(16) or 150(16), MATH140(16) or 143(8), PHYS110(16) or 131(16), PHYS120(16) or 133(8)</td>
</tr>
<tr>
<td></td>
<td>Westville: CHEM110(16), 120(16), MATH130(16) or 150(16), MATH140(16) or 145(16), PHYS110(16) or 131(16), PHYS120(16) or 132(16).</td>
</tr>
<tr>
<td>Year 2</td>
<td>CHEM210(16), 220(16), 230(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>CHEM310(16), 320(16), 330(16), 340(16)</td>
</tr>
</tbody>
</table>
### 6. Computer Science (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COMP100(16), 102(16), MATH130(16), 140(16)</td>
</tr>
<tr>
<td>2</td>
<td>COMP200(16), 201(16), 16C from MATH at Level 2</td>
</tr>
<tr>
<td>3 (Westville)</td>
<td>COMP304(16), 313(16), 314(16), 315(16) \ 314(16), 315(16), 32C from (COMP300(16), 301(16), 304(16), 305(16), 306(16), 307(16), 313(16))</td>
</tr>
</tbody>
</table>

### 7. Ecology (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIOL101(16), 102(16), CHEM110(16), MATH150(16), STAT130(16)</td>
</tr>
<tr>
<td>2</td>
<td>BIOL204(16), 223(16), (BIOL211(16) or 222(16))</td>
</tr>
<tr>
<td>3</td>
<td>BIOL322(16), 323(16), 325(16), 16C from (BIOL303(16), BIOL304(16), BIOL390(16))</td>
</tr>
</tbody>
</table>

### 8. Economics (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ECON101(16), 102(16), MATH130(16), 140(16)</td>
</tr>
<tr>
<td>2</td>
<td>ECON201(16), 202(16)</td>
</tr>
<tr>
<td>3</td>
<td>ECON314(16), 48C from ECON as specified by the School of Accounting Economics &amp; Finance.</td>
</tr>
</tbody>
</table>

**Notes:**

(i) Economics can only be taken in conjunction with another primary major.

(ii) Students majoring in Statistics cannot take ECON314, and must replace that module with ECON309.

### 9. Genetics (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIMI120(16) or BIOL101(16), CHEM110(16), 120(16), MATH150(16), STAT130(16)</td>
</tr>
<tr>
<td>2</td>
<td>GENE240(16), RDNA202(16), STAT222(16)</td>
</tr>
<tr>
<td>3 (Pietermaritzburg)</td>
<td>GENE310(16), 320(16), 330(16), 16C from (AGPS306(16), BIOL304(16), GENE350(16))</td>
</tr>
<tr>
<td>3 (Westville)</td>
<td>GENE310(16), 320(16), 330(16), 16C from (BIOL304(16), GENE340(16))</td>
</tr>
</tbody>
</table>

### 10. Geography (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHEM110(16), ENVS120(16), GEOG110(16), MATH150(16), STAT130(16)</td>
</tr>
<tr>
<td>2</td>
<td>ENVS210(16), 211(16), GEOG220(16)</td>
</tr>
<tr>
<td>3</td>
<td>ENVS322(16); at least 32C from (ENVS314(16), 315(16), 316(16), GEOG330(16)) and at most</td>
</tr>
<tr>
<td></td>
<td>16C from (ENVS318(16), GEOG325(16)) to make up 64C</td>
</tr>
</tbody>
</table>

### 11. Hydrology (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHEM110(16), MATH150(16), PHYS110(16) or 131(16)</td>
</tr>
<tr>
<td>2</td>
<td>HYDR210(16), HYDR220(16)</td>
</tr>
<tr>
<td>3</td>
<td>HYDR310(16), 313(8), 321(8), 322(8), 324(16), 330(8)</td>
</tr>
</tbody>
</table>

**Note:** Students who so wish may take AGPS301 in place of HYDR313.

### 12. Information Systems and Technology (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No longer offered as major in BSc</td>
</tr>
<tr>
<td>2</td>
<td>No longer offered as major in BSc</td>
</tr>
<tr>
<td>3</td>
<td>ISTN31A(8), 31B(8), 31D(8), 31E(8), 32A(8), 32B(8), 32E(8), 32F(8)</td>
</tr>
</tbody>
</table>

**Notes:**

(i) Information Systems and Technology is available as a major within the Bachelor of Science only.
for final year students.

(ii) Information Systems and Technology can only be taken in conjunction with another primary major other than Computer Science.

(iii) Level-3 modules in ISTN not listed above may not be taken as exit level modules counting towards a BSc. majoring in Information Systems and Technology.

### 13. Mathematics (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>MATH130(16), 140(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>MATH212(16), 251(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>Pietermaritzburg: MATH310(16), 323(16), 340(16), (MATH322(16) or 334(16)) Westville: MATH310(16), 340(16), 32C from (MATH301(16), 327(16), 334(16), 338(16), 342(16), 344(16), 346(16), 347(16), 356(16))</td>
</tr>
</tbody>
</table>

### 14. Microbiology (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>BIMI120(16), BIOL101(16), CHEM110(16), 120(16), MATH150(16), PHYS131(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>Pietermaritzburg: (BIOC201(16) or CHEM220(16)), MICR213(16), 214(8), 220(8), RDNA202(16) Westville: MICR213(16), 215(16), RDNA202(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>Pietermaritzburg: MICR304(16), 307(16), 320(16), 360(16) Westville: MICR304(16), 306(16), 307(16), 311(16)</td>
</tr>
</tbody>
</table>

### 15. Physics (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>MATH130(16), 140(16), PHYS110(16), 120(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>Pietermaritzburg: MATH212(16), 251(16), PHYS211(16), 212(16) Westville: MATH212(16), 251(16), PHYS201(16), 204(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>Pietermaritzburg: PHYS361(16), 362(16), 365(16), 366(16) Westville: PHYS361(16), 362(16), 363(16), 364(16)</td>
</tr>
</tbody>
</table>

### 16. Plant Pathology (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>(BIMI120 or BIOL101(16)), CHEM110(16), 120(16), MATH150(16), PHYS131(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>PPTH214(16), RDNA202(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>PPTH305(16), 330(16), 360(16), 370(16)</td>
</tr>
</tbody>
</table>

### 17. Psychology (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>CHEM110(16), MATH150(16), PSYC101(16), 102(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>PSYC201(16), 16C from PSYC</td>
</tr>
<tr>
<td>Year 3</td>
<td>PSYC301(16), 48C from Level 3 PSYC</td>
</tr>
</tbody>
</table>

**Notes:**

(i) Psychology can only be taken in conjunction with another primary major.

(ii) The above rules of combination refer only to Psychology taken as a major within the College.

### 18. Soil Science (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>CHEM110(16), 120(16), ENVS120(16), (MATH130(16) or 150(16)), (PHYS131(16) or 110(16))</td>
</tr>
<tr>
<td>Year 2</td>
<td>SSCI217(16), 230(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>AGPS301(16), SSCI320(16), 351(8), 352(8), 371(8), 372(8)</td>
</tr>
</tbody>
</table>
19. Statistics (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MATH130(16), 140(16), STAT130(16), 140(16)</td>
</tr>
<tr>
<td>2</td>
<td>MATH212(16), 251(16), STAT230(16), 240(16)</td>
</tr>
</tbody>
</table>
| 3     | Pietermaritzburg: STAT301(16), 305(16), 350(16), 360(16)  
Westville: STAT301(16), 330(16), 350(16), 360(16)  |

AES-BS5 Focussed Programmes

The tables below give the programmes of study for focussed programmes within the degree of Bachelor of Science. All modules must be chosen in accordance with Rules AES-BS1 to AES-BS3 and require approval by the Dean and Head of School. Numbers in brackets denote the number of credits for a module.

Please note that this Handbook contains only modules to be taught in 2012. The modules listed in first year are for first-year students, those for second year are for second-year students and so on. Students in first year should not assume that the modules listed below will be the same by the time they reach second and higher years.

1. Applied Chemistry (Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHEM110(16), MATH130 or 150(16), PHYS110(16) or 131(16), Electives(16)</td>
</tr>
<tr>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>MATH120(16), MATH140(16) or 145(16), PHYS120(16) or 132(16), Electives(16)</td>
</tr>
<tr>
<td>2</td>
<td>APCH221(16), CHEM210(16), 220(16), STAT130(16)</td>
</tr>
<tr>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>APCH211(16), 231(16), CHEM230(16), COMP106(16)</td>
</tr>
<tr>
<td>3</td>
<td>APCH312(16), 322(16), CHEM330(16), 340(16)</td>
</tr>
<tr>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>APCH332(16), 342(16), CHEM310(16), 320(16)</td>
</tr>
</tbody>
</table>

Notes:
(i) Entrance into the Applied Chemistry Programme is limited and will be based on merit.
(ii) COMP106 and STAT130 may be taken in either the first or the second year.

2. Applied Physics (Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No longer offered</td>
</tr>
<tr>
<td>2</td>
<td>MATH212(16), PHYS201(16), 231(16), Electives(16)</td>
</tr>
<tr>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>MATH251(16), PHYS204(16), 242(16), Electives(16)</td>
</tr>
<tr>
<td>3</td>
<td>PHYS343(16), 361(16), 363(16), Electives(16)</td>
</tr>
<tr>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>PHYS345(16), 362(16), 364(16), Electives(16)</td>
</tr>
</tbody>
</table>

3. Biological Sciences (General Stream) (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIOL101(16), CHEM110(16), MATH150(16), Electives(16)</td>
</tr>
<tr>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>BIOL102(16), STAT130(16), Electives(32)</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Agriculture, Engineering & Science

<table>
<thead>
<tr>
<th>BIOL200(16), 204(16), 205(16), GENE240(16). 32C from Level-2 BIOL modules as directed by the School, Electives(32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL300(16), 304(16), 390(16), 32C from (BIOL321(16), 324(16), 347(16), 348(16)), 48C from Level-3 BIOL modules or alternatives approved by the School.</td>
</tr>
</tbody>
</table>

4. Biomedical Sciences (Westville)

| Year 1 | No longer offered |
| Year 2 | Semester 1 | BIOC203(16), BIOL200(16), HPHS2C1(16), HPHS2N1(16) |
| Semester 2 | BIO205(16), (BIOL233(16) or 234(16)), HPHS2E2(16), HPHS2G2(16) |
| Year 3 | BIOL300(16), (HPHS3R1(16) or HPHS3P2(16) or HMBC3RP(16)), 64C from (HMBC3ET(8), LAWS4BE(8), MHA3HA1(8), HMBC3MD(16), MVI3MV1(16), HMBC3EB(8), MMI3MM2(16), HPHS3N2(8), HMBC3WH(8)), 32C from Level-3 BIOL modules approved by the School. |

Notes:
(i) Places in Levels 2 and 3 in the Programme will be restricted. A preliminary selection of students to be allowed into Level 2 of the Programme will be made at the end of the 1st semester of first year, but a final decision on whether a student may continue will only be taken once he or she has completed the first-year curriculum. Selection will be on academic merit.
(ii) All students entering Level 2 are required to be vaccinated against Hepatitis B and may be required to register with the Health Professions Council of South Africa. Students will have to bear any necessary costs.

5. Chemistry & Chemical Technology (Pietermaritzburg)

| Year 1 | Semester 1 | CHEM110(16), MATH130(16) or 150(16), PHYS110(16) or 131(16), Electives(16) |
| Semester 2 | CHEM120(16), MATH140(16) or 143(8), PHYS120(16) or 133(8), STAT130(16), Electives to make up 64 credits |
| Year 2 | Semester 1 | CHEM210(16), 220(16), Electives(32) |
| Semester 2 | CHEM230(16), CTEC233(16), Electives(32) |
| Year 3 | Semester 1 | CHEM330(16), 340(16), CTEC323(16), 333(16) |
| Semester 2 | CHEM310(16), 320(16), CTEC313(16), 343(16) |

6. Computational Physics (Pietermaritzburg)

| Year 1 | No longer offered |
| Year 2 | No longer offered |
| Year 3 | Semester 1 | CPHY311(8), 312(8), PHYS361(16), 365(16), 16C at Level-3 from COMP, MATH or STAT |
| Semester 2 | CPHY321(8), 322(8), PHYS362(16), 366(16), 16C at Level-3 from COMP, MATH or STAT |

7.a. Computer Science & Information Technology (Computer Science Stream) (Westville)

| Year 1 | Semester 1 | COMP100(16), MATH130(16), STAT130(16), Electives(16) |
| Semester 2 | COMP102(16), MATH140(16), (MATH144(16) or STAT140(16)), Electives(16) |
| Year 2 | | |
### 7.b. Computer Science & Information Technology (Information Technology Stream) (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>COMP100(16), MATH130(16), STAT130(16), Electives(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
<td>COMP102(16), MATH140(16), (ISTN102(16) or MATH144(16) or STAT140(16)), Electives(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>COMP200(16), ISTN211(16), MATH236(16), Electives(16)</td>
</tr>
<tr>
<td>Semester 1</td>
<td>Pietermaritzburg: COMP201(16), 203(16), ISTN212(16), Electives(16)</td>
</tr>
<tr>
<td>Westville:</td>
<td>COMP201(16), 204(16), ISTN212(16), Electives(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>COMP313(16), 315(16), ISTN31A(8), 31B(8), 31D(8), 31E(8)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>COMP304(16), 314(16), ISTN32A(8), 32B(8), 32E(8), 32F(8)</td>
</tr>
</tbody>
</table>

### 8. Crop & Horticultural Science (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 2</td>
<td>BIOL102(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16)</td>
</tr>
<tr>
<td>Year 2</td>
<td>AMET210(16), BIOL204(16), GENE240(16), Electives(16)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>AGPS200(16), BIOC212(16), PPTH214(16), STAT222(16)</td>
</tr>
<tr>
<td>Year 3</td>
<td>AGPS301(16), 305(16), 307(16), 309(16)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>AGPS306(16), 308(16), 320(16), SSCI320(16)</td>
</tr>
</tbody>
</table>

### 9. Ecological Sciences (General Stream) (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>No longer offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2</td>
<td>No longer offered</td>
</tr>
<tr>
<td>Year 3</td>
<td>BIOL300(16), 303(16), 325(16), 390(16), (32C from BIOL304(16), 322(16), 324 (16), ENVS316), Electives (32)</td>
</tr>
</tbody>
</table>

### 10.a. Environmental Science (Earth Science Stream) (Westville)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>No longer offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2</td>
<td>ENVS210(16), GEOL201(8), 205(8), 220(8), Elective(24)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>ENVS211(16), GEOL211(8), Electives(40)</td>
</tr>
<tr>
<td>Year 3</td>
<td>ENVS314(16), 315(16), GEOL310(8), 313(16), Electives(8)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>ENVS316(16), 318(16), 322(16), Electives(16).</td>
</tr>
</tbody>
</table>
### 10.b. Environmental Science (Life Science Stream) (Pietermaritzburg, Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIOL101(16), CHEM110(16), MATH150(16), GEOG110(16)</td>
<td>BIOL102(16), ENVS120(16), STAT130(16), Electives (16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIOL200(16), ENVS210(16), 32C from (BIOL212(16), 213(16), 214(16), 223(16), SSCI217(16))</td>
<td>(BIOL222(16) or 231(16)), ENVS211(16), GEOG220(16), Elective(16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIOL300(16), 303(16), ENVS314(16), 315(16)</td>
<td>ENVS316(16), 322(16), BIOL390(16), 16C from Level-3 BIOL modules approved by the School.</td>
<td></td>
</tr>
</tbody>
</table>

### 11.a. Geological Sciences (Environmental and Engineering Geology Stream) (Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHEM110(16), GEOL101(16), MATH150(16), Electives(16)</td>
<td>CHEM120(16), COMP106(16), GEOL102(16), Electives(16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEOL201(8), 202(8), 205(8), 220(8), Electives(32)</td>
<td>GEOL200(16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENVS211(16), GEOL211(8), 206(16) Electives(8)</td>
<td>ENVS313(16), 314(16), 323(8), Electives(24)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEOL306(8), 321(16), ENVS316(16), Electives(24)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 11.b. Geological Sciences (Geology and Ore Deposits Stream) (Westville)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHEM110(16), GEOL101(16), MATH150(16), Electives(16)</td>
<td>CHEM120(16), COMP106(16), GEOL102(16), Electives(16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEOL201(8), 202(8), 205(8), 220(8), Electives(32)</td>
<td>GEOL200(16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENVS211(16), GEOL206(16), 211(8), Electives(8)</td>
<td>ENVS316(16), GEOL306(8), 308(16), 310(8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEOL301(16), 303(8), 323 (8), Electives(32)</td>
<td>GEOL304(16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENVS316(16), GEOL306(8), 308(16), 310(8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

(i) Entry into GEOL200, GEOL202, GEOL205 and GEOL206 will be restricted to students in the Geological Sciences programme and limited to a maximum of 56 students. Selection for these modules will be on academic merit and the decision on whether a student will be admitted will only be taken after s/he has passed all of GEOL101, GEOL102, CHEM110, CHEM120, and either MATH130 or MATH150.

(ii) Students will only be allowed to register for GEOL200, GEOL202, GEOL205 and GEOL206 a maximum of 3 times, after which they will be required to de-register from the Geological Sciences programme.
12. Industrial and Applied Biotechnology (Pietermaritzburg)

| Year 1 | Semester 1 | BIOL101(16), CHEM110(16), (MATH130(16) or 150(16)), PHYS110(16) or 131(16) |
|        | Semester 2 | BIMI120(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16) |
| Year 2 | Semester 1 | BIOC201(16), CHEM220(16), (CHEM210(16) or GENE240(16)), MICR213(16) |
|        | Semester 2 | BIOC212(16) or (MICR214(8) and MICR220(8)), CHEM230(16), CTEC233(16), RDNA202(16) |
| Year 3 | Semester 1 | BIOC311(16), CHEM330(16), CTEC333(16), MICR320(16) |
|        | Semester 2 | CTEC343(16), MICR304(16), 360(16), 16C from (BIOC300(16), CHEM320(16), GENE330(16)) |

13. Industrial Mathematics (Westville)

| Year 1 | Semester 1 | COMP100(16), MATH130(16), STAT130(16), Electives(16) |
|        | Semester 2 | MATH140(16), 144(16), STAT140(16), Electives(16) |
| Year 2 | Semester 1 | MATH212(16), STAT230(16), Electives(32) |
|        | Semester 2 | MATH243(16), 251(16), STAT240(16), Electives(16) |
| Year 3 | Semester 1 | MATH334(16), STAT360(16), Electives(32) |
|        | Semester 2 | MATH301(16), 327(16), 346(16), STAT350(16) |

14. Marine Biology (Westville)

| Year 1 | Semester 1 | BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16) |
|        | Semester 2 | BIOL102(16), STAT130(16), Electives(32) |
| Year 2 | Semester 1 | BIOL200(16), 204(16), 214(16), 16C from Level-2 BIOL modules approved by the school (32). |
|        | Semester 2 | BIOL205(16), 231(16) |
| Year 3 |        | BIOL300(16), 304(16), 341(16), 342(16), 343(16), 391(16), 32C from Level-3 BIOL modules approved by the School. |

15. Operations Research (Pietermaritzburg)

| Year 1 | Semester 1 | MATH130(16), STAT130(16), Electives(32) |
|        | Semester 2 | MATH140(16), STAT140(16), Electives(32) |
| Year 2 | Semester 1 | MATH212(16), MATH236(16), STAT230(16), Electives(16) |
|        | Semester 2 | MATH251(16), STAT240(16), Electives(32) |
| Year 3 | Semester 1 | MATH331(16), 334(16), 32C from (BMET314(8), 316(8), STAT301(16), 360(16)) |
|        | Semester 2 | MATH301(16), (MATH322(16) or 324(16)), STAT305(16), 350(16) |
The BSc4 Programme

The BSc4 Programme allows students who would not normally qualify for entry into the College to complete the qualification in one more year than the normally allocated time. There are two streams within the BSc4 Programme.

In the Augmented stream, students are given extra tuition in the first one or two years. In these they attend the regular lectures and practicals with other first year students, but in addition the courses are ‘augmented’ by additional lectures, practical sessions and small group tutorials for which they earn foundation credits. However, instead of eight modules in first year, they will take only four, together with two modules of Scientific Communication.

In the Foundation stream, students earn 32 degree credits which may be carried forward to their qualification, provided they pass all modules. In addition they will earn 96 foundation credits.

The two streams are administered under separate sets of rules.

BSc4 Augmented Stream

For admission criteria into the BSc4 Augmented Stream, see Rule AES-B2.

AES-B4A1 Structure of the Programme

In all years, the choice of modules must be approved by the School.

(a) In their first year students will register for 80 (degree) credits and 64 foundation credits. The latter 64 credits must be from the augmented modules BIOL195, BIOL196, CHEM195, CHEM196, MATH195, MATH196, MATH197, PHYS195 and PHYS196 (each 16 degree credits). Each of these modules will also carry 16 foundation credits so that the notional study hours for these modules will total 320.

(b) In addition students will register for either both SCOM101 and SCOM102 or for both SCOM111 and SCOM112. These modules each carry 8 degree credits. The particular choice of which pair of modules is taken will be determined by an entrance test at first registration. Students must pass 16 credits from: SCOM101, SCOM102, SCOM111 and SCOM112.

(c) In their second year, students will normally register for between 80 and 96 degree credits. These will be selected from augmented and regular Level-1 modules and may also include up to 32 credits in Level-2 modules.

(d) In their third year, students will normally register for 96 credits selected from Levels 2 and 3.

(e) In their fourth year students will register for the credits required to complete their qualification.

Note: Augmented modules have separate codes (because their credit values and notional study hours are different). The table below shows the codes of the augmented modules and their mainstream equivalents.
Rules within College of Agriculture, Engineering & Science

Augmented Module | Mainstream Module
------------------|-------------------
BIOL195          | BIOL101           
BIOL196          | BIOL102           
CHEM195          | CHEM110           
CHEM196          | CHEM120           
MATH195          | MATH130           
MATH196          | MATH140           
MATH197          | MATH150           
PHYS195          | PHYS110           
PHYS196          | PHYS120           

AES-B4A2 Completion of the Qualification

In order to satisfy the requirements for a three-year qualification within the College, students in the Augmented stream must complete 384 degree credits and between 64 and 96 foundation credits. The 384 degree credits must satisfy the requirements of Rule AES-BS1, AES-BAgM2, AES-BAg2, AES-BDiet3 or AES-BHN3, whichever is appropriate.

AES-B4A3 Transfers into Bachelor of Science in Agriculture

Students who transfer from the BSc4 into the BSc(Agric) must complete 512 degree credits and between 64 and 96 foundation credits. These 512 degree credits must satisfy the requirements of Rule AES-BScAg1.

AES-B4A4 Repeating of Modules

None of the augmented modules BIOL195, BIOL196, CHEM195, CHEM196, MATH195, MATH196, MATH197, PHYS195 and PHYS196 may be repeated. Students who fail any of these and wish to obtain credit for these modules must register only the corresponding non-augmented modules BIOL101, BIOL102, CHEM110, CHEM120, MATH130, MATH140, MATH133, PHYS110 and PHYS120, respectively.

BSc4 Foundation Stream

For admission criteria into the BSc4 Foundation Stream, see Rule AES-B3.

AES-B4F1 DP Requirements

Candidates shall not be allowed to present themselves for the final examination in any module unless they have attained the minimum requirements of 40% for the class mark and attendance at 80% of all lectures, practicals, tutorials and fieldwork required for the module, or as otherwise specified for the module.

See also General Academic Rule GR16 Duly Performed (DP) certification.

AES-B4F2 Exclusion

(a) Students who do not satisfy the requirements in Rule AES-B4F7 or who do not satisfy the progression requirements in Rule AES-B7 will be excluded from the College.
(b) Students who, after supplementary examinations, have not passed all modules in the programme as set out in AES-B4F5 will be excluded from the College.
(c) Students who fail to attend at least 80% of the timetabled lifeskills workshops will be
excluded from the College.

(d) Students who have been excluded from the College under (a), (b) or (c) above may apply to be admitted to another college of the University.

AES-B4F3 Repeating

The modules laid down in Rule AES-B4F5 must be completed in two semesters. Students are not permitted to repeat any of the modules listed in Rule AES-B4F5.

AES-B4F4 Language Requirements

Based on their performance in a language test at the beginning of the year, students in the Foundation stream will be prescribed a language module that is most appropriate for their needs. The available modules are SCOM103(16) and SCOM113(16).

AES-B4F5 Curriculum

The modules prescribed for the programme are listed below. Numbers in parentheses refer to foundation credits (F) + degree credits (D).

BIOL199(20F + 4D), CHEM199(20F + 4D), MATH199(36F + 4D), PHYS199(20F + 4D), and either SCOM103(16D) or SCOM113(16D).

AES-B4F6 Credits

(a) The modules SCOM103 and SCOM113 carry 16 degree credits each (see AES-B4F4 above).

(b) The modules BIOL199, CHEM199, and PHYS199 carry 4 degree credits and 20 foundation credits each, while MATH199 carries 4 degree credits and 36 foundation credits. However, students will be awarded the degree credits only if they pass all four of these modules.

AES-B4F7 Requirements for Continuation in Qualifications in Science or Agriculture

(a) In order to be eligible to continue studying in an undergraduate programme in the College, a student must pass every module of the curriculum as specified in AES-B4F5.

(b) In order to be eligible to follow any curriculum in the BSc M-stream (see Rule AES-BS2), a student must pass every module of the curriculum as specified in AES-B4F5, obtain at least 60% in MATH199 and obtain an average over all modules of at least 60%.

Degree of Bachelor of Science in Agriculture

AES-BScAg1 Structure of the Degree

(a) The minimum duration for the qualification is 8 semesters.

(b) The qualification requires that a set of modules with a total credit value of at least 512 be passed, subject to the following conditions:

(i) at least 96 credits shall be at each of Levels 1, 2, 3 and 7;

(ii) a maximum of 160 credits shall be at Level 1;

(iii) a total of at least 224 credits shall be at Levels 2 and 3;

(iv) a total of at least 224 credits shall be at Levels 3 and 7;
(c) Students may not proceed to any Level-7 module until they have obtained a total of at least 128 credits from Levels 2 and 3 including at least 64 credits at Level 3.
(d) Students will elect to undertake one of the programmes listed in Rule AES-BScAg2, where the actual modules required for the programme of study are given. All elective modules must be chosen in accordance with Rule AES-BScAg1(b) and require approval by the Dean and Head of School.

AES-BScAg2 Programmes of Studies

The following tables give the programmes of study within the degree.

1.a. Agribusiness (Animal Science Stream)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16)</td>
<td>BIOL102(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16)</td>
</tr>
<tr>
<td>2.</td>
<td>AGEC210(16), 220(16), ANSI201(16), STAT221(16)</td>
<td>AGEC270(16), ANSI202(16), Electives(32)</td>
</tr>
<tr>
<td>3.</td>
<td>AGEC380(16), ANSI332(16), 344(16), 352(16)</td>
<td>AGEC370(16), ANSI318(16), Electives(32)</td>
</tr>
<tr>
<td>4.</td>
<td>AGEC730(8), ANSI741(16), Electives(16)</td>
<td>AGEC740(16), ANSI718(16), Electives(16)</td>
</tr>
</tbody>
</table>

Year Modules: AGBU790(40)

1.b. Agribusiness (Crop Science Stream)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16)</td>
<td>BIOL102(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16)</td>
</tr>
<tr>
<td>2.</td>
<td>AGEC210(16), 220(16), STAT221(16), Electives(16)</td>
<td>AGEC270(16), AGPS200(16), Electives(32)</td>
</tr>
<tr>
<td>3.</td>
<td>AGEC380(16), AGPS301(16), 305(16), 307(16)</td>
<td>AGEC370(16), AGPS308(16), Electives(32)</td>
</tr>
<tr>
<td>4.</td>
<td>AGEC730(8), AGPS701(8), 710(16), Electives(16)</td>
<td>AGEC740(16), (AGPS712(16) or 714(16)), AGPS791(8)</td>
</tr>
</tbody>
</table>

Year Modules: AGBU790(40)

1.c. Agribusiness (Horticultural Science Stream)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16)</td>
<td>BIOL102(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16)</td>
</tr>
<tr>
<td>2.</td>
<td>AGEC210(16), 220(16), STAT221(16), Electives(16)</td>
<td>AGEC270(16), AGPS200(16), Electives(32)</td>
</tr>
</tbody>
</table>
### 1.d. Agribusiness (Wildlife Management Science Stream)

| Year 3 | Semester 1 | AGEC380(16), AGPS301(16), 307(16), 309(16) |
| Year 3 | Semester 2 | AGEC370(16), AGPS308(16), Electives(32) |
| Year 4 | Semester 1 | AGEC730(8), AGPS701(8), 716(16), 733(16) |
| Year 4 | Semester 2 | AGEC740(16), AGPS732(16), 791(8) |
| Year Modules | | AGBU790(40) |

### 2. Agricultural Economics

| Year 1 | Semester 1 | BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16) |
| Year 1 | Semester 2 | BIOL102(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16) |
| Year 2 | Semester 1 | AGEC220(16), ECON201(16), FINR104(16), STAT221(16) |
| Year 2 | Semester 2 | ACCT103(16), AGEC270(16), ANSI202(16), ECON202(16) |
| Year 3 | Semester 1 | AGEC380(16), AGPS305(16), ECON330(16), 340(16) | ECON360(16) or 311(16) |
| Year 3 | Semester 2 | AGEC370(16), ECON314(16), Electives(16) |
| Year 4 | Semester 1 | AGEC730(8), BMET314(8), 316(8), Electives(16) |
| Year 4 | Semester 2 | AGEC740(16), Level-7 Electives(16) |
| Year Modules | | AGBU790(40) |

### 3.a. Agricultural Plant Sciences (Crop Science Stream)

| Year 1 | Semester 1 | BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16) |
| Year 1 | Semester 2 | BIOL102(16), CHEM120(16), MATH143(8), PHYS133(8), STAT130(16) |
| Year 2 | Semester 1 | AGEC210(16), (AMET210(16) or BIOL204(16)), GENE240(16), SSCI217(16) |
| Year 2 | Semester 2 | AGPS200(16), BIOC212(16), PPTH214(16), STAT222(16) |
| Year 3 | Semester 1 | AGPS301(16), 305(16), 307(16), 309(16) |
| Year 3 | Semester 2 | AGPS306(16), 308(16), 320(16), SSCI320(16) |
| Year Modules | | |
| Semester 1 | AGPS701(8), 710(16), 715(16), Electives at Levels 3 or 7 (8) in either semester |
| Semester 2 | AGPS712(16), 714(16), 791(8) |
| Year Modules | AGPS790(32) |

### 3.b. Agricultural Plant Sciences (Horticultural Science Stream)

<table>
<thead>
<tr>
<th>Year 1</th>
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</thead>
<tbody>
<tr>
<td>Semester 1</td>
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<tr>
<td>Semester 2</td>
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<tr>
<td>Semester 1</td>
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<td>Semester 2</td>
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<td>Year Modules</td>
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### 3.c. Agricultural Plant Sciences (Plant Breeding Stream)

<table>
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<tr>
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<tbody>
<tr>
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<td>Semester 1</td>
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<td>Semester 2</td>
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<tr>
<td>Year Modules</td>
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### 4. Animal and Poultry Science

<table>
<thead>
<tr>
<th>Year 1</th>
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<tbody>
<tr>
<td>Semester 1</td>
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<td>Semester 2</td>
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<td>Year 2</td>
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<td>Year 4</td>
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<td>Semester 1</td>
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<td>Semester 2</td>
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<tr>
<td>Year Modules</td>
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</tbody>
</table>
### 5. Plant Pathology

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Year 2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16)</td>
<td>CHEM120(16), STAT130(16), Electives(32)</td>
<td>GENE240(16), SSCI217(16), STAT221 (16), Electives(16)</td>
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<td></td>
<td>AGPS200(16), PPTH214(16), STAT222(16), Electives(16)</td>
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</table>

#### AES-BScAg3 Transferability of Credits

Except with the permission of the Senate, candidates may not include among the 224 credits at Levels 3 and 7 prescribed in terms of Rule AES-BScAg1(b)(iv), credits for modules passed at another university, or for modules in a subject passed at equivalent level towards the requirements of a qualification in another college, unless they are specified in the programme or major in which the candidate is registered.

### 6. Soil Science

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIOL101(16), CHEM110(16), MATH150(16), PHYS131(16)</td>
<td>CHEM120(16), MATH143(8), PHYS133(8), STAT130(16), Electives(16)</td>
<td>AMET210(16), SSCI217(16), STAT221(16), Electives(16)</td>
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<td></td>
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<td></td>
<td>AGPS200(16), SSCI230(16), Electives(32)</td>
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</tbody>
</table>

#### AES-BScAg4 Transfers into Bachelor of Science in Agriculture

In order for third year students to be eligible to transfer into a BSc(Agric) programme they must have passed at least 96 credits of level 3 modules specified in the relevant curriculum with a credit weighted average of at least 60%. Acceptance into the BSc(Agric) programme will be based on availability of positions and on academic merit.
Degree of Bachelor of Agricultural Management

AES-BAgM1 Structure of the Degree
In order to complete the qualification, a student shall obtain not less than 384 credits and shall complete the modules specified in Rule AES-BAgM2.

AES-BAgM2 Curriculum
The curriculum shall consist of the modules laid out in the table below.

<table>
<thead>
<tr>
<th>Bachelor of Agricultural Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td>Semester 1: BIOL101(16), ECON101(16), FINR104(16), MATH134(16)</td>
</tr>
<tr>
<td>Semester 2: ACCT103(16), ECON102(16), MGNT102(16), STAT130(16)</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
</tr>
<tr>
<td>Semester 1: AGEN216(8), HRMG2HR(8), MARK2MK(8), SSCI217(16), (AGEC220(16) or FINA201(16)), Elective(8))</td>
</tr>
<tr>
<td>Semester 2: ANSI202(16), ENTR2EN(8), SCMA2OP(8), (AGEC270(16) or FINA202(16)), Electives(16)</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
</tr>
<tr>
<td>Semester 1: AGPS301(16), 305(16), 32C from (AGEC380(16), AGPS307(16), 309(16), ANSI332(16), 344(16), 352(16), FINA311(16), (HRMG3ER(16) and 31E(16)), MGNT307(16), 315(16), SCMA301(16))</td>
</tr>
<tr>
<td>Semester 2: AGEC370(16), 48C from (ANSI318(16), 370(16), FINA312(16), 321(16), (HRMG3CE(16) and 30D(16)), MGNT310(16), SCMA306(16), 311(16), Level-3 Electives(16))</td>
</tr>
</tbody>
</table>

*Note: FINA201 and 202 options in Year 2 are only for students wishing to continue to BAgicMg(Hons)(Commerce Stream), specializing in Finance.*

Degree of Bachelor of Agriculture in Agricultural Extension

AES-BAg1 Structure of the Degree
In order to complete the qualification a candidate shall obtain not less than 384 credits and shall complete the modules specified in Rule AES-BAg2.

AES-BAg2 Curriculum
The curriculum shall consist of the modules laid out in the tables below.
Bachelor of Agriculture in Agricultural Extension

| Year 1 | Semester 1 | AGRI151(16), EXTN161(16), FRME151(16), RMGT151(16) |
| Year 2 | Semester 1 | AGRI263(16), 264(16), EXTN261(16), FBMT261(8), FRME261(8) |
|        | Semester 2 | AGRI261(16), 262(16), EXTN262(16), FRME262(16) |
| Year 3 | Semester 1 | EXTN371(16), 372(16) |
|        | Vacation   | EXTN373(32) |
|        | Year Modules | FBMT371(32), RMGT371(32) |

Degree of Bachelor of Science in Dietetics

AES-BDiet1 Structure of the Degree

In order to complete the qualification a student shall obtain not less than 384 credits and shall complete the modules described in Rule AES-BDiet3.

AES-BDiet2 Additional Requirements

(a) In order to be awarded the qualification, students need to complete either ZULN101 or have Matric Zulu at Standard Grade E or NSC Zulu at Level 3 or be fluent in Zulu as determined by School of isiZulu at UKZN.

(b) In terms of Section 61(1)(1)(iv A) of the Medical, Dental and Supplementary Health Service Professions Act (Act 56 of 1974), students must register with the Health Professions Council of South Africa, in their first year of study.

Note: Students’ attention is drawn to implementation of the Statutory Compulsory Community Service for a one-year period upon completion of the BSc (Dietetics) and Postgraduate Diploma in Dietetics in order to register with the Health Professions Council of South Africa (applicable to South African citizens only).

AES-BDiet3 Curriculum

The curriculum shall consist of the modules laid out in the table below.

Bachelor of Science in Dietetics (Pietermaritzburg)

| Year 1 | Semester 1 | BIOL101(16), CHEM110(16), NUTR114(16), ZULN101(16) or Elective (16) |
|        | Semester 2 | CHEM120(16), FSCI120(16), NUTR124(16), STAT130(16) |
| Year 2 | Semester 1 | BIOC201(16), FSCI210(16), MPHY200(16), NUTR224(16) |
|        | Semester 2 | BIOC212(16), DIET237(16), HPHY200(16), MICR214(8), NUTR260(8) |
| Year 3 | Semester 1 | DIET311(8), 350(24), FSMT332(16), NUTR343(16) |
|        | Semester 2 | DIET351(8), 360(24), FSMT333(16), NUTR342(16) |
Degree of Bachelor of Science in Human Nutrition

AES-BHN1 Structure of the degree
In order to complete the qualification a student shall obtain not less than 384 credits and shall complete the modules described in Rule AES-BHN3.

AES-BHN2 Additional Requirements
In order to be awarded the qualification, students need to complete either ZULN101 or have Matric Zulu at Standard Grade E or NSC Zulu at Level 3 or be fluent in Zulu as determined by School of isiZulu at UKZN.

AES-BHN3 Curriculum
The curriculum shall consist of the modules laid out in the table below.

Bachelor of Science in Human Nutrition (Pietermaritzburg)

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIOL101(16), CHEM110(16), NUTR114(16), ZULN101(16) or Electives(16)</td>
<td>CHEM120(16), FSCI120(16), NUTR124(16), STAT130(16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Semester 1</td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>BIOC201(16), FSCI210(16), MPHY200(16), NUTR224(16)</td>
<td>BIOC212(16), DIET237(16), HPHY200(16), MICR214(8), NUTR260(8)</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Year</td>
<td>Semester 1</td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>FSMT332(16), NUTR343(16), FDSC360(16), PSYC304(16)</td>
<td>NUTR350(16), FSMT333(16), NUTR342(16), NUTR370(16)</td>
</tr>
</tbody>
</table>

Degree of Bachelor of Science in Engineering

ECSA Exit Level Outcomes
The exit level outcomes and the competencies, as defined in the Engineering Council of South Africa (ECSA) PE-61 Publication (2004), may be assessed in individual or a combination of modules. They are included here to give the students an understanding of the levels of competencies they are expected to attain.

Exit level outcome 1: Problem solving
Learning outcome: Demonstrate competence to identify, assess, formulate and solve convergent and divergent engineering problems creatively and innovatively.

Exit level outcome 2: Application of scientific and engineering knowledge
Learning outcome: Demonstrate competence to apply knowledge of mathematics, basic science and engineering sciences from first principles to solve engineering problems.

Exit level outcome 3: Engineering Design
Learning outcome: Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes.

Exit level outcome 4: Investigations, experiments and data analysis
Learning outcome: Demonstrate competence to design and conduct investigations and experiments.
Exit level outcome 5: Engineering methods, skills and tools, including Information Technology

Learning outcome: Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

Exit level outcome 6: Professional and technical communication

Learning outcome: Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

Exit level outcome 7: Impact of Engineering activity

Learning outcome: Demonstrate critical awareness of the impact of engineering activity on the social, industrial and physical environment.

Exit level outcome 8: Individual, team and multidisciplinary working

Learning outcome: Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.

Exit level outcome 9: Independent learning ability

Learning outcome: Demonstrate competence to engage in independent learning through well developed learning skills.

Exit level outcome 10: Engineering Professionalism

Learning outcome: Demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.

Note: All components of modules which evaluate ECSA outcomes at exit level are subject to external examination.

AES-BE1 Structure of the degree

(a) In order to complete the qualification a student shall obtain not less than 576 credits and shall complete the modules described in Rule AES-BE4. Of these credits at least 96 must be at Level-4 or above.

(b) The minimum duration for the qualification is 8 semesters.

AES-BE2 External Examination of Engineering Modules

In addition to the requirements of Rule GR19, Engineering modules at any level, where Engineering Council of South Africa (ECSA) exit level outcomes are evaluated subject to external examination.

AES-BE3 Vacation-Work Requirements

BScEng candidates are required to complete a minimum period of 14 weeks practical work for degree purposes, which could include one or more workshop training modules. Candidates shall undertake and perform such vacation work as may be approved by their discipline and shall submit an acceptable report thereon within six weeks of the start of the semester following the completion of each period of such work.

AES-BE4 Bachelor of Science in Engineering Curriculum

Candidates shall obtain credit for the following modules:
### 1. Agricultural Engineering

**YEAR 1**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM163 Chemistry &amp; Society 1 (8)</td>
<td>CHEM173 Chemistry &amp; Society 2 (8)</td>
</tr>
<tr>
<td>or CHEM181 Chemistry for Engineers IA (8)</td>
<td>or CHEM191 Chemistry for Engineers IB (8)</td>
</tr>
<tr>
<td>ENCH1TC Tech. Comm. for Engineers (8)</td>
<td>ENAG1DE Engineering Design (8)</td>
</tr>
<tr>
<td>or ENCV1ED Introduction to Civil Design (8)</td>
<td></td>
</tr>
<tr>
<td>ENME1DR Engineering Drawing (8)</td>
<td>ENAG1MT Intro. to Engineering Materials (8)</td>
</tr>
<tr>
<td>or ENME1EM Intro. to Engineering Materials (8)</td>
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<tr>
<td>MATH131 Mathematics 1A (Eng) (16)</td>
<td>MATH141 Mathematics 1B (Eng) (16)</td>
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<tr>
<td>MATH132 Applied Mathematics 1A (Eng) (16)</td>
<td>MATH142 Applied Mathematics 1B (Eng) (16)</td>
</tr>
<tr>
<td>PHYS110 Mech., Optics &amp; Thermal Phys (16)</td>
<td>PHYS120 Electromag, Waves &amp; Mod. Phys (16)</td>
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<tr>
<td>or PHYS151 Engineering Physics 1A (16)</td>
<td>or PHYS152 Engineering Physics 1B (16)</td>
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**YEAR 2**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>ENCV2SA Structures 1 (16)</td>
<td>ENCV2FL Fluids 1 (8)</td>
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<tr>
<td>ENEL2EE Electrical and Electronic Eng (16)</td>
<td>ENEL2EN Environmental Engineering (8)</td>
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<tr>
<td>or ENAG4EA Elec. Applications for Bio-Systems (8)</td>
<td>or ENVS322 Environmental Management (16)</td>
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<td>and ENAG4SE Sustainable Energy for Bio-Systs (8)</td>
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<tr>
<td>ENME2TH Thermodynamics 1 (8)</td>
<td>ENCV2SB Structures 2 (16)</td>
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<td>ENSV2SE Surveying Engineering (16)</td>
<td>ENCV2SD Structural Design 1 (16)</td>
</tr>
<tr>
<td>ENCV3G1 Geotechnical Engineering Studies (16)</td>
<td>ENME2DM Design Methods (16)</td>
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<td>ENME3TH Thermodynamics 2 (8)</td>
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<td>ENCV1EP Engineering Practice Workshop (DP)</td>
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**YEAR 3**

<table>
<thead>
<tr>
<th>Semester 1</th>
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<tbody>
<tr>
<td>ENAG3US Undergraduate Seminar (16)</td>
<td>AGEC240 Applied Farm Financial Mgmt (8)</td>
</tr>
<tr>
<td>HYDR210 Introduction to Physical Hydrology (16)</td>
<td>ENAG3SA Structural Analysis &amp; Design (8)</td>
</tr>
<tr>
<td></td>
<td>COMP102 Computer Programming (16)</td>
</tr>
<tr>
<td></td>
<td>or ENEL2CM Applied Computer Methods (8)</td>
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<tr>
<td></td>
<td>and ENME2CF Computer Fundamentals (8)</td>
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<tr>
<td>MATH212 Advanced Calculus &amp; Lin. Alg. (16)</td>
<td>MATH251 Further Calculus and Intro Analysis (16)</td>
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<tr>
<td>or MATH238 Mathematics 2A (Eng) (16)</td>
<td>or MATH248 Mathematics 2B (Eng) (16)</td>
</tr>
<tr>
<td>STAT130 Introduction to Statistics (16)</td>
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<tr>
<td><strong>16 Credits selected from the following (or as approved by the Dean &amp; Head of School)</strong></td>
<td><strong>24 Credits selected from the following (or as approved by the Dean &amp; Head of School)</strong></td>
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<tr>
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</tr>
<tr>
<td>ENAG3PT Power &amp; Traction*</td>
<td>ENAG3FE Forest Engineering*</td>
</tr>
<tr>
<td>ENAG3EI Irrigation Engineering*</td>
<td>ENAG4EC Env.Control of Biol. Commodities*</td>
</tr>
<tr>
<td>ENAG4BM Bio-Production Systems &amp; Mgmt*</td>
<td>ENAG4FE Food Engineering Unit Operations*</td>
</tr>
<tr>
<td>ENAG3FP Principles of Food Processing*</td>
<td>ENAG4SW Soil &amp; Water Conservation Eng*</td>
</tr>
<tr>
<td>ENAG4ST Selected Topics</td>
<td>ENAG4AP Advanced Power &amp; Traction*</td>
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</tbody>
</table>

*Denotes modules offered in alternate years.

### YEAR 4

<table>
<thead>
<tr>
<th>Year Modules</th>
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<tbody>
<tr>
<td>ENAG4BD Bioresources Engineering Design Project</td>
<td>(24)</td>
</tr>
<tr>
<td>ENAG4EP ECSA Outcomes Portfolio</td>
<td>(DP)</td>
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</tbody>
</table>

<table>
<thead>
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<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>CTEC733 Business Management or ENCH4ML Eng. Mgmt &amp; Labour Relations</td>
<td>Electives (Complementary studies)</td>
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<tr>
<td>HYDR310 Modelling for Hydrological Design</td>
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<tr>
<td>ENAG4WS Workshop Course</td>
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<td>ENAG4VW Vacation Work</td>
<td>(DP)</td>
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<table>
<thead>
<tr>
<th>24 Credits selected from the following (or as approved by the Dean &amp; Head of School)</th>
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<tbody>
<tr>
<td>ENAG3PT Power &amp; Traction*</td>
<td>ENAG3FE Forest Engineering*</td>
</tr>
<tr>
<td>ENAG3EI Irrigation Engineering</td>
<td>ENAG4EC Env.Control of Biol. Commodities*</td>
</tr>
<tr>
<td>ENAG4BM Bio-Production Systems &amp; Mgmt*</td>
<td>ENAG4FE Food Engineering Unit Operations*</td>
</tr>
<tr>
<td>ENAG3FP Principles of Food Processing*</td>
<td>ENAG4SW Soil &amp; Water Conservation Eng*</td>
</tr>
<tr>
<td>ENAG4ST Selected Topics in Engineering</td>
<td>ENAG4AP Advanced Power &amp; Traction*</td>
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</table>

* Denotes modules offered in alternate years.
## 2. Chemical Engineering

### YEAR 1

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<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>ENCH1EA Chemical Engineering Principles 1 (8)</td>
<td>ENCH1EB Chemical Engineering Principles 2 (8)</td>
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<td>ENCH1TC Tech. Communication for Engineers (8)</td>
<td>CHEM120 Chemical Reactivity or CHEM171</td>
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<td>Chemical Engineering Chemistry 2 (16)</td>
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<tr>
<td>CHEM110 General Principles of Chemistry (16)</td>
<td>MATH141 Mathematics 1B (Eng) (16)</td>
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<tr>
<td>or CHEM161 Chemical Engineering Chem. 1 (16)</td>
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<td>MATH142 Applied Mathematics 1B (Eng) (16)</td>
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<td>MATH132 Applied Mathematics 1A (Eng) (16)</td>
<td>PHYS162 Chemical Engineering Physics 1B (16)</td>
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<td>PHYS161 Chemical Engineering Physics 1A (8)</td>
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### YEAR 2

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<tr>
<th>Semester 1</th>
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<tbody>
<tr>
<td>ENCH2MB Mass and Energy Balances (8)</td>
<td>ENCH2CP Chemical Engineering Practicals 1 (8)</td>
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<tr>
<td>ENCH2OM Oil &amp; Mineral Processing (8)</td>
<td>ENCH2EF Chemical Engineering Fundamentals (16)</td>
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<td>ENEL2CM Applied Computer Methods (8)</td>
<td>ENCH2IT Instrument Technology (8)</td>
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<tr>
<td>ENEL2EE Electrical &amp; Electronic Engineering (16)</td>
<td>ENCH2MS Materials of Construction (8)</td>
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<td>ENME1DR Engineering Drawing (8)</td>
<td>ENCH2TD Thermodynamics 1 (8)</td>
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<td>MATH248 Mathematics 2B (Eng) (16)</td>
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<td>ENCH2WS Workshop Training (DP)</td>
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### YEAR 3

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<th>Semester 1</th>
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<tr>
<td>ENCH3FD Fluid Mechanics Design (8)</td>
<td>ENCH3CP Chemical Engineering Practicals 2 (8)</td>
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<td>ENCH3FM Fluid Mechanics (8)</td>
<td>ENCH3EC Chemical Engineering Design (8)</td>
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<td>ENCH3HE Heat Transfer (16)</td>
<td>ENCH3MP Materials Processing (8)</td>
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<tr>
<td>ENCH3SL Safety &amp; Loss Prevention (8)</td>
<td>ENCH3MT Mass Transfer (16)</td>
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<tr>
<td>ENCH3TH Thermodynamics 2 (8)</td>
<td>ENCH3PO Process Modelling &amp; Optimization (16)</td>
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<td>CHEM261 Appl Inorganic Chem for Chem Eng (8)</td>
<td>ENCH3RT Reactor Technology Fundamentals (16)</td>
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<td>STAT370 Engineering Statistics (8)</td>
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### YEAR 4

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<tr>
<td>ENCH4LA Laboratory/Industry Project 1 (16)</td>
<td>ENCH4PE Projects and the Environment (8)</td>
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<td>ENCH4ML Eng Management &amp; Labour Relns (8)</td>
<td>ENEL4EB Engineering Business (8)</td>
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<td>ENCH4MT Advanced Mass Transfer (8)</td>
<td>ENCH4VW Practical Vacation Work (12 weeks) (DP)</td>
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### 3. Civil Engineering

#### YEAR 1

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<td>ENME1DR Engineering Drawing (8)</td>
<td>ENCV1ED Introduction to Civil Design (8)</td>
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<tr>
<td>or ENAG1DE Engineering Design (8)</td>
<td>or ENME1EM Intro. to Engineering Materials (8)</td>
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<tr>
<td>ENCH1TC Tech. Comm. for Engineers (8)</td>
<td>or ENAG1MT Intro to Engineering Materials (8)</td>
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<tr>
<td>CHEM181 Chemistry for Engineers 1A (8)</td>
<td>CHEM191 Chemistry for Engineers 1B (8)</td>
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<tr>
<td>or CHEM163 Chemistry &amp; Society 1 (8)</td>
<td>or CHEM173 Chemistry &amp; Society 2 (8)</td>
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<td>MATH131 Mathematics 1A (Eng) (16)</td>
<td>MATH141 Mathematics 1B (Eng) (16)</td>
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<td>MATH132 Applied Mathematics 1A (Eng) (16)</td>
<td>MATH142 Applied Mathematics 1B (Eng) (16)</td>
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<td>PHYS151 Engineering Physics 1A (16)</td>
<td>PHYS152 Engineering Physics 1B (16)</td>
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<tr>
<td>or PHYS110 Mech., Optics &amp; Thermal Phys (16)</td>
<td>or PHYS120 Electromag, Waves &amp; Mod. Phys (16)</td>
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#### YEAR 2

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<tr>
<td>ENCV2MT Civil Engineering Materials (8)</td>
<td>ENCV2FL Fluids 1 (8)</td>
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<tr>
<td>ENCV2SA Structures 1 (16)</td>
<td>ENCV2SB Structures 2 (16)</td>
</tr>
<tr>
<td>ENSV2SE Surveying (Engineering) (16)</td>
<td>ENCV2SD Structural Design 1 (16)</td>
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<tr>
<td>MATH238 Mathematics 2A (Eng) (16)</td>
<td>GEOL215 Elements of Geology for Civil Eng. (16)</td>
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<tr>
<td>Electives (16)</td>
<td>MATH248 Mathematics 2B (Eng) (16)</td>
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<td>ENCV2MW Materials workshop (DP)</td>
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#### YEAR 3

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<tr>
<td>ENCV3FA Fluids 2 (16)</td>
<td>ENCV3SD Structural Design 2 (16)</td>
</tr>
<tr>
<td>ENCV3G1 Geotech. Engineering Studies 1 (16)</td>
<td>ENCV3FB Fluids 3 (16)</td>
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</tbody>
</table>
Civil Engineering candidates must complete 56 credits of elective modules of which at least 32 credits must be in Social Studies and Humanities. A minimum of 16 credits of electives will be required at 4th year level. The Dean and Head of School must approve all electives.

### 4. Computer Engineering

#### YEAR 1

<table>
<thead>
<tr>
<th>Semester 1</th>
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<tbody>
<tr>
<td>ENCH1TC Tech. Communication for Engineers (8)</td>
<td>ENEL1ED Electrical Design 1 (8) or ENAG1DEP2 Introduction to Engineering Design (8)</td>
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<tr>
<td>ENME1DR Engineering Drawing (8)</td>
<td>ENME1EM Intro. to Engineering Materials or ENAG1MT Intro to Engineering Materials (8)</td>
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<tr>
<td>CHEM181 Chemistry for Engineers 1A or CHEM163 Chemistry &amp; Society 1 (8)</td>
<td>CHEM191 Chemistry for Engineers 1B or CHEM173 Chemistry &amp; Society 2 (8)</td>
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<td>MATH131 Mathematics 1A(Eng) (16)</td>
<td>MATH141 Mathematics 1B(Eng) (16)</td>
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<td>MATH132 Applied Mathematics 1A(Eng) (16)</td>
<td>MATH142 Applied Mathematics 1B(Eng) (16)</td>
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<tr>
<td>PHYS151 Engineering Physics 1A or PHYS110 Mech., Optics &amp; Thermal Phys (16)</td>
<td>PHYS120 Electromag, Waves &amp; Mod. Phys or PHYS152 Engineering Physics 1B (16)</td>
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#### YEAR 2

<table>
<thead>
<tr>
<th>Semester 1</th>
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<tbody>
<tr>
<td>ENEL2CA Computer Methods 1 (8)</td>
<td>ENEL2CB Computer Methods 2 (8)</td>
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<tr>
<td>ENEL2EA Electrical Principles 1 (16)</td>
<td>ENEL2DS Data Structures &amp; Algorithms (8)</td>
</tr>
<tr>
<td>MATH239 Applied Finite Mathematics (8)</td>
<td>ENEL2EB Electrical Principles 2 (16)</td>
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<td>MATH238 Mathematics 2A(Eng) (16)</td>
<td>ENEL2EN Environmental Engineering (8)</td>
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### Agriculture, Engineering & Science

<table>
<thead>
<tr>
<th>Electives</th>
<th>ENEL2SE Software Engineering 1</th>
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<tbody>
<tr>
<td>ENEL2WS Workshop Training</td>
<td>ENEL2FT Field Theory</td>
<td>(8)</td>
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#### Electives (16)
- ENEL2SE Software Engineering 1 (8)
- MATH248 Mathematics 2B(Eng) (16)
- ENEL2WS Workshop Training (DP)

## YEAR 3

<table>
<thead>
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<tbody>
<tr>
<td><strong>Electives</strong> (16)</td>
<td><strong>Electives</strong></td>
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<td>ENEL3DS Digital Systems (16)</td>
<td>ENEL3CO Communications (16)</td>
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<tr>
<td>ENEL3TA Analogue Electronics 1 (8)</td>
<td>ENEL3CB Computer Engineering Design 2 (8)</td>
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<td>STAT370 Engineering Statistics (8)</td>
<td>ENEL3AE Analogue Electronics 2 (8)</td>
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<td>MATH354 Mathematics 3(Eng) (8)</td>
<td>ENEL3DE Digital Electronics (8)</td>
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<td>ENEL3CC Computer Methods 3 (8)</td>
<td>ENEL3CS Control Systems 1 (8)</td>
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<tr>
<td>ENEL3SS Systems and Simulation (8)</td>
<td>MATH349 Discrete Mathematics (8)</td>
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<td>ENCH4ML Engineering Mgmt &amp; Labour Reins (8)</td>
<td>MATH360 Numerical Methods (8)</td>
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## YEAR 4

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<tr>
<td><strong>Electives</strong> (16)</td>
<td><strong>Electives</strong></td>
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<tr>
<td>ENEL4AA Design &amp; Analysis of Algorithms (8)</td>
<td>ENEL4CB Computer Eng. Design Project (32)</td>
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<tr>
<td>ENEL4CA Computer Engineering Design 3 (16)</td>
<td>ENEL4EB Engineering Business (8)</td>
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<tr>
<td>ENEL4CO Computer Architecture &amp;Org. (8)</td>
<td>ENEL4ES Embedded Systems (8)</td>
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<td>ENEL4DC Digital Communications (8)</td>
<td>ENEL4IE Internet Engineering (8)</td>
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<td>ENEL4DT Data Communications (8)</td>
<td>ENEL4RC Real Time Computing (8)</td>
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<td>ENEL4EE Engineering Entrepreneurship (8)</td>
<td>ENEL4VW Vacation Work (DP)</td>
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<td>ENEL4OS Operating Systems for Engineers (8)</td>
<td>ENEL4AI Artificial Intelligence (8)</td>
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<td>ENEL4CM E-commerce Systems (8)</td>
<td>ENEL4CC Distributed Computing Systems (8)</td>
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<td>ENEL4CS Control Systems 2 (8)</td>
<td>ENEL4IP Image Processing (8)</td>
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<td>ENEL4DS Digital Signal Processing (8)</td>
<td>ENEL4ST Selected Topics in Computer Eng.2 (8)</td>
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<tr>
<td>ENEL4SE Security and Encryption (8)</td>
<td>ENEL4VL VLSI Design (8)</td>
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<tr>
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### 5. Electrical Engineering

#### YEAR 1

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<td>ENCH1TC Tech. Communication for Engineers (8)</td>
<td>ENEL1ED Electrical Design 1 (8) or ENAG1DEP2 Introduction to Engineering Design (8)</td>
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<td>ENME1EM Intro. to Engineering Materials (8) or ENAG1MT Intro to Engineering Materials (8)</td>
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<td>CHEM181 Chemistry for Engineers 1A (8)</td>
<td>CHEM191 Chemistry for Engineers 1B (8) or</td>
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### Rules within College of Agriculture, Engineering & Science

<table>
<thead>
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<th>Year</th>
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<td>CHEM173 Chemistry &amp; Society 2</td>
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<td>PHYS120 Electromag, Waves &amp; Mod. Phys or PHYS152 Engineering Physics 1B</td>
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<tr>
<td><strong>202</strong></td>
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<td>Semester 1</td>
<td>ENEL2CA Computer Methods 1</td>
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<td>ENEL2EA Electrical Principles 1</td>
<td>(16)</td>
<td>ENEL2EB Electrical Principles 2</td>
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<td>ENME2MS Material Strengths</td>
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<td>ENEL2ED Electrical Design 2</td>
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<td>ENEL2TD Thermofluids</td>
<td>(8)</td>
<td>ENEL2FT Field Theory</td>
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<td>MATH238 Mathematics 2A(Eng)</td>
<td>(16)</td>
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<td>Two 8C or one 16C module from outside the College taken in either semester and chosen with approval of the School.</td>
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<td>Optional modules. These must be chosen to account for 56C in total. At least one of these modules must be a self-study module.</td>
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<td>ENEL4HB High Voltage Engineering 2</td>
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<td>ENEL4HA High Voltage Engineering 1</td>
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<td>ENEL4MB Electrical Machines 4</td>
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### 6. Electronic Engineering

#### YEAR 1

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<td>ENCH1TC Tech. Communication for Engineers (8)</td>
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<tr>
<td>ENME1DR Engineering Drawing (8)</td>
<td>ENME1EM Intro. to Engineering Materials (8)</td>
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<tr>
<td>or ENAG1MT Intro to Engineering Materials (8)</td>
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<tr>
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<td>CHEM191 Chemistry for Engineers 1B (8)</td>
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<tr>
<td>or CHEM163 Chemistry &amp; Society 1 (8)</td>
<td>or CHEM173 Chemistry &amp; Society 2 (8)</td>
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<td>MATH141 Mathematics 1B(Eng) (16)</td>
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<tr>
<td>MATH132 Applied Mathematics 1A(Eng) (16)</td>
<td>MATH142 Applied Mathematics 1B(Eng) (16)</td>
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<td>PHYS151 Engineering Physics 1A (16)</td>
<td>PHYS120 Electromag, Waves &amp; Mod. Phys (16)</td>
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<tr>
<td>or PHYS110 Mech., Optics &amp; Thermal Phys (16)</td>
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#### YEAR 2

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<tbody>
<tr>
<td>ENEL2CA Computer Methods 1 (8)</td>
<td>ENEL2CB Computer Methods 2 (8)</td>
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<tr>
<td>ENEL2EA Electrical Principles 1 (16)</td>
<td>ENEL2ED Electrical Design 2 (8)</td>
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<tr>
<td>ENEL2PA Physical Electronics 1 (8)</td>
<td>ENEL2EB Electrical Principles 2 (16)</td>
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<td>ENME2TF Thermofluids (8)</td>
<td>ENEL2EN Environmental Engineering (8)</td>
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<td>MATH239 Applied Finite Mathematics (8)</td>
<td>ENEL2FT Field Theory (8)</td>
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#### YEAR 3

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>ENEL3CC Computer Methods 3 (8)</td>
<td>ENEL3AE Analogue Electronics 2 (8)</td>
</tr>
<tr>
<td>ENEL3DA Electronic Design 1 (8)</td>
<td>ENEL3CO Communications (16)</td>
</tr>
</tbody>
</table>
### YEAR 4

#### Compulsory modules

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEL4DA Electronic Design 3</td>
<td>(16) ENEL4EB Engineering Business</td>
</tr>
<tr>
<td>ENEL4EC Analogue Electronics 3</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4EE Engineering Entrepreneurship</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4TA Selected topics in Electronic Eng</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4VW Vacation Work</td>
<td>(DP)</td>
</tr>
</tbody>
</table>

Two 8C or one 16C module from outside the College taken in either semester and chosen with approval of the School.

#### Optional modules. These must be chosen to account for 48C in total.

#### Between 24C and 32C from

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEL4CS Control Systems 2</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4DC Digital Communications</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4DP Digital Processes</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4DS Digital Signal Processing</td>
<td>(8)</td>
</tr>
</tbody>
</table>

#### Between 16C and 24C from

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEL4AC Acoustics</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4DT Data Communications</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4IN Instrumentation</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4PA Power Electronics 2</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4TA Selected topics in Electronic Eng 1</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4AI Artificial Intelligence</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4AM Automation</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4ES Embedded Systems</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4IP Image Processing</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4MS Microwave Systems</td>
<td>(8)</td>
</tr>
<tr>
<td>ENEL4SY Communication Systems</td>
<td>(8)</td>
</tr>
</tbody>
</table>

### 7. Mechanical Engineering

#### YEAR 1

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENME1DR Engineering Drawing</td>
<td>(8)</td>
</tr>
<tr>
<td>ENCH1TC Tech. Comm. for Engineers</td>
<td>(8)</td>
</tr>
<tr>
<td>CHEM181 Chemistry for Engineers 1A or CHEM163 Chemistry &amp; Society 1</td>
<td>(8)</td>
</tr>
<tr>
<td>MATH131 Mathematics 1A (Eng)</td>
<td>(16)</td>
</tr>
<tr>
<td>ENME1ED Mechanical Engineering Design or ENAG1DE Engineering Design</td>
<td>(8)</td>
</tr>
<tr>
<td>ENME1EM Intro. to Engineering Materials or ENAG1MT Intro to Engineering Materials</td>
<td>(8)</td>
</tr>
<tr>
<td>CHEM191 Chemistry for Engineers 1B or CHEM173 Chemistry &amp; Society 2</td>
<td>(8)</td>
</tr>
<tr>
<td>MATH141 Mathematics 1B (Eng)</td>
<td>(16)</td>
</tr>
<tr>
<td>Semester 1</td>
<td>Semester 2</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>ENME2CF Computer Fundamentals (8)</td>
<td>ENEL2EC Electronic Engineering (8)</td>
</tr>
<tr>
<td>ENME2DY Dynamics (8)</td>
<td>ENEL2EN Environmental Engineering (8)</td>
</tr>
<tr>
<td>ENME2FM Fluid Mechanics 1 (8)</td>
<td>ENME2DM Design Methods (16)</td>
</tr>
<tr>
<td>ENME2PM Funds of Physical Metallurgy (8)</td>
<td>ENME2MM Measurements &amp; Exptl Methods (8)</td>
</tr>
<tr>
<td>ENME2TH Thermodynamics 1 (8)</td>
<td>ENME2SM Strength of Materials 1 (16)</td>
</tr>
<tr>
<td>ENEL2EL Electrical Engineering (16)</td>
<td>MATH248 Mathematics 2B (Eng) (16)</td>
</tr>
<tr>
<td>MATH238 Mathematics 2A (Eng) (16)</td>
<td>ENME2WS Workshop Course (DP)</td>
</tr>
</tbody>
</table>

YEAR 3

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCH4ML Eng. Mgmt &amp; Labour Relations (8)</td>
<td>ENEL2EC Electronic Engineering (8)</td>
</tr>
<tr>
<td>ENEL3MA Electrical Machines 1 (8)</td>
<td>ENEL2EN Environmental Engineering (8)</td>
</tr>
<tr>
<td>ENEL3SS Systems and Simulation (8)</td>
<td>ENME2DM Design Methods (16)</td>
</tr>
<tr>
<td>ENME3DM Design of Machine Elements (16)</td>
<td>ENME2MM Measurements &amp; Exptl Methods (8)</td>
</tr>
<tr>
<td>ENME3ST Strength of Materials 2 (16)</td>
<td>ENME2SM Strength of Materials 1 (16)</td>
</tr>
<tr>
<td>MATH354 Mathematics 3 (Eng) (8)</td>
<td>MATH248 Mathematics 2B (Eng) (16)</td>
</tr>
<tr>
<td>STAT370 Engineering Statistics (8)</td>
<td>ENME2WS Workshop Course (DP)</td>
</tr>
</tbody>
</table>

YEAR 4

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENME4AM Advanced Manufacturing Systems (8)</td>
<td>ENEL4EE Engineering Entrepreneurship (8)</td>
</tr>
<tr>
<td>ENME4CM Eng. Computational Methods (8)</td>
<td>ENME4DP Design and Research Project 2 (24)</td>
</tr>
<tr>
<td>ENME4FP Design of Fluid Power Systems (8)</td>
<td>ENME4MT Mechatronic Engineering (8)</td>
</tr>
<tr>
<td>ENME4PD Design and Research Project 1 (16)</td>
<td>ENME4MV Mechanical Vibrations (8)</td>
</tr>
<tr>
<td>ENME4TD Thermodynamics 3 (8)</td>
<td>ENME4VW Vacation Work (DP)</td>
</tr>
</tbody>
</table>

**Elective modules (see note 1)**
- ENEL4EB Engineering Business (8)
- ENME4DM Design & Analysis of Mnftng Proc. (8)
- ENME4ES Alternative Energy Systems (8)
- ENME4MC Mechanics of Composite Materials (8)
- ENME4ME Selected Topics in Mech. Eng 1 (8)
- Free elective modules (see note 2)

**Elective modules (see note 1)**
- ENME4ED Mechanical Engineering Design (8)
- ENME4EM Energy Management (8)
- ENME4FF Fracture & Fatigue of Eng. Materials (8)
- ENME4MN Selected Topics in Mech. Eng. 2 (8)
- MATH360 Numerical Methods (8)
- Free elective modules (see note 2)

Notes:
1. A student shall take a total of 48 elective credits to be selected following consultation
with, and approval by the Dean and Head of School.

2. Free elective modules are modules offered outside the College. Each student must complete a minimum of 24 credits, and a maximum of 32 credits of free elective modules. Any selected module(s) shall require the approval of the Dean and Head of School, and the Dean and Head of the School offering the module.

3. The remaining credits, to total 48 credits, should be selected from modules in Mechanical Engineering.

Degree of Bachelor of Science in Land Surveying

AES-BLS1 Structure of the degree

In order to complete the qualification a student shall obtain not less than 576 credits and shall complete the modules described in Rule AES-BL2.

AES-BLS2 Bachelor of Science in Land Surveying Programme

Candidates shall obtain credit for the following modules:

Bachelor of Science in Land Surveying (Howard College)

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCH1TC Tech. Comm. for Engineers</td>
<td>(8)</td>
<td>ENSV1G2 Geomatics 2</td>
</tr>
<tr>
<td>ENSV1G1 Geomatics 1</td>
<td>(16)</td>
<td>ENSV1GM Introduction to Geomorphology</td>
</tr>
<tr>
<td>MATH131 Mathematics 1A (Eng)</td>
<td>(16)</td>
<td>MATH141 Mathematics 1B (Eng)</td>
</tr>
<tr>
<td>MATH132 Applied Mathematics 1A (Eng)</td>
<td>(16)</td>
<td>MATH142 Applied Mathematics 1B (Eng)</td>
</tr>
<tr>
<td>PHYS151 Engineering Physics 1A</td>
<td>(16)</td>
<td>PHYS152 Engineering Physics 1B</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>YEAR 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSV2SE Surveying Engineering</td>
<td>(16)</td>
<td>ENSV2T2 Theory of Adjustments 2</td>
</tr>
<tr>
<td>ENSV2T1 Theory of Adjustments 1</td>
<td>(16)</td>
<td>ENVS211 GIS</td>
</tr>
<tr>
<td>MATH238 Mathematics 2A Eng</td>
<td>(16)</td>
<td>HOUS204 Housing theory &amp; Practice 2B</td>
</tr>
<tr>
<td>PHYS251 Optics and Wave Motion</td>
<td>(8)</td>
<td>LAWS2PR Property Law</td>
</tr>
<tr>
<td>HOUS203 Housing theory &amp; Practice 2A</td>
<td>(16)</td>
<td>ENSV2SC Survey Camp 2 (in July vacation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR 3</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEL2CA Computer Methods 1</td>
<td>(8)</td>
<td>ENSV3CS Cadastral Surveying 2</td>
</tr>
<tr>
<td>or ENME2CF Computer Fundamentals</td>
<td>(8)</td>
<td></td>
</tr>
<tr>
<td>ENSV2CS Cadastral Surveying 1</td>
<td>(16)</td>
<td>ENSV3SE Engineering Surveying 2</td>
</tr>
<tr>
<td>ENSV2HY Hydrographic Surveying</td>
<td>(16)</td>
<td>ENSV3SS Satellite Surveying</td>
</tr>
<tr>
<td>ENSV3CG Co-ord Systems &amp; Geodetic Projs</td>
<td>(16)</td>
<td>ENVS316 GIS &amp; Remote Sensing</td>
</tr>
</tbody>
</table>
**Degree of Bachelor of Science in Property Development**

*No new admissions to the first year of the BScPropDev will be considered from 2011 onwards.*

**AES-PD1 Structure of the degree**

In order to complete the qualification a student shall obtain not less than 432 credits and shall complete the modules described in Rule AES-PD2.

**AES-BPD2 Bachelor of Science in Property Development Programme**

Candidates shall obtain credit for the following modules:

**Bachelor of Science in Property Development (Howard College)**

### YEAR 1

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENPD2DA Design Appraisal &amp; Measmnt 2A (16)</td>
<td>ENPD2DB Design Appraisal &amp; Measmnt 2B (16)</td>
</tr>
<tr>
<td>ENPD2EA Construction Econ. &amp; Mgmt 2A (16)</td>
<td>ENPD2EB Construction Econ. &amp; Mgmt 2B (16)</td>
</tr>
<tr>
<td>LAWS1IL Introduction to Law (16)</td>
<td>LAWS1AS Aspects of South African Law (16)</td>
</tr>
<tr>
<td>Elective  (8)</td>
<td>Elective  (8)</td>
</tr>
</tbody>
</table>

**YEAR 2**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENPD3DA Design Appraisal &amp; Measmnt 3A (16)</td>
<td>ENPD3CC Construction Contracts (8)</td>
</tr>
<tr>
<td>ENPD3EA Construction Econ. &amp; Mgmt 3A (16)</td>
<td>ENPD3DB Design Appraisal &amp; Measmnt 3B (16)</td>
</tr>
<tr>
<td>ENPD3TA Construction Tech. &amp; Processes 3A (8)</td>
<td>ENPD3PR Property Law (16)</td>
</tr>
<tr>
<td>ENPD3PS Property Studies  (16)</td>
<td>ENPD3PM Project Management (24)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCH4ML Eng. Mgmt &amp; Labour Relations (16)</td>
<td>ENEL4EB Engineering Business (8)</td>
</tr>
<tr>
<td>or ENPD7PP Professional Practice (8)</td>
<td>or ENEL4EE Engineering Entrepreneurship (8)</td>
</tr>
<tr>
<td>ENSV4GY Geodesy (16)</td>
<td>ENSV4PE Precise Engineering Surveying (16)</td>
</tr>
<tr>
<td>ENSV4TN Land Tenure (16)</td>
<td>ENSV4PO Photogrammetry 2 (16)</td>
</tr>
<tr>
<td>ENPD3PL Project Planning (16)</td>
<td>ENSV4SP Surveying and Mapping Project (32)</td>
</tr>
<tr>
<td>ENSV4RM Research Methodology  (8)</td>
<td></td>
</tr>
<tr>
<td>TNPL401 Law for Planners  (8)</td>
<td></td>
</tr>
</tbody>
</table>
HONOURS DEGREES

AES-H1 Applicability of Rules

The following rules apply to the following Honours qualifications offered by the College.

Bachelor of Agriculture Honours  BAgicHons
Bachelor of Agricultural Management Honours  BAgicMgmtHons
Bachelor of Science Honours  BScHons
Bachelor of Science in Property Development Honours (Construction Management)  BScPropDevHons(CM)
Bachelor of Science in Property Development Honours (Quantity Surveying)  BScPropDevHons(QS)

Note: No new admissions to the first year of the BScPropDevHons will be considered from 2014 onwards.

AES-H2 Eligibility

In addition to the provisions of General Academic Rule HR2, to be eligible to apply for admission for an Honours degree, applicants must have a credit weighted average of at least 55% in the relevant Level-3 modules. In calculating this credit-weighted average, all attempts at the relevant Level-3 modules will be taken into account.

AES-H3 Structure of the Degree

(a) For a BAgicHons, BAgicMgmtHons or BScHons, in order to complete the degree, a student shall obtain not less than 128 credits. At least 32 credits must be a research project.

(b) For a BScPropDevHons(CM) or a BScPropDevHons(QS), in order to complete the degree, a student shall obtain not less than 144 credits at Level 7.

AES-H4 Project Modules

The General Academic Rule HR6 applies to the following project modules, which may not be repeated:

BScHons: ACSC709, AGPS790, ANSI790, BIOC702, BIOL790, CHEM791, CHEM793, COMP700, ENVIS730, GENE701, GEOL707, HYDR790, MATH798, MATH799, MICR710, PHYS709, PHYS735, PHYS760, PHYS761, PPTH750, SSCI793, STAT795

BAgricHons: RRMG750

BAgricMgmtHons: AGEC790, AGEC791, AGPS790, ANSI790

BScPropDevHons: ENPD7RR.

Degree of Bachelor of Science (Honours)

AES-H5 Bachelor of Science Honours - Combinations

The following lists give the programmes of study within the degree of Bachelor of Science
Honours. All elective modules must be chosen in accordance with Rule AES-H3 and require approval by the Dean and Head of School.

1. Applied Mathematics

*Prerequisites:* Completion of a major or programme in Applied Mathematics or equivalent approved by the Dean and Head of School with a credit-weighted average of at least 55% in the Level-3 Applied Mathematics modules.

**a. Pietermaritzburg**

*Core:* MATH798(32).

*Electives:* 96C from MATH730(16), 731(16), 732(16), 733(16), 734(16), 740(16), 741(16), 755(16), 765(16), 785(16) or other modules approved by the School.

**b. Westville**

*Core:* MATH798(32).

*Electives:* 96C from Level-7 MATH. (Up to 32 of these credits may be replaced by Level-7 credits outside the School, approved by the School.)

2. Biochemistry

*Prerequisites:* Completion of a major or programme in Biochemistry with a credit-weighted average of at least 55% in the Level-3 Biochemistry modules.

**a. Pietermaritzburg**

*Core:* BIOC701(16), 702(48), 703(16), 705(16), 707(16), 710(16).

**b. Westville**

*Core:* BIOC702(48), 708(16), 709(16), 711(16), 713(16), 715(16).

3. Biological Sciences

*Prerequisites:* Completion of a major or programme in the Biological Sciences with a credit-weighted average of at least 55% in 64C of the Level-3 Biological Sciences modules. Note that acceptance into the programme may depend on availability of places.

**a. Pietermaritzburg**

*Core:* BIOL701(16), 790(48).

*Electives:* 48C from BIOL721(16), 722(16), 723(16), 724(16), 726(16), 732(16), 733(16), 762(16), 763(16), 764(16) and a further 16C chosen freely from Level-7 modules within the College.

**b. Westville**

*Core:* BIOL701(16), 790(48).

*Electives:* 48C from BIOL711(16), 712(16), 713(16), 715(16), 716(16), 731(16), 734(16), 741(16), 744(16), 745(16), 747(16), 748(16), 749(16), 750(16), 781(16), 782(16), 884(16) and a further 16C chosen freely from Level-7 modules within the College.

4. Biometry (Pietermaritzburg)

*Prerequisites:* BMET314(8), BMET316(8) and completion of a major in Statistics each with a credit-weighted average of at least 55%.

*Core:* STAT714(16), 730(16), 740(16), 795(32). The project (STAT795) must be in Biometry.
Electives: 48C from STAT710(16), 711(16), 715(16), 719(16), 723(16), 752(8), 753(16), 754(16), 760(16).

5. Botany (Pietermaritzburg)
Prerequisites: Completion of a major or programme in the Biological Sciences with a credit-weighted average of at least 55% in the Level-3 Plant Sciences modules. Note that acceptance into the programme may depend on availability of places.
Core: BIOL701(16), 790(48).
Electives: 32C from BIOL726(16), 733(16), 762(16), 763(16), 16C from Level-7 modules within the School and a further 16C chosen from relevant Level-7 modules within the College, approved by the School.

6. Cellular Biology (Westville)
Prerequisites: Completion of a major or programme in Cellular Biology with a credit-weighted average of at least 55% in 64C of the Level-3 Biological Sciences modules. Note that acceptance into the programme may depend on availability of places.
Core: BIOL701(16), 790(48).
Electives: 32C from BIOL715(16), 731(16), 741(16), 744(16), 745(16), 747(16), 748(16), 749(16), 750(16), 16C from Level-7 modules within the School and a further 16C chosen from relevant Level-7 modules within the College, approved by the School.

7. Chemistry
Prerequisites: Completion of a major or programme in Chemistry with a credit-weighted average of at least 55% in the Level-3 Chemistry modules.
a. Pietermaritzburg
Core: CHEM733(16), 743(16), 763(32), 793(48).
Electives: 16 credits chosen from CHEM753(8), CTEC733(8), 743(8).
b. Westville
Core: CHEM711(16), 721(16), 731(16), 741(16), 781(32), 791(32).

8. Computer Science (Pietermaritzburg, Westville)
Prerequisites: Completion of a major or programme in Computer Science with a credit-weighted average of at least 55% in the Level-3 Computer Science modules. Note that acceptance into the programme may depend on the availability of places.
Core: COMP700(32).
Electives: 64C of Computer Science modules at Level 7 plus 32C from the College or from ISTN, approved by the School.

9. Crop Science (Pietermaritzburg)
Prerequisites: Completion of the BSc programme in Crop and Horticultural Sciences or an appropriate major with a credit-weighted average of at least 55% in the Level-3 modules.
Core: AGPS701(8), 710(16), 712(16), 714(16), 715(16), 790(32), 791(8).
Electives: 16C at Level 7 or 8 approved by the School.
10. Ecological Sciences (General Stream)

**Prerequisites:** Completion of a major or programme in the Biological Sciences with a credit-weighted average of at least 55% in the Level-3 Biological and/or Environmental Science modules. Note that acceptance into the programme may depend on availability of places.

**a. Pietermaritzburg**

**Core:** BIOL701(16), 790(48).

**Electives:** 48C from BIOL721(16), 722(16), 723(16), 724(16), 726(16), 764(16) and a further 16C chosen from relevant Level-7 modules approved by the School.

**b. Westville**

**Core:** BIOL701(16), 790(48).

**Electives:** 48C from BIOL711(16), 712(16), 713(16), 715(16), 716(16), 734(16), 781(16), 782(16), 884(16) and a further 16C chosen from relevant Level-7 modules within the College.

11. Ecological Sciences (Rangeland & Wildlife Conservation Stream) (Pietermaritzburg)

**Prerequisites:** Completion of a major or programme in Ecological Sciences or Grassland Science with a credit-weighted average of at least 55% in the Level-3 Biological and/or Environmental Science modules. Note that acceptance into the programme may depend on availability of places.

**Core:** BIOL701(16), 790(48).

**Electives:** 32C from (BIOL722(16), 723(16), 724(16), 725(16)), 16C from (BIOL721(16), 722(16), 723(16), 724(16), 726(16)) and a further 16C chosen from relevant Level-7 modules within the College approved by the School.

12. Entomology (Pietermaritzburg)

**Prerequisites:** Completion of a major or programme in the Biological Sciences with a credit-weighted average of at least 55% in the Level-3 Biological Sciences modules. Note that acceptance into the programme may depend on availability of places.

**Core:** BIOL701(16), 721(16), 726(16), 790(48).

**Electives:** 32C chosen from relevant Level-7 modules within the College approved by the School.

13. Environmental Science

The BSc Environmental Science Honours degree is a *multidisciplinary qualification*. Students registering for 48 credits or more in a single discipline (excluding the research project) should register in the discipline from which the majority of the course credits are derived.

**a. Pietermaritzburg**

**Prerequisites:** Completion of a major or programme in Environmental Science, Biology, Geography, Geology, Hydrology, Microbiology or Soil Science including at least 16C of MATH and 16C of CHEM, with a credit-weighted average of at least 55% in the Level-3 modules within their completed undergraduate degree. Acceptance is dependent on the availability of places.

**Core:** ENVS700(16), 730(48).

**Electives:** 64C chosen from AMET, BIOL, ENVS, GEOG (not to exceed 32C in GEOG), HYDR, MICR, or SSCI approved by the School.
b. Westville

Prerequisites: Completion of a major or programme in Biological Sciences, Environmental Science, Geography or Geology including at least 16C of MATH and 16C of CHEM, with a credit-weighted average of at least 55% in the Level-3 modules.
Core: ENVS700(16), 730(48).
Electives: 64C including at least 32C from BIOL781(16), 782(16), ENVS708(16), 711(16), 712(16), 720(16), 741(16), 751(16), GEOG727(16), 733(16), 735(16), 744(16), (not to exceed 32C in GEOG), GEOL712(16), or other modules from related disciplines approved by the School.

14. Financial Mathematics (Westville)

Prerequisites: Completion of a programme in Actuarial Science with a credit-weighted average of at least 55% in the Level-3 modules. Applicants with other qualifications may be considered.
Core: ACSC709(32).
Electives: 96C from ACSC701(16), 702(16), 703(16), 704(16), 705(16), 707(16), 708(16), STAT713(16), 721(16).

15. Genetics (Pietermaritzburg)

Prerequisites: Completion of a major or programme in Genetics with a credit-weighted average of at least 55% in the Level-3 Genetics modules.
Core: GENE701(48), 703(16), 714(16), 715(16), 716(16).
Electives: 16C from: BIOL724(16), 733(16), GENE718(16), approved by the School.

16. Geology (Westville)

Prerequisites: Completion of a major or programme in Geology with a credit-weighted average of at least 55% in the Level-3 core Geology modules. Limitations on student numbers may be imposed by available resources.
Core: GEOL706(16), 707(32) and, depending on the specialisation, either GEOL705(16) or GEOL711(16).
Electives: 80C from GEOL701(16), 702(16), 703(16), 705(16), 708(16), 710(16), 711(16), 712(16), 713(16), 714(16), 715(16), 716(16), 717(16) or up to 16C of electives at Level 7 from related disciplines as approved by the School.

17. Horticultural Science (Pietermaritzburg)

Prerequisites: Completion of the BSc programme in Crop and Horticultural Sciences or an appropriate major with a credit-weighted average of at least 55% in the Level-3 modules.
Core: AGPS701(8), 732(16), 790(32), 791(8).
Electives: 64C from AGPS712(16), 716(16), 733(16), 734(16) or up to 16C of other Level-7 or -8 modules may be selected and approved by the School.

18. Hydrology (Pietermaritzburg)

Prerequisites: Completion of a major or programme in Hydrology with a credit-weighted average of at least 55% in the Level-3 Hydrology modules.
Core: HYDR710(16), 720(16), 725(16), 790(32), 795(32).

Electives: 16C at Level 7 approved by the School.

19. Industrial and Applied Biotechnology (Pietermaritzburg)
Prerequisites: Completion of the Industrial and Applied Biotechnology programme with a credit-weighted average of at least 55% in Level-3 Microbiology modules.
Core: CTEC733(8), 773(8), MICR710(48), 721(16), 722(16), 723(16), 724(16).

20. Industrial Mathematics (Westville)
Prerequisites: Completion of a major or programme in Applied Mathematics with a credit-weighted average of at least 55% in the Level-3 Applied Mathematics modules.
Core: MATH798(32), 778(16), 792(16), 793(16), 794(16).
Electives: 32C from MATH783(16), 785(16), 786(16), 795(16), 796(16), STAT721(16).

21. Marine Biology (Westville)
Prerequisites: Completion of a major or programme in Biological Sciences with a credit-weighted average of at least 55% in 64C of the Level-3 Biology and Conservation Sciences modules. Note that acceptance into the programme may depend on availability of places.
Core: BIOL701(16), 781(16), 782(16), 784(16), 790(48), 884(16).

22. Mathematics
Prerequisites: Completion of a major or programme in Mathematics with a credit-weighted average of at least 55% in the Level-3 Mathematics modules.
a. Pietermaritzburg
Core: MATH710(16), 799(32), 721(16), 751(16).
Electives: 48C from MATH720(16), 730(16), 740(16), 762(16), 763(16), 780(8) or other modules from Statistics, Applied Mathematics or Computer Science, approved by the School.
b. Westville
Core: MATH701(16), 799(32), 785(16).
Electives: 64C from Level-7 MATH. (Up to 32 of these credits may be replaced by Level-7 credits outside the School, approved by the School.)

23. Microbiology
Prerequisites: Completion of a major or programme in Microbiology with a credit-weighted average of at least 55% in the Level-3 Microbiology modules.
a. Pietermaritzburg
Core: MICR710(48), 721(16), 722(16), 723(16), 724(16).
Electives: 16C chosen at Level 7 or 8 approved by the School.
b. Westville
Core: MICR701(16), 710(48), 711(16), 712(16), 713(16), 719(16).

24. Physics
a. Pietermaritzburg
Prerequisites: Completion of a major or programme in Physics with a credit-weighted average
of at least 55% in the Level-3 Physics modules.

**Core:** PHYS711(32), 735(32), 742(16).

**Electives:** PHYS721(16), 752(32), or up to 32C of modules from another school, approved by the School.

**b. Westville**

**Prerequisites:** Completion of a major or programme in Physics with a credit-weighted average of at least 55% in the Level-3 Physics modules. Students without Level-3 Mathematics will be required to take PHYS769.

**Core:** PHYS701(16), 702(16), 703(16), 735(32).

**Electives:** up to 32C of modules from another school, subject to the approval by both Schools.

### 25. Plant Pathology (Pietermaritzburg)

**Prerequisites:** Completion of a major or programme in Plant Pathology with a credit-weighted average of at least 55% in the Level-3 Plant Pathology modules.

**Core:** PPTH730(16), 745(16), 750(48), 785(8).

**Electives:** PPTH713(16) or 723(16) plus 24 other credits approved by the School.

### 26. Soil Science (Pietermaritzburg)

**Prerequisites:** Completion of a major or programme in Soil Science with a credit-weighted average of at least 55% in the Level-3 Soil Science modules.

**Core:** SSCI710(8), 760(8), 770(8), 780(8), 792(16), 793(48), 794(16).

**Electives:** up to 32C of modules from another school, subject to the approval by both Schools.

### 27. Statistics

**Prerequisites:** Completion of a major or programme in Statistics with a credit-weighted average of at least 55% in the Level-3 Statistics modules.

**a. Pietermaritzburg**

**Core:** STAT714(16), 730(16), 740(16), 795(32).

**Electives:** up to 32C of modules from another school, subject to the approval by both Schools.

**b. Westville**

**Core:** STAT795(32).

**Electives:** up to 32C of modules from another school, subject to the approval by both Schools.

### 29. Zoology (Pietermaritzburg)

**Prerequisites:** Completion of a major or programme in Zoology with a credit-weighted average of at least 55% in the Level-3 Biology and Conservation Sciences modules. Note that acceptance into the programme may depend on availability of places.

**Core:** BIOL701(16), 790(48).

**Electives:** up to 32C of modules from another school, subject to the approval by both Schools.
Degree of Bachelor of Agriculture (Honours)

AES-H6 Bachelor of Agriculture (Honours) Curriculum

The modules prescribed for the qualification are listed below (128C) (numbers in parentheses refer to credits).

<table>
<thead>
<tr>
<th>Year-long Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDSC760 Introduction to Research Methods</td>
<td>(8)</td>
</tr>
<tr>
<td>RRMG700 Systems Thinking Foundations</td>
<td>(16)</td>
</tr>
<tr>
<td>RRMG710 Rural Development Placement</td>
<td>(32)</td>
</tr>
<tr>
<td>RRMG711 Advanced Communication &amp; Innovation</td>
<td>(16)</td>
</tr>
<tr>
<td>RRMG712 Project Design &amp; Management</td>
<td>(16)</td>
</tr>
<tr>
<td>RRMG750 Agricultural Extension / Development Research Project</td>
<td>(40)</td>
</tr>
</tbody>
</table>

Degree of Bachelor of Agricultural Management (Honours)

AES-H7 Bachelor of Agricultural Management (Honours) Curriculum

The curriculum shall consist of one of the following combinations of modules (128C) (numbers in parentheses refer to credits):

(a) **Commerce Stream**: AGEC730(8), 740(16), 790(40), together with 64 credits at Level 7 approved by the School, of which 48 must be chosen from the School of Management IT and Governance; or

(b) **Production Stream**: AGEC730(8), 740(16), 791(32), (AGPS790(32) or ANSI790(32)), together with 40 credits at Level 7 approved by the School.

Degree of Bachelor of Science in Property Development Honours (Construction Management)

AES-H8 Curriculum

Candidates shall complete approved modules to a value of not less than 144 credits and shall comply with the prescribed curriculum requirements:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Modules</strong></td>
<td><strong>Core Modules</strong></td>
</tr>
<tr>
<td>ENPD7RM Research Methodology (16)</td>
<td>ENPD7RR Research Report (24)</td>
</tr>
<tr>
<td>ENPD7PA Project Administration (32)</td>
<td>ENPD7BC Law of Building Contracts (16)</td>
</tr>
<tr>
<td>ENPD7PE Property Development Economics (16)</td>
<td>ENPD7CM Applied Construction Management (24)</td>
</tr>
<tr>
<td><strong>Elective Modules. 16C to be chosen from</strong></td>
<td><strong>Elective Modules. 16C to be chosen from</strong></td>
</tr>
<tr>
<td>ENPD7CT Advanced Construction Technology (8)</td>
<td>ENPD7DA Advanced Design Appraisal &amp; Msmnt (8)</td>
</tr>
</tbody>
</table>
Degree of Bachelor of Science in Property Development Honours (Quantity Surveying)

AES-H9 Curriculum
Candidates shall complete approved modules to a value of not less than 144 credits and shall comply with the prescribed curriculum requirements:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Modules</strong></td>
<td><strong>Core Modules</strong></td>
</tr>
<tr>
<td>ENPD7RM Research Methodology (16)</td>
<td>ENPD7RR Research Report (24)</td>
</tr>
<tr>
<td>ENPD7PE Property Development Economics (16)</td>
<td>ENPD7SO Simulated Office Project (16)</td>
</tr>
<tr>
<td>ENPD7CE Cost Engineering (32)</td>
<td>ENPD7BC Law of Building Contracts (16)</td>
</tr>
<tr>
<td>ENPD7PP Professional Practice (8)</td>
<td></td>
</tr>
<tr>
<td><strong>Elective Modules</strong></td>
<td><strong>Elective Modules</strong></td>
</tr>
<tr>
<td>ENPD7CT Advanced Construction Technology (8)</td>
<td>ENPD7DA Advanced Design Appraisal &amp; Msmnt (8)</td>
</tr>
<tr>
<td>ENPD7PP Professional Practice (8)</td>
<td>ENPD7PV Property Valuations (16)</td>
</tr>
<tr>
<td></td>
<td>ENPD7CL Mgmnt of Construction Contracts (8)</td>
</tr>
<tr>
<td>Any other Level-7 module approved by the School</td>
<td></td>
</tr>
</tbody>
</table>

POSTGRADUATE DIPLOMAS

Postgraduate Diploma in Community Nutrition

AES-PCN1 Eligibility
An applicant is eligible to apply for selection to register for the qualification of Postgraduate in Community Nutrition provided he or she is
(a) a holder of a Bachelor of Science in Human Nutrition or a graduate of another recognized university who has been admitted to the status thereof; or
(b) a person admitted by permission of the Senate under General Academic Rule GR7(b) to register for the Diploma.
(c) Students shall submit a certificate of registration with the Health Professions Council of South Africa (HPCSA) when applying for admission into the Postgraduate Diploma in Community Nutrition.
(d) Students shall produce a certificate of completed Hepatitis B Immunisations.

AES-PCN2 Repeating of Failed Modules
Except for the project module NUTR741, which may not be repeated, a student may repeat any failed module. No module may be repeated more than once.
AES-PCN3 Curriculum
The modules prescribed for the Diploma are listed below (152C) (numbers in parentheses refer to credits).

Core modules: NUTR711(48), 730(8), 741(32), PODS701(32).
Elective modules: 32C from 32C from FDSC700(16), 720(8), 730(8), 755(8), RRMG700(16).

Postgraduate Diploma in Dietetics

AES-PD1 Eligibility
An applicant is eligible to apply for selection to register for the qualification of Postgraduate Diploma in Dietetics provided he or she is
(a) a holder of a Bachelor of Science in Dietetics or a graduate of another recognized university who has been admitted to the status thereof; or
(b) a person admitted by permission of the Senate under General Academic Rule GR7(b) to register for the Diploma.
(c) Students shall submit a certificate of registration with the Health Professions Council of South Africa when applying for admission into the Postgraduate Diploma in Dietetics.
(d) Students shall produce a certificate of completed Hepatitis B Immunisations.

AES-PD2 Repeating of Failed Modules
Except for the project module NUTR741, which may not be repeated, a student may repeat any failed module. No module may be repeated more than once.

AES-PD 3 Curriculum
The modules prescribed for the Diploma are listed below (176C) (numbers in parentheses refer to credits).
DIET711(64), FSMT711(32), NUTR711(48), 741(32).

Postgraduate Diploma in Food Security

AES-PFS1 Eligibility
An applicant is eligible to apply for selection to register for the qualification of Postgraduate Diploma in Food Security provided he or she is
(a) a holder of a relevant Bachelors Degree of the University or a graduate of another recognized university who has been admitted to the status thereof; or
(b) a person who has been admitted by permission of the Senate in terms of General Academic Rule GR7(b) as a candidate for the diploma.
(c) The relevance of the qualifications offered shall be determined by the School.

AES-PFS2 Repeating of Failed Modules
Except for the project modules FDSC701 and FDSC711, which may not be repeated, a student may repeat any failed module. No module may be repeated more than once.
AES-PFS3 Curriculum

The modules prescribed for the Diploma are listed below (128C) (numbers in parentheses refer to credits).

**Core Modules**: FDSC700(16), FDSC760(8), (FDSC701(40) or 711(40)), PODS601(32), RRMG712(16).

**Electives**: 16C from FDSC720(8), 730(8), 755(8).

**MASTERS DEGREES**

**College Rules for Masters Degrees**

**AES-M1 Applicability of Rules**

This section refers to the following qualifications:

- Master of Science: MSc
- Master of Science in Agriculture: MScAgric
- Master of Science in Engineering: MScEng
- Master of Science in Land Surveying: MScSur
- Master of Agricultural Management: MAgicMgt
- Master of Agriculture: MAgic
- Master of Science in Dietetics: MScDiet
- Master of Science in Human Nutrition: MScHumNutr
- Master of Environmental Management: MEnvMan
- Master of Science in Construction Management: MScConstMan
- Master of Science (Construction Project Management): MSc(ConstProjMan)
- Master of Science in Quantity Surveying: MScQS

**AES-M2 Masters Eligibility**

(a) Under the provisions of General Academic Rules CR2(b) and MR2(b), except with the permission of the College Dean of Research, applicants must have a credit weighted average of at least 60% in the relevant qualification.

(b) Additional requirements are listed under the rules for specific qualifications.

**See also General Rules CR2 and MR2.**

**AES-M3 Relevant Qualifications**

The table below gives the relevant qualification for entry in terms of Rule AES-M2(a) for each qualification.

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSc</td>
<td>Honours degree in an appropriate subject</td>
</tr>
<tr>
<td>MScAgric</td>
<td>Bachelor of Science in Agriculture</td>
</tr>
<tr>
<td>MScEng</td>
<td>BScEng in an appropriate discipline</td>
</tr>
<tr>
<td>MScSur</td>
<td>4-year Bachelors degree in Land Surveying</td>
</tr>
<tr>
<td>MAgicMgt</td>
<td>BAgricMgmtHons</td>
</tr>
</tbody>
</table>
MAgric  B Agric(Hons) or Postgraduate Diploma in Agriculture  
MScDiet  PGDipDiet (See also Rule AES-M9)  
MScHumNutr  PGDipHumNutr (See also Rule AES-M9)  
MEnvMan  BScHons in Environmental Science or other appropriate honours degree  
MScConstMan  BScPropDevHons(CM)  
MScQS  BScPropDevHons(QS)  

Where necessary, the appropriateness of the qualification will be determined by the relevant School.

AES-M4 Types of Masters Degrees
A Masters Degree in the College may be obtained by one of two methods.
1. By research. In this case the qualification is assessed purely on the basis of a dissertation.
2. By coursework. In this case the qualification is assessed by coursework and a dissertation.

The table below shows which types of Masters Degree may be obtained for each qualification.

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSc</td>
<td>Research or Coursework</td>
</tr>
<tr>
<td>MScAgric</td>
<td>Research or Coursework</td>
</tr>
<tr>
<td>MScEng</td>
<td>Research or Coursework</td>
</tr>
<tr>
<td>MScSur</td>
<td>Research</td>
</tr>
<tr>
<td>MAgricMgmt</td>
<td>Research</td>
</tr>
<tr>
<td>MAgric</td>
<td>Research or Coursework</td>
</tr>
<tr>
<td>MScDiet</td>
<td>Research</td>
</tr>
<tr>
<td>MScHumNutr</td>
<td>Research</td>
</tr>
<tr>
<td>MEnvMan</td>
<td>Coursework</td>
</tr>
<tr>
<td>MScConstMan</td>
<td>Research</td>
</tr>
<tr>
<td>MScQS</td>
<td>Research</td>
</tr>
</tbody>
</table>

Additional Rules for Specific Masters Degrees

AES-M5 Combinations for MSc by Coursework
The following lists give the programmes of study within the degree of Master of Science by coursework. Numbers in parentheses refer to credits.

1. Environmental Science (Westville)  
   Core: ENVS800(64).
   Electives: A minimum of 48C at Level 8 from ENVS810(16), 813(16), 814(16), 815(16), 817(16). Up to 16C credits chosen from ECON8EN(16) or relevant Level 8 elective(s).

2. Mathematics (Westville)  
   Core: MATH811(16), MATH812(16), MATH813(16), MATH814(16), MATH819(96)
   Electives: 32C from MATH815(16), MATH816(16), MATH817(16), MATH818(16).

3. Water Resources Management (Pietermaritzburg)
AES-M6 Combinations for MScEng by Coursework

The following lists give the programmes of study within the degree of Master of Science in Engineering by Coursework.

1. Bioresources Engineering

   **Core:**
   - ENAG8RM Research Methodology (8)
   - ENAG8AT Advanced Topics in Bioresources Engineering (16)
   - ENAG8DI Dissertation (72)

   **Electives:** 48C as approved by School

2. Chemical Engineering

   **Core:**
   - DNC8DL1 Dissertation (80)

   **Electives:** 64C from
   - ENCH8AP Advanced Pulping Technology (16)
   - ENCH8AT Advanced Chemical Engineering Topics (16)
   - ENCH8PC Paper Chemistry (16)
   - ENCH8PP Pulp & Paper Environmental Issues (8)
   - ENCH8PT Advanced Papermaking Technology (16)
   - ENCH8WC Wood Chemistry (8)

3. Civil Engineering

   **Core:**
   - ENCV801 Dissertation (72)
   - ENCV8NM Numerical Methods (16)
   - ENPD8RM Advanced Research Methodology (8)
   - ENCV8EI Environmental Impact Assessment (8)

   **Electives:**

   a. Geotechnical Engineering: At least 48C from
   - ENCV8GS Site Investigation (16)
   - ENCV8GF Advanced Foundation Design (16)
   - ENCV8GE Introduction to Environmental Geotechnics (16)
   - ENCV8GA Advanced Soil Mechanics (16)
   - ENCV8GB Rock Mechanics (16)

   b. Pavement and Transportation Engineering: At least 40C from
   - ENCV8PT Public Transport (16)
   - ENCV8TC Transport Control (16)
   - ENCV8TD Transport Development (16)
   - ENCV8TP Transportation Planning (16)
   - ENCV8CP Concrete Pavements (8)
   - ENCV8PD Pavement Design (16)
c. Structural Engineering: At least 48C from
ENCV8SB Advanced Reinforced Concrete Structures (16)
ENCV8SA Prestressed Concrete theory and Design (16)
ENCV8DS Structural Design (16)
ENCV8SD Structural Dynamics (16)
ENCV8ST Structural Theory (16)

d. Water Engineering: At least 40C from
ENCV8EF Environmental Fluid Dynamics (16)
ENCV813 Advanced Hydrology (8)
ENCV834 Advanced Groundwater Hydrology (8)
ENCV837 Hydraulics of Pipelines (8)
ENCV838 Open Channel Flow (8)

4. Environmental Engineering
Core:
ENCV801 Dissertation (72)
ENPD8RM Advanced Research Methodology (8)

Electives:
48C from
ENCV804 Water Resources Planning & Management (16)
ENCV8UH Urban Hydrology (8)
ENCV8WQ Principles of Water Quality & Legislation (8)
or 16C from other modules approved by the School

(a) Water and Wastewater Treatment (16C from)
ENCH8BP Biological Effluent Treatment Processes (16)
ENCH8WT Design of Water/Waste Treatment Plants (16)
ENCH8IW Industrial Wastewater Treatment (8)
ENCV804 Water Resources Planning & Management (8)
ENCV8UH Urban Hydrology (8)
ENCV8WQ Principles of Water Quality & Legislation (8)
or 16C from other modules approved by the School

(b) Waste Management (16C from)
ENCV8LD Landfill Design & Management (8)
ENCH8CP Cleaner Production (8)
ENVS814 Sustainable Development (16)
or 16C from other modules approved by the School

(c) Environmental Modelling (16C from)
ENCV8EF Environmental Fluid Dynamics (16)
ENCH8AA Applied Aquatic Chemistry (16)
ENCV817 Environmental Pollution and Control (8)
or 16C from other modules approved by the School

5. Electrical Power and Energy Systems

Core:
ENEL810 Dissertation (72)

Electives: 72C from
ENEL818 Overview of Power and Energy Systems (8)
ENEL819 Project Engineering and Business Strategy (8)
ENEL825 Advanced Power Electronics (16)
ENEL826 Advanced HVDC Systems Design and Operation (16)
ENEL827 Advanced High Voltage Engineering (16)
ENEL828 Advanced EMC and Power Quality (16)
ENEL829 Power Systems Protection (16)
ENEL830 Transmission and Distribution Systems (16)

AES-M7 Combinations for MScAgric by Coursework

The following lists give the programmes of study within the degree of Master of Science in Agriculture by Coursework. Numbers in parentheses refer to credits.

Agricultural and Environmental Instrumentation (Pietermaritzburg):

Core: AMET869(64).

Electives: 64C from AMET860(8), 861(8), 862(8), 863(8), 864(8), 865(8), 866(8), 867(8),
or other modules approved by the School.

AES-M8 Combinations for MAgric

The following lists give the programmes of study within the degree of Master of Agriculture.

1. Agricultural Extension and Rural Resource Management
   This programme is by research.

2. Food Security
   FDSC800(16), 815(96), 840(16), 860(16), 870(16), 880(16), 890(16).

AES-M9 MScDiet and MScHumNutr Additional Requirements

In addition to the requirements of AES-M2 students must have obtained their Postgraduate Diploma having passed all modules on the first attempt with a credit weighted average of 60%, inclusive of a minimum module mark of 60% in NUTR741.

AES-M10 Curriculum for Master of Environmental Management

In order to complete the qualification, a student shall complete the following modules (128C) (Numbers in parenthesis refer to credits):
DOCTORAL DEGREES

Degree of Doctor of Philosophy

AES-D1 PhD Eligibility Requirements
Under General Academic Rule, DR2, the relevant pre-requisite qualification is an appropriate Master’s degree in one of the disciplines in this College.

AES-D2 Upgrading
Candidates registered for a research masters degree in the College who have produced research results deemed to be suitable for upgrade to a PhD degree may apply (under GR7(b)) to have their registration upgraded to a Doctor of Philosophy registration before the masters is awarded. The total minimum registration for the PhD shall be not less than six semesters after admission to the status of Honours or after completion of a four year degree. Registration may not subsequently revert to masters.

Degree of Doctor of Science and

Degree of Doctor of Science in Agriculture

AES-SD1 Eligibility
An applicant is eligible to apply for selection to register for the senior doctoral qualifications in this College under General Academic Rule DS2. The relevant doctoral degree is in a discipline offered by the College.
Introduction to the Syllabus Section

How to Understand a Syllabus

In order to understand the syllabus section that follows, consider the following example:

Electromagnetism, Waves and Modern Physics
PHYS120 P2 W2  (39L-9T-36P-0S-54H-15R-0F-0G-7A-13W-16C)

Prerequisite requirements: 40% in PHYS110 or 60% in PHYS131.

Corequisite: MATH140.

Aim: Introduction to electromagnetism, waves, physical optics and modern physics.


Assessment: Class tests (25%), practical reports (5%), 3 h theory exam (50%), 2 h practical exam (20%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals

Credit may not be obtained for both PHYS120 and PHYS196.

The title is Electromagnetism, Waves and Modern Physics

The code PHYS120 P2 W2 shows that the syllabus is in Physics (“PHYS”) and that it is at Level 1. The 2 & 0 have no special significance. P2 and W2 show that it is offered in semester 2 at Pietermaritzburg and Westville. Similarly H1 would show it is offered in semester 1 in Howard College and W1 at Westville. Other codes are B if the module is offered in both semesters, C if it may be offered in either the first or second semester, Y if it is a year-long module, and V if it is offered in the winter vacation. Thus, for example, GEOL304 WV is a Westville module in Geology in 3rd year during the winter vacation.

The notional study hours
(39L-9T-36P-0S-54H-15R-0F-0G-7A-13W-16C)

are interpreted as follows:

39L means 39 hours of lectures, i.e. 52 lectures of 45 minutes
9T means 9 hours of tutorials
0S means 0 hours of seminars
15R means 15 hours of revision
0G means 0 hours for problem based groups
13W means the module runs for 13 weeks
16C means the module is worth 16 credits.

The meanings of “prerequisite”, “corequisite” and “DP requirements” are explained in the definitions at the beginning of the handbook. It is assumed that no explanation is needed for “aims”, “content” etc.
SYLLABI

Actuarial Science
Offered in the School of Mathematics, Statistics and Computer Science

Introduction to Derivative Pricing
ACSC701 WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To understand the terminology and mechanics of various derivatives and the markets in which they are traded.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or Semester 2.

Interest Rate Markets
ACSC702 WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To introduce students to the fundamental derivatives traded in the interest rate markets.
Content: Zero coupon bonds, forward rates, forward rate agreements, interest rate swaps and swaptions. Black’s model, cross currency derivatives, introduction to exotic interest rate derivatives.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or Semester 2.

Stochastic Calculus
ACSC703 W1
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Completion of a programme in Actuarial Science with a credit-weighted average of at least 60% in the Level-3 Actuarial Science modules. Applicants with other qualifications may be considered.
Aim: To introduce students to the stochastic concepts necessary for pricing derivative claims.
Content: Filtration processes, martingale theory, stochastic integration techniques and Itô’s formula.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.

Extensions to the Black-Scholes World
ACSC704 WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To introduce students to pricing derivatives in complex situations.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or Semester 2.

Term Structure Modelling
ACSC705 WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To expose students to more advanced techniques in modelling exotic interest rate derivatives.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or Semester 2.
Martingale Methods in Finance
ACSC707 WC (39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Completion of a programme in Actuarial Science with a credit-weighted average of at least 60% in the Level-3 Actuarial Science modules. Applicants with other qualifications may be considered.
Aim: To study and then exploit the relationship between arbitrage-free pricing and the existence of equivalent martingale measures.
Content: Feynman-Kac formula, risk neutral measures, first and second fundamental theorem of asset pricing, change of measures, Girsanov theorem, pricing in incomplete markets.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or Semester 2.

Credit Risk Modelling Techniques
ACSC708 W2 (39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Prerequisite Modules: ACSC703.
Corequisite: ACSC705.
Aim: Numerous disasters in the banking industry have created a need for people to be properly trained in credit risk management at an honours level. The purpose of this course is to achieve such an objective.
Content: Market risk, credit risk, structural models, reduced form models, credit migration models, credit portfolio models, Creditmetrics, KMV, Creditportfolio, CVar.
Assessment: Class mark (20%); 3 h exam (80%).
DP Requirement: 80% attendance.

Advanced Modelling in Finance
ACSC709 WY (5L-5T-0P-4S-306H-0R-0F-0G-0A-26W-32C)
Aim: To introduce advanced modelling in finance, with the aid of computers.
Content: Project work on various current financial models.
Assessment: Two presentations: project proposal and research findings (10%), written project proposal (5%), research report (85%, externally examined).
DP Requirement: Not applicable.
This module has no supplementary exam.

Agribusiness

Offered in the School of Agricultural, Earth and Environmental Sciences

Agribusiness Research Project & Seminars
AGBU790 PY (0L-0T-0P-20S-380H-0R-0F-0G-0A-26W-40C)
Corequisite: AGEC740 and (ANSI718 or (BIOL722 and BIOL723)).
Aim: To equip students with the ability to: (a) critically review literature, write scientific papers, and formally present and defend their work, and (b) integrate theory and techniques covered in earlier modules.
Content: This module integrates topics covered in earlier modules. For the project, students must identify a relevant research problem, develop models to test hypotheses, collect and analyse data, interpret results, recommend how to solve the problem, and prepare a comprehensive research report.
Assessment: Presentation of 2 papers (50%), research report (50%).
DP Requirement: Not applicable.
Year-long Module. This module has no supplementary exam.

Agribusiness Research Project & Seminar
AGBU791 PY (0L-0T-0P-20S-300H-0R-0F-0G-0A-26W-32C)
Corequisite: AGEC740 and AGPS791.

Aim: To equip students with the ability to: (a) Critically review literature, write scientific papers, and formally present and defend their work, and (b) integrate theory and techniques covered in earlier modules. For the project, students must identify a relevant research problem, develop models to test hypotheses, collect and analyse data, interpret results, recommend how to solve the problem, and prepare a comprehensive research report.

Content: This module integrates topics covered in earlier modules.

Assessment: Presentation of 1 paper (33%), research report (67%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

Agricultural Economics

Offered in the School of Agricultural, Earth and Environmental Sciences

Introduction to Agricultural Economics

AGEC210 P1

Aim: (a) To understand the key economic principles of production, market demand and supply and how these principles can assist farm decision-makers in making improved decisions, and (b) to learn key accounting principles to develop a sound farm record-keeping system.


Practicals: Elementary farm accounting.

Assessment: 2 class tests (33%); 3 h exam (67%).

DP Requirement: 40% average for the 2 class tests, and attendance at 80% of all practicals.

Farm Management

AGEC220 P1

Corequisite: AGEC210 or (ECON101, 102).

Aim: To understand the economic and management principles which guide the practice of managing farms.

Content: Farm management - definition, planning environment, managerial functions and management by objectives. Key economic principles and planning concepts. Farm information systems, data analysis and budgeting. Organisation of capital. Farm machinery management. Land economics. Labour management.

Practicals: Application of economic principles to farming, analysis of farm records, budgeting, capital use and machinery and labour management decisions.

Assessment: 2 class tests (33%); 3 h exam (67%).

DP Requirement: 40% average for the 2 class tests, and attendance at 80% of all practicals.

Applied Farm Financial Management

AGEC240 P2

Prerequisite Modules: AGEC220 (Bioresources Engineering students are exempt).

Aim: To learn and apply the principles and tools of finance to managerial problems in agriculture.


Practicals: Risk analysis, information flows, farm firm growth model, capital budgeting and discounted cash flow problems.

Assessment: Class test (33%); 1.5 h exam (67%).

DP Requirement: 40% for the class test, and attendance at 80% of all practicals.

Credit may not be obtained for both AGEC240 and AGEC270.
Agribusiness Finance & Marketing
AGEC270 P2  
(39L-0T-39P-0S-57H-20R-0F-0G-5A-13W-16C)

Corequisite: AGEC220 or (MGNT21M, 21P).
Aim: (a) To apply finance principles to solve managerial problems in agriculture, and (b) to study food marketing principles, and to craft and implement strategy in food and agricultural firms.
Practicals: Risk analysis, information flows, farm firm growth model, capital budgeting and discounted cash flow problems, and agribusiness case studies.
Assessment: 2 class tests (33%); 3 h exam (67%).
DP Requirement: 40% average for the 2 class tests, and attendance at 80% of all practicals.
Credit may not be obtained for both AGEC240 and AGEC270.

Production Economics & Price Analysis
AGEC370 P2  
(39L-0T-39P-0S-57H-20R-0F-0G-5A-13W-16C)

Corequisite: AGEC270, FINA202 or 16C in Level-2 ECON.
Aim: To apply principles of production economics in making enterprise choices, to quantify demand & supply relations in agriculture, and assess the economic effects of policies that distort markets.
Practicals: Application of production and cost functions to agriculture. Farm planning with linear programming. Regression analysis of demand functions.
Assessment: 2 class tests (33%); 3 h exam (67%).
DP Requirement: 40% average for the 2 class tests.

Agricultural Development
AGEC380 P1  
(39L-0T-8P-0S-88H-20R-0F-0G-5A-13W-16C)

Corequisite: AGEC220 or 32C in Level-2 ECON.
Aim: (a) To identify constraints which limit agricultural and economic growth in less-developed regions, and (b) to analyse policies that will alleviate these binding constraints.
Content: Characteristics of developing regions. Role of agriculture in economic development. Theories of economic and agricultural growth. Adoption of technology. Impact of property rights (land tenure), credit, risk and information on technology adoption. Demand for children.
Practicals: 1 field trip.
Assessment: 2 class tests (33%); 3 h exam (67%).
DP Requirement: 40% average for the 2 class tests.

Applied Linear Programming
AGEC730 P1  
(20L-0T-39P-0S-12H-5R-0F-0G-4A-13W-8C)

Prerequisite Modules: AGEC370 or (MATH130, 140).
Aim: (a) To identify and formulate farm and agribusiness problems as linear programming (LP) problems, and (b) to solve these LP problems by computer and interpret their solutions.
Practicals: Using the computer to solve farm planning, cash flow, plant selection, feed blending and policy-oriented models.
Assessment: 1 class test (23%), 1 project (10%); 2 h exam (67%).
DP Requirement: 40% average for the class test and the project.
Agricultural Policy Analysis
AGEC740 P2 (39L-13T-0P-0S-83H-20R-0F-0G-5A-13W-16C)
**Prerequisite Modules:** AGEC370.
**Aim:** To provide insight into the application of economic theory to a wide range of policy issues in South African agriculture. This module contributes towards an understanding of the macro-economic situation facing South African agriculture.
**Assessment:** 2 class tests (33%); 3 h exam (67%).
**DP Requirement:** 40% average for the 2 class tests.

Agricultural Economics Project & Seminars
AGEC790 PY (0L-0T-0P-20S-300H-0R-0F-0G-0A-26W-32C)
**Aim:** To equip students with the ability and confidence to: (a) critically review literature, write scientific papers, and formally present and defend their work; and (b) integrate theory and techniques covered in earlier modules.
**Content:** This module integrates topics covered in earlier modules. For the project, students must identify a relevant research problem, develop models to test hypotheses, collect and analyse data, interpret results, recommend how to solve the problem, and prepare a comprehensive research report.
**Assessment:** Presentation of 2 papers (50%), research report (50%).
**DP Requirement:** Not applicable.
**Year-long Module. This module has no supplementary exam. Only for students majoring in Agricultural Economics or BAgricMgmtHons (Commerce Stream).**

Management Research Project & Seminar
AGEC791 PY (0L-0T-0P-20S-300H-0R-0F-0G-0A-26W-32C)
**Aim:** To equip students with the ability and confidence to: (a) critically review literature, write scientific papers, and formally present and defend their work; and (b) integrate theory and techniques covered in earlier modules.
**Content:** This module integrates topics covered in earlier modules. For the project, students must identify a relevant research problem, develop models to test hypotheses, collect and analyse data, interpret results, recommend how to solve the problem, and prepare a comprehensive research report.
**Assessment:** Presentation of 1 paper (33%), research report (67%).
**DP Requirement:** Not applicable.
**Year-long Module. This module has no supplementary exam. Only for students majoring in BAgricMgmtHons (Production Stream).**

Advanced Agricultural Price Analysis
AGEC802 P1 (20L-0T-0P-0S-30H-27R-0F-0G-3A-13W-8C)
**Aim:** To provide insight into the application and analysis of price theory in product and resource markets with specific reference to South African Agriculture. This module focuses on macro-economic issues.
**Content:** Economics of free markets (Hayek, Buchanan, and Coase). Economics of water markets. Supply and risk. Demand for resources. Agriculture and the State.
**Assessment:** 3 h exam (100%).
**DP Requirement:** 80% attendance at lectures.
**Only for students registered for MScAgric in Agricultural Economics or Agribusiness, or MAgricMgmt or MSc in Agricultural Economics.**

Applied Econometrics
AGEC803 P1 (0L-39T-39P-0S-43H-36R-0F-0G-3A-13W-16C)
**Aim:** To enable students to apply econometric models and techniques to a wide range of empirical problems in the fields of economic policy, price analysis, marketing, and agribusiness management.
**Content:** Methodology of Econometrics. Multicollinearity, autocorrelation and specification bias in linear regression models. Dummy variables. Lag and autoregressive models. Panel data regression models. Simultaneous-equation
models. Cointegration. Principal components. Linear discriminant, logit and probit models. Autoregressive Conditional Heteroskedasticity (ARCH) and Generalized ARCH (GARCH) models.

Practicals: Computer applications in practical exercises using selected econometric data.
Assessment: 1 project (30%); 3 h exam (70%).
DP Requirement: 50% for the 1 project.
Only for students registered for MScAgric in Agricultural Economics or Agribusiness, MSc in Agricultural Economics, MAgricMgmt or MCom in Economics.

Strategic Farm & Agribusiness Management
AGEC804 P1 (0L-20T-0P-30H-27R-0F-3A-13W-8C)
Aim: To provide students with a thorough insight into the key issues facing farm and agribusiness managers. This module focuses on micro-economic, macro-economic and strategy issues.
Assessment: One agribusiness case study oral and written presentation (30%); 3 h exam (70%).
DP Requirement: 50% for the agribusiness case study presentation.
Only for students registered in MScAgric in Agricultural Economics or Agribusiness, or MAgricMgmt or MSc in Agricultural Economics.

Agricultural Engineering
Offered in the School of Engineering

Agricultural Mechanisation
AGEN216 P1 (20L-7T-7P-0S-30H-12R-0F-4A-13W-8C)
Aim: To provide students with knowledge of the principles of operation and management of agricultural machines and their application.
Content: Farm power: spark ignition and compression ignition, internal combustion engines; power transmission; tractors, traction and tractor operation. Agricultural machinery: implements and machines; principles of operation, adjustment and use. Farm power and machinery management: power, machinery performance; cost analysis; mechanisation planning and equipment selection.
Practicals: Engines, power & torque, power train, wheel slip, implements and planning.
Assessment: 2 tests (20%), pracs/research project (10%), 1 tutorial (5%), exam (65%)
DP Requirement: Students are required to write all class tests and complete all practicals and assignments satisfactorily, as specified in the module outline.
For students in BSc(Agric) only.

Soil & Water Conservation Systems
AGEN225 P2 (39L-10T-18P-0S-68H-20R-0F-5A-13W-16C)
Aim: To provide students with an understanding of the principles of soil and water conservation and their application.
Practicals: Survey and field trip for assessing erosion prevention devices and degraded land areas.
Assessment: 2 tests and design projects (30%); 3 h exam (70%).
DP Requirement: Students are required to write all class tests and complete all practicals and assignments satisfactorily, as specified in the module outline.
For students in BSc(Agric) only.
Engineering Design
ENAG1DE P2  (20L-39T-0P-0S-10H-8R-0F-0G-3A-13W-8C)
Aim: To develop the ability to configure an appropriate design process and to select appropriate materials and manufacturing processes to carry out the construction and testing of a simple device.
Content: Philosophy of design process: problem definition, implementation, evaluation, time and project management and safety. Software tools for problem solving and engineering analysis: MATLAB (introduction to MATLAB and basic programming).
Assessment: Class mark (30%), including assignments, projects and tests; 2 h exam (70%).
DP Requirement: Students are required to write all class tests and complete all practicals and assignments satisfactorily, as specified in the module outline.

Introduction to Engineering Materials
ENAG1MT P2  (20L-10T-0P-0S-22H-24R-0F-0G-4A-13W-8C)
Aim: The candidates will acquire a basic understanding of materials, their structure and its influence on the physical and mechanical properties; crystallographic structures, defects in these structures and how this influences the mechanical properties; the mechanical properties of materials; and phase diagrams and how microstructures are formed.
Assessment: Class mark: 30% (2 tests, assignments/tutorials); 2 h exam (70%).
DP Requirement: Students are required to write all class tests and complete all tutorials and assignments satisfactorily, as specified in the module outline.

Irrigation Engineering
ENAG3EI P1  (29L-13T-39P-0S-56H-12R-6F-0G-5A-13W-16C)
Prerequisite Modules: ENCV2FL.
Aim: To equip students with the knowledge and skills required when designing irrigation systems for South African conditions.
Content: Introduction to irrigation systems and design considerations. Soil, water, atmosphere and plant continuum and how they relate to design planning. Pipe hydraulics. Design of sprinkler, micro, flood and moving irrigation systems, Types of pumps and performance characteristics, irrigation scheduling, system evaluation and maintenance.
Practicals: Irrigation design projects; laboratory and field exercises on syllabus covered.
Assessment: Two one hour tests and four assignments (40%); 3 h exam (60%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Forest Engineering
ENAG3FE P2  (20L-10T-3P-0S-28H-12R-3F-0G-4A-13W-8C)
Prerequisite Requirement: ENAG3PT (40%) or ENAG4BM (40%).
Aim: To acquaint students with the processes of timber harvesting, including current harvesting equipment, methods, and systems; methods of estimating logging productivity and costs; system evaluation principles; forest product markets, wood procurement systems, logging safety, harvest planning, environmental impacts, Best Management Practices, wildlife/visual concerns, regulations/legislation affecting harvesting, and forest road layout.
Assessment: Two one hour tests and assignments (30%); 2 h exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.
Principles of Food Processing
ENAG3FP P1
(22L-4T-24P-0S-20H-6R-0F-0G-4A-13W-8C)
Prerequisite Requirement: ENME3TH (40%).
Aim: Students will gain knowledge of the basic principles governing the processing of different foods. Students will also be able to create process flow diagrams and use these diagrams to determine food processing related mass and energy balances and factory layout.
Content: Basics of meat, vegetable, cereal, dairy and oil seed processing and packaging. Basics of factory layout, legal aspects, marketing and labeling and hygienic best practices. Introduction to the management of basic food processing and related legislation.
Practicals: 2 Practicals, 4 field trips
Assessment: Tutorials (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each); 2 h exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Power and Traction for Agricultural Machines
ENAG3PT P1
(24L-3T-15P-0S-22H-10R-0F-0G-6A-13W-8C)
Prerequisite Requirement: ENME3TH (40%) & ENME2DM (40%).
Aim: To impart to the student skills and basic understanding of the engineering principles of agricultural power machines, how to optimize power transfer for optimum usage and to utilise these skills to solve agricultural machinery problems.
Content: Diesel engines and performance, power optimization and efficiency; power transfer transmission systems and methods like hydraulics, hitching systems, tyres and traction.
Practicals: 6 Practicals at Ukulinga research farm.
Assessment: Tutorials and practicals (5%), assignment (5%), 2 tests (10% each); 2 h exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Structural Analysis and Design
ENAG3SA P2
(20L-5T-7P-0S-32H-10R-3F-0G-3A-13W-8C)
Prerequisite Requirement: ENCV2SD (40%) & ENCV2SB (40%).
Aim: Students will learn design and analysis techniques related to agricultural structures, including load analysis and stress analysis, statically determinate and statically indeterminate structures, appropriate use of steel, concrete, and timber in agricultural structures.
Practicals: Structural Assessment of Existing Structures, Load Testing.
Assessment: 1 hour test (15%), mini-project (15%); 2 h exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Undergraduate Seminar
ENAG3US P1
(6L-0T-24P-21S-29H-0R-0F-0G-0A-13W-8C)
Prerequisite Modules: ENCH1TC.
Aim: To undertake a literature review; to prepare a seminar or report; to be able to present a seminar effectively
Content: Individual investigations or studies by means of a literature review of any facet of Bioresources Engineering selected by the candidate and approved by the Head of School who will nominate a supervisor for the study. Technical Communication: Literature research techniques; seminar writing and presentation.
Practicals: Proper use of library resources to obtain relevant literature.
Assessment: Seminar document (70%) and oral presentation (30%).
DP Requirement: Not applicable.
This module has no supplementary exam.
Advanced Power & Traction for Agric Machines
ENAG4AP P2  
(20L-7T-9P-0S-25H-10R-5F-0G-4A-13W-8C)
Prerequisite Modules: ENAG3PT.
Aim: To impart to the student skills and advanced understanding of the engineering principles of agricultural power machines, how to optimize power transfer for optimum usage and to utilise these skills to solve agricultural machinery problems.
Content: Diesel engines performance thermodynamics, power optimization and efficiency; power transfer systems, hitching systems and weight transfer; traction aids, tractor testing.
Practicals: Tractor engine performance and fuels, tractor traction performance and implement combination, hydraulic controls and hitching systems.
Assessment: Pre-class questions (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each) and one 2-hour examination (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Bioresources Engineering Design Project
ENAG4BD P1  
(4L-26T-0P-0S-210H-0R-0F-0G-0A-13W-24C)
Prerequisite Requirement: Student must be in a position to complete the degree at end of year.
Prerequisite Modules: ENAG3SA, ENAG3US.
Aim: To identify & solve real-world design problems in collaboration with industry. The students assume the role of consulting engineers working in a team & experiencing constraints typically found in the workplace.
Content: Open-ended, industry-related design projects which utilise principles of engineering design, engineering analysis & functional operation of engineering systems. Projects extend over two semesters & are selected, design teams formed, concepts visualised and alternatives evaluated. A theoretical design must be constructed & tested or evaluated. Emphasis on design strategies, project management, communication skills and technical writing.
Assessment: Theoretical Design (30%), Final Report (50%), Year Mark (10%), Presentation (10%).
DP Requirement: Not applicable.
This module has no supplementary examination.

Bio-Production Systems and Management
ENAG4BM P1  
(44L-4T-28P-0S-60H-16R-3F-0G-5A-13W-16C)
Prerequisite Requirement: ENCV2SB (40%).
Aim: Students will develop an understanding of the interaction between the environment and engineering aspects of bio-production systems. Students will understand the technical design principles underlying different processes with specific reference to agricultural and other implement design. Students will also develop skills of modelling, managing and optimising bio-systems.
Content: Principles of systems analysis, operation principles and basic equipment design for tillage, planting, chemical application, hay & forage harvesting and crop harvesting processes. Strategic planning principles, precision agriculture, systems analysis, cost analysis; mechanisation planning and optimal equipment selection.
Practicals: Field trips to farms and related conferences. Visits to major equipment suppliers.
Assessment: Tutorials (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each); 3 h exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Electrical Applications for Bio-Systems
ENAG4EA P2  
(20L-5T-0P-0S-36H-10R-6F-0G-3A-13W-8C)
Prerequisite Requirement: ENEL2EE (40%).
Aim: To provide students with skills to analyse problems related to electrical applications in agricultural production in order to optimise control of and use of energy and water, and be able to set up farm electrification.
Content: Appraisal of current proven systems in South Africa, definitions, resistive networks, reactive networks, electrical machines, 3-phase heating in farm structures, control systems, power factors, corrections, farm contribution systems, protection.
Practicals: Building electrical system layout, control systems.
Assessment: One test (15%), one-project (15%); 2 h exam (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Credit may not be obtained for ENAG4EA and ENEL2EE.

Environmental Control for Biol Commodities
ENAG4EC P2 (20L-5T-7P-0S-32H-10R-3F-0G-3A-13W-8C)

Prerequisite Requirement: ENME3TH (40%).

Aim: To enable students to understand the environmental requirements for livestock and plants and learn the important parameters in agricultural structures so that they will be able to apply engineering sciences to analyse and solve problems in environmental control.

Content: Heat transfer, mass transfer, psychrometry, energy and mass balance, environmental control in greenhouse, poultry and dairy structures.

Practicals: Visits to industrial indoor agricultural production systems (greenhouse, poultry, dairy, piggery etc.), thermal measurements of buildings, fan testing procedures

Assessment: One test (15%), mini-project (15%); 2 h exam (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

ECSA Outcomes Portfolio
ENAG4EP PY (0L-0T-0P-0S-0H-0R-0F-0G-0A-26W-0C)

Aim: For students to understand the requirements for, and demonstrate competence to meet, all outcomes required by Engineering Council of South Africa (ECSA) as specified in ECSA Document PE-61.

Content: The concept of outcomes and assessment criteria; ECSA Outcomes and ECSA Assessment Criteria; Bloom’s Taxonomy, and its link to ECSA’s outcomes, assessment criteria, and range statements; the importance of attaining competence in each of ECSA’s ten outcomes; concepts of, and techniques for reflection and self evaluation; how to structure, construct and present a professional portfolio.

Assessment: Submission of ECSA Outcomes Portfolio containing evidence of both development and competence to meet ECSA outcomes; Exit level interviews/questionnaires.

DP Requirement: Satisfactory evidence of competence to meet all ECSA outcomes.

Food Engineering Unit Operations
ENAG4FE P2 (26L-4T-21P-0S-20H-5R-0F-0G-4A-13W-8C)

Prerequisite Requirement: ENAG3FP (40%).

Aim: To equip students with an understanding of the different unit operations and related equipment used in food engineering.

Content: Fundamentals of food engineering, mass and energy balance, size reduction operations, processing using ambient temperature operations, processing with heat using steam and water, processing with heat using hot air, processing with heat using hot oils, processing with heat using irradiation, processing through the removal of heat.

Practicals: 2 practicals, 4 field visits.

Assessment: Tutorials (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each); 2 h exam (70%).

DP Requirement: 80% attendance of lectures, 80% attendance of practicals, complete both tests, all tuts, all assignments and obtain at least 40% class mark.

Sustainable Energy for Bio-systems
ENAG4SE P2 (20L-7T-6P-0S-30H-13R-0F-0G-4A-13W-8C)

Prerequisite Requirement: All first and second year engineering modules must be completed, plus the following modules completed or taken as corequisites: ENAG3PT, ENAG3EI, ENAG4BM, ENAG3FP.

Prerequisite Modules: ENME3TH.

Aim: To develop an understanding of sustainable energy systems in the Bioresources industries.


Practicals: Three practicals are spread throughout the semester.
Assessment: Two 45 minute tests (30%); 2 h exam (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Credit may not be obtained for ENAG4SE and ENEL2EE.

Selected Topics in Bioresources Engineering
ENAG4ST P2 (20L-5T-7P-0S-36H-10R-0F-2A-13W-8C)

Aim: To provide the student with a flexible ability to tackle a subject of Bioresources Engineering and apply new technologies and analytical techniques to solve problems.

Content: The topics will be selected from new and current disciplines in the field of Bioresources Engineering and will focus on the latest technologies and analytical techniques.

Assessment: Practicals and assignments (5%), tests (25%), final report (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

This module has no supplementary exam.

Soil and Water Conservation Engineering
ENAG4SW P2 (20L-13T-3P-0S-28H-12R-0F-4A-13W-8C)

Prerequisite Requirement: HYDR310 (40%); HYDR324 (40%) (or taken as corequisite).

Aim: To provide students with an understanding of the principles of soil and water conservation and to design and analyse soil and water conservation structures.


Practicals: Field visits.

Assessment: Assignments and two one hour tests (40%); 2 h exam (60%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Vacation Work
ENAG4VW PC (0L-0T-0H-0R-0F-0G-0A-12W-0C)

Aim: To provide students with experience in a realistic working environment thus enabling them to consider their studies in context and to gain a sense of perspective into their university studies.

Content: This is a Duly Performed requirement for the BSc Eng (Agricultural) degree. Vacation work is to be arranged and undertaken by students during the course of the degree in fields relevant to Agricultural Engineering. A total of 12 weeks must be accumulated. A report on the work conducted is to be submitted to the department within one month of the conclusion of each vacation work period, together with a certificate of progress from the firm concerned, in which the actual period is also stated.

Assessment: Reports acceptable in terms of scientific method, synthesis, computer use and presentation.

DP Requirement: Satisfactory completion of vacation work reports.

Workshop Course
ENAG4WS PC (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Prerequisite Modules: ENAG3SA

Corequisite: Eligibility to register for ENAG4BD & ENAG3US.

Aim: Candidates to acquire an appreciation and basic skills in common fabrication techniques, and familiarise themselves with the structure and function of commonly used workshop equipment.

Content: This is a Duly Performed requirement. Practical workshop instruction and experience includes workshop safety, workshop techniques including welding and machining, and the manufacture of machine components, both individually and in groups. Introduction to electrical & electronic equipment and CAD.

Assessment: Students attend week - long course and submit a report.

DP Requirement: Satisfactory completion of training and workshop report.
Advanced Topics in Bioresources Engineering
ENAG8AT PC (40L-0T-5P-0S-100H-12R-0F-0G-3A-13W-16C)

Aim: To apply advanced techniques in dealing with bioreseng problems.
Content: Topics will depend on the expertise and interests of available staff, and will vary from year to year. Probable topics will include Bio-Environmental Systems Modelling, Soil and Water Engineering Modelling and Analysis, Engineering Hydrology, Bio-Processing.
Assessment: Written Report (20%), presentation (10%); 3 h exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Dissertation
ENAG8DI PY (0L-0T-0P-0S-720H-0R-0F-0G-0A-26W-72C)

Aim: Students will identify, plan, execute, analyze, and present a cohesive, thorough research project at the Masters level.
Content: The student will identify a suitable research topic, plan and carry out appropriate investigations to address the crucial research questions associated with the topic, analyze results of these investigations, and present the research project in the form of a professional-quality dissertation.
Assessment: Dissertation (100%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Research Methodology
ENAG8RM PC (5L-0T-2.5P-0S-64H-8R-0F-0G-0.5A-13W-8C)

Aim: Students will develop an understanding of scientific method, research, and professionalism in research. Students will learn and develop the skills necessary to prepare professional quality research proposals, both in written and oral form.
Assessment: Written Report (70%), Presentations (30%).
DP Requirement: 80% attendance of class sessions.
This module has no supplementary exam.

Agricultural Extension
Offered in the School of Agricultural, Earth and Environmental Sciences

Rural Wealth Creation
EXTN161 P1 (39L-0T-35P-0S-60H-10R-0F-12G-4A-13W-16C)

Aim: To provide a) an introduction to rural community development, an understanding of wealth and poverty; and b) skill in structuring projects to facilitate movement of communities along a pathway to prosperity.
Content: The nature of wealth and poverty. Sustainable Livelihoods assets framework for identifying opportunities and projects for development. Project planning.
Practicals: 3 hour field trip to learn about agricultural or rural systems. Weekly 2 hour practical.
Assessment: Project proposal with plan & logical framework (20%), Research paper (20%), Test (10%); 3 h exam (50%).
DP Requirement: 40% Class mark, 80% attendance at lectures and practicals.
Only for students registered at Cedara College of Agriculture.

Rural Economic Systems
EXTN162 P2 (39L-0T-35P-0S-60H-10R-0F-12G-4A-13W-16C)

Aim: To provide a basic understanding of macro and micro economic systems in the rural socio-agricultural context in
relation to facilitating prosperity in rural communities.

**Content:** Basic concepts in farm economics and integrated rural development; sustainability planning/assessment using a sustainability model; analysis of farm/enterprise systems in the context of the rural community.

**Practicals:** 3 hour field trip to learn about agricultural or rural economic systems. Weekly 2 hour practical.

**Assessment:** Test (10%), Learning report (20%), Policy review (20%); 3 h Exam (50%).

**DP Requirement:** 40% Class mark, 80% attendance at lectures and practicals.

*Only for students registered at Cedara College of Agriculture.*

**Extension Methods**
EXTN261 P1

*(45L-0T-0P-0S-75H-16R-0F-20G-4A-13W-16C)*

**Aim:** To introduce different extension models and techniques and to prepare students to apply participatory extension methods in a rural agriculture context.

**Content:** Perspective, values and attitudes in rural development. Theory of adult learning and experiential learning; introduction to farming systems. Participatory approaches to extension: PLA, PTD, Farmer to Farmer. Policies impacting on extension and rural development. Application of farming systems analysis in the field.

**Practicals:** One day fieldtrip to a rural community; group presentations and journal writings.

**Assessment:** Journals (10%), Individual presentation (10%), 1 Test (10%), Field Report (20%); 3 h exam (50%).

**DP Requirement:** 40% class mark; 80% attendance at lectures and practicals.

*Only for students registered at Cedara College of Agriculture.*

**Extension Practice**
EXTN262 P2

*(45L-0T-20P-0S-75H-16R-0F-0G-4A-13W-16C)*

**Prerequisite Modules:** EXTN261.

**Aim:** The module offers the opportunity for students to apply the competencies learned in EXTN261 in real extension tasks in resource poor rural communities.

**Content:** Group dynamics and team contracts, facilitation and presentation skills, active communication strategies; application of participatory techniques.

**Practicals:** Three-day fieldtrip to a rural community; group presentations, report and project plan writing.

**Assessment:** Group report (10%), group presentation (10%); individual report (10%); project plan (20%); 3 h Exam (50%).

**DP Requirement:** 40% class mark; 80% attendance in lectures; attendance at field trip.

*Only for students registered at Cedara College of Agriculture.*

**Designing Extension Projects**
EXTN371 P1

*(45L-0T-0P-0S-94H-0R-0F-20G-1A-13W-16C)*

**Prerequisite Modules:** EXTN261.

**Aim:** To enable students to (a) apply in a virtual setting the Sustainable Livelihoods analysis, Soft-systems methodology and vulnerability and stakeholder analysis frameworks for determining extension project opportunities that benefit rural communities, (b) develop criteria for, conduct and write a critical policy analysis and (c) design and write a proposal for an extension project based on a theoretical Sustainable Livelihoods analysis.

**Content:** Learning models; group dynamics; Sustainable Livelihoods Approach; participatory project planning; developing and applying a theoretical framework for research/policy critique.

**Assessment:** Policy Review (40%), Project proposal (40%), Learning journal (20%), Oral defence of portfolio.

**DP Requirement:** Submission of all assessments as a portfolio; 80% attendance at lectures. There is no separate class mark. All students are required to make an oral defence of their portfolios. After all of the assessments have been marked, they will receive a single final mark for the module.

This module has no supplementary exam. Only for students registered at Cedara College of Agriculture.

**Designing Extension Projects**
EXTN371 P1

*(45L-0T-0P-0S-94H-0R-0F-20G-1A-13W-16C)*

**Prerequisite Modules:** EXTN261.

**Aim:** To enable students to (a) apply in a virtual setting the Sustainable Livelihoods analysis, Soft-systems methodology and vulnerability and stakeholder analysis frameworks for determining extension project opportunities
that benefit rural communities, (b) develop criteria for, conduct and write a critical policy analysis and (c) design and write a proposal for an extension project based on a theoretical Sustainable Livelihoods analysis.

**Content:** Learning models; group dynamics; Sustainable Livelihoods Approach; participatory project planning; developing and applying a theoretical framework for research/policy critique.

**Assessment:** Policy Review (40%), Project proposal (40%), Learning journal (20%), Oral defence of portfolio.

**DP Requirement:** Submission of all assessments as a portfolio; 80% attendance at lectures.

There is no separate class mark. All students are required to make an oral defence of their portfolios. After all of the assessments have been marked, they will receive a single final mark for the module.

This module has no supplementary exam. Only for students registered at Cedara College of Agriculture.

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**Participatory Extension**

EXTN372 P1

**Aim:** To develop an understanding of the application of various participatory approaches, techniques and models in a rural socio-agriculture context.

**Content:** Participatory development methods. The community development cycle and process in rural communities. Expectations of community development practitioners in a rural socio-agriculture context. The application of specific participatory techniques, community intervention and project proposal writing.

**Practicals:** Two half-day field trips to apply participatory approaches in a rural community to evaluate, identify and plan community project and writing project proposals for funding.

**Assessment:** Research Paper (15%), Field trip report (10%), Project proposal (15%), Test (10%); 3 h Exam (50%).

**DP Requirement:** 40% class mark, attendance of two field trips, attendance of 80% of practicals. Only for students registered at Cedara College of Agriculture.

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**Extension Placement**

EXTN373 P2

**Prerequisite Modules:** EXTN371.

**Aim:** To enable students to (a) apply in a real-world setting the Sustainable Livelihoods analysis, Soft-systems methodology and vulnerability and stakeholder analysis frameworks for determining extension project opportunities that benefit rural communities; and (b) to track and critically reflect on the application of theory in practice in a real-world setting.

**Content:** Learning models, Group dynamics, Sustainable Livelihoods approach, participatory project planning; and application of extension theory.

**Assessment:** Portfolio (placement report, reflection on learning, project proposal) plus 1 h oral defence of portfolio (100%).

**DP Requirement:** Submission of portfolio in time, 80% attendance in internship. This module has no supplementary exam. Only for students registered at Cedara College of Agriculture.

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**Agricultural Plant Sciences**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Introduction to Plant Production**

AGPS200 P2

**Prerequisite Modules:** BIOL101.

**Aim:** To provide knowledge of the principles of agricultural plant production locally and globally.


**Practicals:** Once a week on topical subject. Practicals may include field trips.

**Assessment:** 2 tests (25%), laboratory reports (12.5%), project (12.5%); 2 h exam (50%).

**DP Requirement:** 40% Class mark, attendance at 80% of practicals & 100% of tests.
Sustainable Community Agriculture
AGPS210 P1

**Aim:** To introduce students to plant production, including effects of environment, cropping practices, and their effects on the environment. Sustainable agriculture is discussed in such a way that students will be able to do elementary problem-solving regarding plant production.

**Content:** Principles of agroecology, traditional farming, organic farming.

**Practicals:** Field trips.

**Assessment:** 2 tests (30%), 1 assignment (20%); 2 h exam (50%).

**DP Requirement:** 40% Class mark, attendance at 80% of practicals & 100% of tests.

Irrigation Design & Management
AGPS301 P1

**Aim:** To teach students the principles of irrigation design and management.

**Content:** Criteria for selection of land and water for irrigation; availability of soil water; measurement of soil water; water uptake; crop water requirements and response to water stress; design of irrigation systems; pumps and flow of water in pipes and channels; irrigation scheduling; negative impacts of irrigation on soil and water resources.

**Practicals:** Field excursions; designing an irrigation scheme with associated management recommendations; tutorial exercises on irrigation.

**Assessment:** 2 theory tests (7%), irrigation design report (35%), tutorials (8%); 3 h exam (50%).

**DP Requirement:** 40% Class mark, attendance at 80% of practicals & 100% of tests.

Credit may not be obtained for both AGPS301 and HYDR313.

Field Crop Management
AGPS305 P1

**Prerequisite Modules:** AGPS200.

**Aim:** To provide students with knowledge of management practices involved in the production of field crops.

**Content:** Soil fertilization and liming, tillage and residue management, mulching, crop improvement techniques, weed and pest control, ley-cropping, forage preservation and grain storage.

**Practicals:** Research project with field trips.

**Assessment:** 2 tests (25%), research project (15%), prac evaluations (10%); 3 h exam (50%).

**DP Requirement:** 40% Class mark, attendance at 80% of practicals & 100% of tests.

Principles of Plant Breeding
AGPS306 P2

**Prerequisite Modules:** GENE240.

**Aim:** To provide students with an understanding of principles and practical skills in classical plant breeding.

**Content:** Sexual and asexual modes of reproduction; quantitative or polygene inheritance; fertility-regulation; breeding self-pollinated, cross-pollinated, hybrids and clonally propagated plants; utilization of polyploidy and induced mutations.

**Practicals:** Conducting hand-pollinations of selected plant species, data collection and statistical analysis, and selections from segregating populations.

**Assessment:** 2 tests (24%), 1 mini-seminar presented in both written & verbal form (12%), 1 prac report (14%); 3 h exam (50%).

**DP Requirement:** 40% Class mark, attendance at 80% of practicals & 100% of tests.

Orchard Management
AGPS307 P1

**Aim:** To provide students with skills and experience in managing intensively produced orchard crops.

**Content:** Climate and climate modification, modification of the plant environment, managing orchard soils and the orchard floor, plant factors in the orchard, plant manipulation, crop protection, harvesting and postharvest handling.

**Practicals:** Field trips to commercial orchards, as well as at the University research farm.

**Assessment:** 2 theory tests (25%), prac assessment (25%); 3 h exam (50%).

**DP Requirement:** 40% Class mark, attendance at 80% of practicals & 100% of tests.
Crop Protection
AGPS308 P2

Prerequisite Modules: BIOL101, 102.

Aim: To introduce students to the principles of integrated control of crop pests, diseases and weeds.

Content: Principles of integrated pest control, ecological interaction, management and use of threshold level of pests, diseases and weeds; pesticide formulation; sprayer calibration and nozzle function. Safe handling and storage of pesticides.

Practicals: Pest and disease recognition, weed identification, scouting; disease and weed assessment; field evaluation of herbicides and phytotoxicity; calibration of applicators. Disease control project. Field visits.

Assessment: 2 tests (25%), practicals and projects (25%); 3 h exam 50%.

DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Protected Cultivation of Plants
AGPS309 P1

Prerequisite Modules: BIOL101.

Aim: To provide students with an understanding of the influence of environmental conditions on development and growth of crops and the optimisation of these conditions in protected environments.

Content: The influence of environment on plant growth and development, greenhouse structures and covering materials, shadehouses, growth rooms, nurseries, artificial lighting and daylength control, climate control, irrigation and growing systems, with special emphasis on hydroponic production, growing media, plant production with emphasis on propagation.

Practicals: Visits to commercial enterprises, plant propagation practicals, plant production practicals.

Assessment: 2 theory tests (25%), assignments (25%), 3h exam (50%).

DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Agricultural Plant Physiology
AGPS320 P2

Prerequisite Modules: CHEM110, 120.
Corequisite: BIOC201 or 212.

Aim: To develop skills required for analysis of mechanisms controlling and coordinating plant growth and development.

Content: Physiological processes related to plant mineral nutrition, photosynthesis in agriculture, source-sink relationships, fruit growth and development pre- and post-harvest.

Practicals: To demonstrate the above mentioned processes.

Assessment: 2 tests (10%), 1 essay (20%), prac assignments (20%); 3 h exam (50%).

DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Principles of Agricultural Research
AGPS701 P1

Aim: To acquire the skills to plan, implement, and communicate results of agricultural research.

Content: Presentation of technical information and communication skills; development, organization and financing of agricultural research; research philosophy and policy. Research methods with emphasis on the scientific method and economic plant improvement. Field plot, glasshouse and controlled environment research techniques.

Practicals: Critical reviews of published scientific papers; conduct of field and pot experiments; visits to research establishments.

Assessment: Theory test (20%), oral & written criticisms (30%); 2 h exam (50%).

DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Forage Production & Utilisation
AGPS710 P1

Prerequisite Requirement: An academic background deemed suitable by the School.

Aim: To equip students with an understanding of the principles of selection, growth, management and utilization of
cultivated forages.

Content: Accumulation and utilization of energy reserves, nitrogen fixation, soil amelioration and fertilization, and uses of forage crops for animal production systems.

Practicals: Demonstrations, visits, exercises and assignments designed to enhance the understanding of the lectures.

Assessment: 2 tests (30%), prac exercises (15%); 3 h exam (55%).

DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Advanced Seed Technology
AGPS712 P2

Prerequisite Requirement: AGPS200 or permission of the School.

Aim: To provide skills and experience in seed science and technology.

Content: Physiology, biochemistry and molecular biology of orthodox and recalcitrant seeds in relation to seed production, development, germination, conditioning, storage and marketing.

Practicals: A project pertinent to the objectives of the course will be undertaken by students as individuals or groups. One trip to a seed related institution. One field trip to a farming community.

Assessment: 2 theory tests (15%), 1 project (35%); 3 h exam (50%).

DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Staple Crop Production
AGPS714 P2

Aim: To provide an understanding of the crop-environment interaction and its management to sustain staple crop production.

Content: A study of the management and production of staple crops drawn from summer and winter cereals, legumes and roots & tubers. Impact of environmental variables particularly stress on crop production. Management to sustain productivity. Harvesting, grading and storage of crop products.

Practicals: Mini-project/poster presentation. Visits to research stations and crop producers.

Assessment: 2 tests (30%), project (20%); 3 h exam (50%).

DP Requirement: 40% Class mark, 80% attendance at practicals and 100% at tests.

Industrial Crop Production
AGPS715 P1

Aim: Students will, through acquisition of an understanding of the basis of crop growth and development, be able to improve productivity of industrial crops.

Content: A detailed study of agronomy, physiology, nutrition, growth and development in relation to environmental factors of selected industrial food and non-food crops from oils, starch & sugars, fibres & dyes and tobacco. Crop improvement, harvesting storage and grading of crop products.

Practicals: Mini-project/poster presentation. Visits to research stations and crop producers.

Assessment: Project (10%), 2 theory tests (30%), field report (10%); 3 h exam (50%).

DP Requirement: 40% Class mark, 80% attendance at practicals and 100% at tests.

Pomology
AGPS716 P1

Prerequisite Modules: AGPS307.

Aim: To increase understanding of the production of fruit crops, including temperate, tropical and subtropical and citrus fruits.

Content: The origin, distribution, classification of major fruit types. Fruit and tree morphology. Techniques for manipulation of production.

Practicals: Field trips to production units of the major fruit crops.

Assessment: 2 tests (20%), self-study assignments (30%); 3 h exam (50%).

DP Requirement: 40% Class mark, 80% attendance at practicals and 100% attendance at tests.
Advanced Plant Breeding
AGPS730 P2 (36L-0T-33P-0S-56H-30R-0F-0G-5A-13W-16C)
Prerequisite Modules: GENE310, 715; BMET210, 222.
Corequisite: BMET710.
Aim: To expose students to advanced concepts in applied plant breeding.
Content: Critical analysis and vigorous debate of topics e.g. interpreting genotype x environment interactions; genetics of host x parasite interactions; gene action; marker assisted selection; ideotype breeding; alternative approaches such as somatic cell hybridization and cell selection.
Practicals: Analysis and discussion of applied problems. A mini-literature review on a selected topic to be presented in both written and verbal form.
Assessment: 2 theory tests (25%), assignment report (15%); 3 h exam (60%).
DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Postharvest Technology
AGPS732 P2 (36L-0T-43P-10S-50H-16R-0F-0G-5A-13W-16C)
Aim: For students to be proficient in postharvest management of horticultural crops.
Content: Pre- and post-harvest physiology of major groups of horticultural products as influenced by environmental conditions and storage atmosphere. Packhouse technologies for decreasing incidence of physiological and pathological disorders. Technology for quality prediction. Effects and requirements of phytosanitary regulations. Quality and food safety management systems, and logistics for distribution of products from farm to consumer.
Practicals: Field trips to packing and distribution units.
Assessment: 2 tests (30%), self-study assignments (20%); 3 h exam (50%).
DP Requirement: 40% Class mark, 80% attendance at practicals and 100% at tests.

Vegetable and Flower Crop Production
AGPS733 P1 (30L-0T-40P-0S-70H-15R-0F-0G-5A-13W-16C)
Prerequisite Modules: AGPS200.
Aim: To familiarize students to the production and utilization of vegetable and floriculture crops.
Content: Key concepts of production of flower and vegetable crops, their classification, management and utilization.
Practicals: Practical projects, visits to commercial enterprises.
Assessment: 2 theory tests (20%), assignments (30%), 3h exam (50%).
DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Ornamental and Amenity Horticulture
AGPS734 P2 (30L-0T-40P-0S-70H-15R-0F-0G-5A-13W-16C)
Prerequisite Modules: AGPS200.
Aim: To extend student's knowledge into production and utilization of plants in the recreational and leisure industry.
Content: Key concepts of landscape design, plant selection, indigenous alternatives, alien invaders, amenity plants, turf grass species and management, sustainable design and management.
Practicals: Visits to commercial enterprises, practical projects.
Assessment: 2 theory tests (25%), assignments (25%), 3h exam (50%).
DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Applied Plant Sciences Project & Seminar
AGPS790 PY (10L-0T-30P-280H-0R-0F-0G-0A-26W-32C)
Aim: To develop written and verbal communication skills; critical and creative thinking; information retrieval, evaluation, comprehension and review skills.
Content: Undertake and present a literature review on an approved topic and undertake an appropriate research project.
Practicals: Survey of relevant literature. A research project including design and management, record and analyze data, a written report, Verbal presentations will include use of modern presentation media.
Assessment: Written & verbal presentations are assessed by internal & external examiners. Students may be
required to go on a field trip. Seminar (40%), project (60%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

**Observation & Analysis of Agro-Industry**

AGPS791 P2

Corequisite: AGPS701 or 790.

Aim: To introduce students to a variety of agro-industries, and integrate theoretical knowledge within the operations within a diverse commercial sector.

Content: Visit agro-industries, including farms, companies, processing plants and research institutions during vacation periods to observe and evaluate production as well as value adding, marketing and distribution of products related to plant based agricultural industries.

Practicals: Site visits to several agricultural enterprises.

Assessment: Seminar comprising written and oral analyses related to the agro-industries that were visited (100%).

DP Requirement: Not applicable.

This module has no supplementary exam.

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**Agriculture (General Modules)**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Farming Systems**

AGRI151 P1

Aim: To provide an introduction into different farming systems and basic production requirements of crop and animal systems.

Content: Farming systems; types of crops and animals; basic requirements for crop or animal system; terminology and recording; stages in production cycle of crops and animals; productivity and profitability of crop or animal production; production records.

Practicals: 3 Weekly 2 hour practical.

Assessment: Test (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).

Only for students registered at Cedara College of Agriculture.

**Agricultural Production**

AGRI152 P2

Aim: To provide basic insight into crop and animal production principles and how to apply them.


Practicals: Weekly 2 hour practical.

Assessment: Tests (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).

Only for students registered at Cedara College of Agriculture.

**Field Crop Production**

AGRI261 P2

Prerequisite Modules: AGRI152.

Aim: To gain knowledge in field crop production systems and be able to determine the best management practices for a particular farming situation, in order to become an efficient producer.

Content: The industry; data used in managing crop enterprises; crop growing systems; plant and growth characteristics; environmental factors; establishing crops; manipulation of environment; sustainable production; economics; harvesting, packaging and marketing products.

Practicals: Weekly 2 hour practical; scheduled field trips to field crop production farms and markets.
**Assessment:** Tests (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).

**DP Requirement:** 40% class mark; 80% attendance at lectures and practicals.

*Only for students registered at Cedara College of Agriculture.*

**Vegetable Production**  
AGRI262 P2  
(30L-0T-32P-0S-60H-20R-0F-13G-5A-13W-16C)

**Prerequisite Modules:** AGRI152

**Aim:** To gain knowledge in vegetable production systems and be able to determine the best management practices for a particular farming situation, in order to become an efficient producer.

**Content:** The industry; data used in managing vegetable enterprises; vegetable growing systems; plant and growth characteristics; environmental factors; establishing vegetables; manipulation of environment; sustainable production; economics; harvesting, packaging and marketing products.

**Practicals:** Weekly 2 hour practical; scheduled field trips to vegetable production farm and markets.

**Assessment:** Tests (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).

*Only for students registered at Cedara College of Agriculture.*

**AGRI263 P1**  
(30L-0T-32P-0S-60H-20R-0F-13G-5A-13W-16C)

**Prerequisite Modules:** AGRI152.

**Corequisite:** AGRI262.

**Aim:** To gain knowledge in beef production systems and be able to determine the best management practices for a particular farming situation, in order to become an efficient producer.

**Content:** The industry; production systems; breeding and selection; management principles and practices; reproduction; feeding and nutrition; diseases management; product quality; value adding; records; economics of production.

**Practicals:** Weekly 2 hour practical; scheduled visits to beef production farms and markets.

**Assessment:** Tests (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).

*Only for students registered at Cedara College of Agriculture.*

**Forage Management**  
AGRI264 P1  
(30L-0T-32P-0S-60H-20R-0F-13G-5A-13W-16C)

**Prerequisite Modules:** AGRI152.

**Corequisite:** AGRI263.

**Aim:** To gain knowledge in veld and fodder management and be able to determine the best management practices for a particular farming situation, in order to become an efficient producer.

**Content:** Veld Management; grazing and grazing systems; conserved feeds; stock and fodder flow.

**Practicals:** Weekly 2 hour practical.

**Assessment:** Tests (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).

*Only for students registered at Cedara College of Agriculture.*

**Scientific Communication**  
AGRI710 P1  
(18L-50T-0P-92H-OR-0F-0G-0A-13W-16C)

**Aim:** To prepare postgraduate science students with core communication skills in reading, writing and oral presentations for effective and efficient performance in postgraduate (and professional) work.

**Content:** Planning and conducting a literature review, summarizing, information retrieval; characteristics of well-written, formal scientific writing; constructing an argument; mind maps; the principles and strategies of efficient and effective advanced reading; the professional writing process; common errors in scientific English; oral presentations in science.

**Assessment:** Library project (15%), summaries (10% x 2), 2 science essays (20% x 2), reading test (5%), oral presentation (20%).

**DP Requirement:** Not applicable.

*To be offered only in the ACCI programme. This module has no supplementary exam.*
Research Project Management
AGRI810 PV (18L-50T-0P-0S-92H-0R-0F-0G-0A-4W-16C)
Aim: To prepare senior postgraduates with the understandings and skills they need to: plan, budget for, and manage research; to raise funding for research; to manage funding; and to maintain optimal relations with grant-makers.
Content: Basic communication principles underlying "Grantsmanship"; planning a research project with basic planning tools; budgeting the project; the concept note and proposal; communication with the grant-maker; identifying sources of funding; managing research funds; reporting to the grant-maker; oral presentation on project.
Assessment: Portfolio concept note (15%); research plans (15%); budget (20%); outline and notes of research proposal (10%); correspondence (10%); financial reports (10%); oral presentation (20%).
DP Requirement: Not applicable.

Advanced Scientific Communication
AGRI820 P2 (18L-50T-0P-0S-92H-0R-0F-0G-0A-13W-16C)
Aim: To provide postgraduate students with the knowledge, understanding and skills they need for their research thesis, writing and publishing journal articles, and important forms of professional communication in management positions.
Content: Requirements for a research thesis; characteristic, functional features of the science journal research paper for both reader and writer; introduction to the publishing process; initial postgraduate.
Assessment: Continuous: Thesis outline (5%); initial literature review (35%); real/simulated journal article (35%); planning and sketches for poster (15%); basic types of business communication (10%).
DP Requirement: Not applicable.

Agrometeorology
Offered in the School of Agricultural, Earth and Environmental Sciences

Agrometeorology & Environmental Biophysics
AMET210 P1 (36L-5T-40P-0S-50H-24R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 32C at Level 1.
Aim: Provision of concepts and applications in applied environmental, agricultural and ecophysiological sciences.
Practicals: Temperature measurement; reflectivity, radiation profiles in crops; humidity; rainfall and evaporation; leaf resistance and water potential. Project.
Assessment: Tests (15%), practicals (12%), project (6%); 3 h exam (67%).
DP Requirement: 80% attendance at lectures and practicals.

Environmental Instruments: Life/Earth Sciences
AMET211 P2 (20L-0T-39P-0S-0H-17R-0F-0G-4A-13W-8C)
Prerequisite Requirement: 32C at Level 1.
Aim: To provide students taking agriculture and environmental science options with the skills to set up an automatic weather station.
Content: Datalogging measurement and control techniques using an automatic weather station (AWS) and other sensors for measurement and control purposes. Internet techniques, information retrieval and storage and data display.
Practicals: Identifying, checking electronic components. Use of an AWS.
Assessment: Test (10%), practicals (23%); 3 h practical exam (67%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Students may not obtain credit for both AMET212 and AMET211.

Environmental Instruments: Life/Earth Sciences

AMET212 P2
(23L-0T-115P-0S-0H-17R-0F-0G-5A-13W-16C)

Prerequisite Requirement: 64C at Level 1.

Aim: To provide students taking agriculture and environmental science options with the skills to set up an automatic weather station.

Content: Datalogging measurement and control techniques using an automatic weather station (AWS) and other sensors for measurement and control purposes. Internet techniques, information retrieval and storage and data display.

Practicals: Identifying, checking electronic components. Use of an AWS. Grass reference estimation; fire index; wind chill and chilling index estimation. Internet techniques, information retrieval and storage and data display.

Assessment: Test (5%), 13 practicals (12 %), project (50%); 3 h practical exam (33%).

DP Requirement: 80% attendance at all academic contact activities, 100% at practicals; 45% subminimum on the project.
Students may not obtain credit for both AMET212 and AMET211.

Evaporation Estimation

AMET860 PY
(20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

Aim: To provide students with the theory necessary to understand the principles of evaporation estimation and techniques for turbulence measurement.

Content: Water and energy in the environment; radiation and energy transfer; lysimetry; atmometers. Sap flow theory and measurement; Bowen ratio, eddy covariance, surface renewal. Penman-Monteith equation and use; infra red thermometry; energy balance closure; Monin-Obukhov similarity theory; scintillometry.

Practicals: Field use of equipment and sensors; advanced data analysis using a spreadsheet including VBA.

Assessment: 1 h test (33%); 2 h exam (67%).

DP Requirement: 80% attendance at lectures and practicals.
Year-long module.

Automatic Weather Station Technologies 1

AMET861 PY
(20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

Aim: To provide theory and skills to set up an automatic weather station and the checking and use of collected data. Included here is the checking of the electronic components and an understanding of the sensors used.

Content: Datalogging measurement and control technologies, including datalogging programming. Theory of sensors used. Procedures for the checking and use of automatic weather station (AWS) data. Data processing and presentation. Theory and use of the AWS sensors and their use for measurement and control. Data telecommunication techniques. Internet techniques, information retrieval and storage, scientific graphics display.

Practicals: Field use of equipment. Advanced data analysis using a spreadsheet.

Assessment: 1 h test (33%); 2 h exam (67%).

DP Requirement: 80% attendance at lectures and practicals.
Year-long Module.

Digital Data Treatment & Representation

AMET862 PY
(20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

Aim: To provide students with the skills necessary to process and exchange, present, store, retrieve, display and publish data and information.


Practicals: Assignments based on generated and other data sets.

Assessment: 1 h test (33%); 2 h exam (67%).

DP Requirement: 80% attendance at lectures and practicals.
Year-long Module.
AWS Measurement & Control Technologies
AMET863 PY (20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

**Aim:** To provide students with the theory necessary to understand the use of automatic weather station sensors for the measurement and control of various microclimates.

**Content:** Theory and use of automatic weather station (AWS) sensors and their use for measurement and control, for example, of frost protection, reference evaporation, glasshouse microclimate.

**Practicals:** Field use of equipment.

**Assessment:** 1 h test (33%); 2 h exam (67%).

**DP Requirement:** 80% attendance at lectures, 100% at practicals.

*Year-long Module.*

AWS Measurement & Control Technologies
AMET864 PY (20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

**Aim:** To provide students with the theory necessary to understand the following AWS systems and measurement systems.

**Content:** Theory and use of the following systems and sensors: automatic weather station (AWS) sensors and their use for measurement and control, for example, of disease forecasting, fire-danger warning; leaf wetness measurements, radio telemeters, infrared thermometry, AWS sensors, time-domain reflectometry.

**Practicals:** Field use of equipment and sensors.

**Assessment:** 1 h test (33%); 2 h exam (67%).

**DP Requirement:** 80% attendance at lectures and practicals.

*Year-long Module.*

Heat Pulse Measurement in Plants & Soils
AMET865 PY (20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

**Aim:** To provide students with the theory necessary to understand the following heat pulse technologies for use in soils and plants.

**Content:** Heat pulse technologies for the measurement of sap flow in trees and other non-woody stems and the measurement of the thermal properties of porous materials.

**Practicals:** Field use of equipment and sensors.

**Assessment:** 1 h test (33%); 2 h exam (67%).

**DP Requirement:** 80% attendance at lectures and practicals.

*Year-long Module.*

Modelling Exchanges in the SPAC System 1
AMET866 PY (20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

**Aim:** To provide students with the theory necessary to understand the principles of modelling energy and water flow in the SPAC.

**Content:** Principles of modelling: CERES and SWB models; modelling using finite differences; application of models; specialized data techniques for model evaluation.

**Practicals:** Field use of equipment and sensors.

**Assessment:** 1 h test (33%); 2 h exam (67%).

**DP Requirement:** 80% attendance at lectures and practicals.

*Year-long Module.*

Environmental Temperature & Radiation
AMET867 PY (20L-5T-18P-0S-27H-7R-0F-0G-3A-26W-8C)

**Aim:** To provide students with the theory necessary to understand the principles of temperature measurement and calibration of radiation instrumentation.


**Practicals:** Field use of equipment and sensors.

**Assessment:** 1 h test (33%); 2 h exam (67%).
Syllabus

DP Requirement: 80% attendance at lectures and practicals.

Year-long Module.

Agric/Environment Instrumentation Research
AMET869 PY  (0L-0T-390P-0S-250H-0R-0F-0G-0A-26W-64C)
Aim: To allow distance students to undertake a research project at their place of employment.
Content: Research on a topic agreed upon by the supervisor, the student and the employer(s).
Practicals: This forms the basis of the research project.
Assessment: 1 project report (100%).
DP Requirement: Not applicable.
Year-long Module. This module has no supplementary exam.

Animal Science

Offered in the School of Agricultural, Earth and Environmental Sciences

Pig & Poultry Production
ANSI201 P1  (38L-0T-39P-0S-38.5H-40R-0F-0G-4.5A-13W-16C)
Prerequisite Modules: BIOL101.
Aim: To enable students to solve problems encountered in pig and poultry production.
Management of pullet, broiler, broiler breeder and pig production systems. Economic factors influencing management decisions in broiler, egg and pork production. Pig and poultry welfare.
Practicals: Anatomy of a chicken, visit different pig and poultry production systems.
Assessment: Essays (12.5%), development of spreadsheet models (12.5%), oral & written presentations (7.5%), practical reports (7.5%), participation in debate on animal welfare issues (5%), formal tests (5%); 3 h exam (50%).
DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Livestock Production
ANSI202 P2  (38L-0T-39P-0S-38.5H-40R-0F-0G-4.5A-13W-16C)
Prerequisite Modules: BIOL101.
Aim: Students should develop a holistic approach towards the production of beef, sheep, goats and dairy and be capable of identifying and solving production problems associated with these systems.
Content: Beef, sheep, goats and dairy production systems.
Practicals: Visit various beef, sheep, goat and dairy farms.
Assessment: Impromptu tests (7.5%), formal test (25%), essays and/or projects (7.5%), breed project (10%); 3 h exam (50%).
DP Requirement: Class mark of 40%, including 80% attendance at practicals.

Animal Feeding and Feed Formulation
ANSI318 P2  (9L-30T-39P-0S-53H-24R-0F-0G-5A-13W-16C)
Prerequisite Modules: BIOL 101.
Aim: Students should develop understanding of the attributes of feed used in different animal production systems.
This module also aims to introduce principles of feed formulation with emphasis in economic feeding of animals.
Assessment: Referenced essays (5%), practical write-ups (15%), poster and oral presentation (10%), formal tests (20%); 3 h exam (50%).
DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.
Practical & Research Skills in Animal Science
ANSI325 P2 (38L-10T-35P-0S-54H-18R-0F-0G-5A-13W-16C)
Prerequisite Modules: ANSI 201, 202.
Aim: To expose students to practical skills of collecting and analysing data from animals.
Content: Principles of well designed trials with animals. Designing and planning the implementation of animal trials; Data preparation, storage, editing and application of bio-statistic knowledge; Dose-response trials, repeated measurements, regression and factorial trials; Data analysis and presentation of results; Animal research ethics, field studies, copyrights, peer-review processes, publication in journals.
Assessment: Written assignments (5%), oral & written presentations (10%), formal tests (10%), scientific report (25%); 3 h exam (50%).
DP Requirement: 40% Class mark, attendance at 80% of practicals.

Animal Growth & Development
ANSI332 P1 (38L-0T-39P-0S-47H-32R-0F-0G-4A-13W-16C)
Aim: Students should analyze the relationships between body size and composition over time as a means of predicting the consequences of internal and external stimuli on growth and development of domestic and non-domestic animals.
Content: Basic growth terminology, analysis of growth curves, scaling and allometry, growth modelling, manipulation of growth, physiology of muscles, conversion of muscle to meat and meat quality.
Practicals: Allometric measurements and analyses.
Assessment: Practical reports (20%), poster/oral presentations (5%), essay (5%), formal tests (20%); 3 h exam (50%).
DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Digestive Physiology & Herbivore Nutrition
ANSI344 P1 (38L-0T-39P-0S-54H-24R-0F-0G-5A-13W-16C)
Aim: To learn how to evaluate the digestive, absorptive & metabolic processes in animals and how these influence the nutritive value of feeds and to associate ways of measuring nutritive value to the nutrient requirements.
Assessment: Essays (10%), report on feed evaluation (10%), impromptu test (5%), formal tests (25%); 3 h exam (50%).
DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Animal Health
ANSI352 P1 (38L-10T-35P-0S-54H-18R-0F-0G-5A-13W-16C)
Prerequisite Modules: BIOL101.
Aim: To enable students to understand the complexities of maintaining animal health and welfare and its effects on constraining potential. Also to maintain health and welfare in an economically and commercially sustainable manner.
Practicals: Biological sampling & preparation for submission to diagnostic laboratory, post-mortem examination, basic prophylaxis for disease farm species, visit to diagnostic laboratories.
Assessment: Written assignments (10%), oral & written presentations (15%), prac. reports (10%), tests (15%); 3 h exam (50%).
DP Requirement: 40% Class mark, attendance at 80% of practicals.

Applied Reproductive Physiology
ANSI370 P2 (38L-0T-39P-0S-54.5H-24R-0F-0G-4.5A-13W-16C)
Aim: Students will learn to integrate animal physiology and endocrinology with nutritional, behavioural, health and environmental factors by implementing strategies for improving reproductive efficiency.

Practicals: Superovulation and in vitro culture techniques. Ultrasonography.

Assessment: Essays (10%), oral presentations (15%), formal tests (20%), project (5%); 3 h exam (50%).

DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Companion Animal Nutrition
ANSI703 P2

Aim: To familiarise students with the pet food industry and to integrate nutritional principles with the peculiarities of various companion animal requirements.

Content: Unique nutrient requirements and feeding management of cats, dogs and horses. Feeding for activity, reproduction, health and longevity. Preparation of food and its effect on nutrient quality. Regulation, marketing and labelling of pet food. Dynamics of the pet food industry in South Africa.

Practicals: Determine nutrient requirements of pets. Marketing and labelling of pet food. Trips to feed companies.

Assessment: Problem-solving based tests (10%), essays (5%), practicals (25%), oral & written presentations (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Applied Pig and Poultry Nutrition
ANSI718 P2

Prerequisite Modules: ANSI318.

Aim: Students should integrate nutritional theory into solving more advanced nutritional problems using simulation models.


Practicals: Using simulation models, feed formulations.

Assessment: Assignments (15%), problem solving exercises (15%), oral presentations (10%), formal test (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Quantitative Nutrition
ANSI741 P1

Prerequisite Modules: ANSI332.

Aim: Students should optimise feeding strategies for farm animals through integration of biological and economic factors, these being associated with the animal, the feed and the environment.

Content: Theories of control of voluntary food intake. Determination of amino acid requirements. Energy systems and determination of energy requirements of animals. Optimum economic feeding systems for growing and reproducing animals.

Practicals: Feed formulation and modelling projects

Assessment: Problem-solving based tests (20%), essays (10%), spreadsheets and modelling exercises (15%), oral & presentation of reports (5%); 3 h exam (50%).

DP Requirement: Class mark of 40%, including at least 80% attendance at practicals.

Rumen Metabolism and Feed Formulation
ANSI744 P1

Prerequisite Modules: BIOC201, ANS344.

Aim: To increase students' understanding of metabolism of carbohydrate and protein in ruminant and their skills in determining requirements for feed formulation.


Assessment: Written assignments (10%), oral & written presentations (15%), practical reports (10%), formal tests
Animal Science Research Project & Seminars
ANSI790 PY

Aim: This is a module with a heavy focus on integrated assessment of the exit-level outcomes specified for the programme in Animal and Poultry Science. It involves information and data management, analysis and communication, self-evaluating reflection and personal organisation.

Content: Seminar/review paper writing. Literature search. Presentation skills. Topical discussions with industrial players. Formulating and presenting a project proposal. Conducting an experiment, analyzing results and presenting as scientific paper. Interviews on career awareness.

Assessment: Oral & written presentation of review (50%), scientific paper (50%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

Applied Chemistry

Offered in the School of Chemistry and Physics

Environmental Chemistry
APCH211 W2

Prerequisite Modules: CHEM110, CHEM120.

Aim: To introduce a wide range of science students to the principles of environmental chemistry.

Content: Chemical pollution: acid rain, photochemical smog, global warming, and ozone depletion. Water purification, recycling and waste management. The toxicity of heavy metals and organic compounds.

Practicals: A combination of laboratory work, assignments and workshops.

Assessment: Tests (8%), practicals (25%); 3 h exam (67%).

DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit.

Chemistry & Industry
APCH221 W1

Prerequisite Modules: CHEM110, CHEM120.

Aim: To highlight how chemistry can be applied to create a successful industrial venture.

Content: Insights into the South African and global chemical industry, highlighting the chemistry, the manufacturing processes, the costs and profits and the environmental consequences. A holistic view will be taken where one or two processes will be covered in detail outlining the cradle-to-grave approach necessary in today's economic and social climate.

Practicals: A combination of laboratory work, assignments and workshops.

Assessment: Tests (8%), practicals (25%); 3 h exam (67%).

DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit.

Chemical Analysis
APCH231 W2

Prerequisite Modules: CHEM110, CHEM120 and (MATH130 or 133).

Aim: To show the role and importance of analytical chemistry in industry and society and to provide basic theory and practical skills in "wet analytical” techniques.

Content: Analytical methodology, titrimetric and gravimetric methods of analysis, errors and uncertainties in measurements, principles of calibration, industrial applications.

Assessment: Tests (10%), practicals & assignments (30%); 3 h exam (60%). 

DP Requirement: Practical mark 50%, 80% attendance at practicals, 100% attendance at tests. 

Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit.

Materials
APCH312 W1

Prerequisite Modules: CHEM210, 230.

Aim: To show the relationship between the microstructure and macroscopic properties of materials.

Content: Introduction to the atomic structures of crystalline materials, glasses and polymers. The relationship between structure, microstructure and useful macroscopic properties.

Practicals: Preparation and characterisation of various materials.

Assessment: Tests (10%), practicals (15%), assignment (5%); 3 h exam (70%).

DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests. 

Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit.

Industrial Chemistry
APCH322 W1

Prerequisite Modules: CHEM230.

Corequisite: CHEM330.

Aim: To make students aware of the link between the traditional subjects of chemistry and chemical engineering.

Content: The industrial manufacturing process, qualitative and quantitative process flow diagrams, unit operations and unit processes, mass and energy balances on steady state systems – recycle, bypass and purge, heat exchangers and steam tables, industrial separations and applications of phase chemistry.

Practicals: Phase chemistry; problem-solving workshops; flow sheet simulation using computer software; industrial project. The course includes field trips.

Assessment: Tests (5%), practicals (14%), assignments (14%); 3 h exam (67%).

DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests. 

Students may be required to contribute to the cost of field trips. Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit.

Environmental Analysis
APCH332 W2

Prerequisite Modules: CHEM230; APCH231 or CTEC233.

Aim: To show the role and importance of analytical chemistry in studying the environment.

Content: Speciation, partition and transport, solubility, advanced analytical techniques, sampling: strategy, techniques and preservation.

Practicals: Sampling and analysis of real systems, use of modern instrumental methods of analysis.

Assessment: Tests (10%), practicals (23%); 3 h exam (67%).

DP Requirement: Class mark 40%, 80% attendance at practicals and workshops, 100% attendance at tests. 

Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit.

Integrated Project
APCH342 W2

Prerequisite Modules: CHEM210, 220, 230, 340; APCH231 or CTEC233.

Aim: To develop an integrated approach to practical work.

Content: This module builds on elementary experimental techniques and focuses on experimental chemistry as a whole rather than as isolated segments of laboratory work. It is intended that students learn to carry out independent research/study. Sampling strategy, practical methodology, research techniques, record-keeping, writing laboratory reports, library practice and data sources, use of spreadsheets in chemistry.

Practicals: Mini-projects.
Assessment: Continuous assessment of laboratory work, written project reports and seminar (80%), tests and assignments (20%).
DP Requirement: Not applicable.

Only for students in the Applied Chemistry programme. Entrance into the Applied Chemistry Programme is limited and will be based on merit. This module has no supplementary exam.

Biochemistry

Offered in the School of Life Sciences

Introductory Biochemistry and Microbiology
BIMI120 P2 W2
Prerequisite Requirement: 40% in CHEM110.
Aim: To introduce students into the world of biochemistry and microbes.
Practicals: Introduction to practical aspects of Biochemistry & Microbiology.
Assessment: 3 h tests (20%), practical reports & assignments (20%); 3 h exam (60%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Biochemistry for Optometry
BIOC200 W1
Prerequisite Modules: CHEM110, 120, BIOL101.
Aim: To provide an overview of Biochemistry to Optometry students.
Assessment: Class Tests (50%); 2 h exam (50%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.
For students in the College of Health Sciences only.

Introduction to Biomolecules
BIOC201 P1 W1
Prerequisite Modules: BIMI120 or BIOL101. CHEM110, CHEM120.
Aim: To provide an insight into the molecular diversity in living systems.
Practicals: Analyses of carbohydrates, amino acids, proteins and vitamins.
Assessment: Theory tests (25%), practical test and reports (25%); 3 h exam (50%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.
Credit may not be obtained for both of BIOC201 and BIOC203.

Bioenergetics and Integrated Metabolism
BIOC202 W2
Prerequisite Modules: BIMI120 or BIOL101. CHEM110, CHEM120.
Aim: To introduce students to integrated biochemical pathways.
Content: The biosynthesis and oxidation of simple and complex lipids, lipid storage disorders. The metabolism of carbohydrates, amino acids, nucleotides and one-carbon fragments. Clinical correlations resulting from aberrations in
individual metabolic pathways. Bioenergetics, regulation and control of metabolic pathways.

**Practicals:** Sploptrophometric techniques, electrophoresis and chromatography of serum and other metabolites.

**Assessment:** Class Tests (25%), practical test and reports (25%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.

Credit may not be obtained for both of BIOC202 and BIOC203.

### Biochemistry for Biologists

**BIOC203 W1**

**Prerequisite Requirement:** 64C at Level 1 including CHEM110, BIOL101, BIOL102.

**Aim:** To provide an overview of Biochemistry for Biologists in order to understand the processes involved in cellular metabolism, and the experimental techniques used to facilitate understanding in this field.

**Content:** Chemistry and metabolism of carbohydrates, lipids, amino acids and proteins. Introduction to enzymology and kinetics. Clinical correlations resulting from aberrations in individual metabolic pathways. Bioenergetics, regulation and control of metabolic pathways.

**Practicals:** Experimental techniques in biochemistry.

**Assessment:** Class Tests (25%), practical test and reports (25%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of lectures and practicals.

Credit may not be obtained for both BIOC203 and either of BIOC201 or BIOC202.

### Signal Transduction and Metabolism

**BIOC212 P2**

**Prerequisite Requirement:** 40% in BIMI120 or BIOL101.

**Prerequisite Modules:** CHEM110, 120.

**Aim:** To introduce the fundamentals of cell biology.

**Content:** Properties and function of biological membranes and subcellular organelles. Bioenergetics of metabolism. Carbohydrate, lipid and amino acid metabolism; photosynthesis and nitrogen metabolism. Integration and regulation of metabolic pathways in animals, humans, plants, and microbes.

**Practicals:** Extraction & analyses of cell components & diagnostic procedures. Video illustration of properties & role of lipids in signal transduction.

**Assessment:** Theory tests (25%), practical test and reports (25%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.

### Cellular Regulation and Signalling

**BIOC300 P2**

**Prerequisite Modules:** BIOC201, 202.

**Aim:** To provide insight into cellular processes and the role of signal transduction pathways in their regulation in cells and the whole organism.

**Content:** The integration and regulation of cellular processes under normal, stressful- (e.g. diabetes), diseased (e.g. cancer) and toxic conditions (e.g. microbial toxins, drugs), and associated signalling pathways.

**Practicals:** Methods of RNA isolation, characterization and quantification.

**Assessment:** 2 h tests (30%), practical reports and assignments (20%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.

### RNA Chemistry and Gene Expression

**BIOC307 W1**

**Prerequisite Requirement:** 40% in CHEM220.

**Prerequisite Modules:** BIOC201, 202, RDNA202.

**Aim:** To introduce students to more advanced aspects of gene expression in prokaryotes and eukaryotes.

Practicals: Methods of RNA isolation, characterization and quantification.
Assessment: 2 h class tests (25%), practical reports and assignments (25%); 3 h exam (50%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Physiological Biochemistry
BIOC308 W2
(30L-7T-36P-0S-57H-25R-0F-0G-5A-13W-16C)
Prerequisite Modules: BIOC201, 202, CHEM220, RDNA202.
Aim: To introduce students to the physiological relatedness of various biomolecules.
Content: Sterol and hormone biosynthesis and regulation, lipoprotein structure and metabolism, inborn errors and gene therapy, biomembranes structure and function and signal transduction. Viral and chemical carcinogenesis.
Practicals: Properties and analysis of ATP, genetic mutation, isoenzymes and polyacrylamide gel electrophoresis.
Assessment: 2 h class tests (25%), practical reports and assignments (25%); 3 h exam (50%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Biochemical Methods
BIOC311 P1
(27L-10T-22P-0S-71H-25R-0F-0G-5A-13W-16C)
Prerequisite Modules: BIOC201, 212, PHYS131.
Aim: To introduce techniques for protein, DNA, lipid and carbohydrate identification, isolation and analysis for biochemical, biological, medical, agricultural, and food sciences.
Content: Identification, extraction, separation and analysis of proteins, DNA, lipids and carbohydrates; centrifugation, precipitation, chromatography, electrophoresis, laboratory safety, cell culture, accessing the scientific literature.
Practicals: Techniques for protein, DNA, lipid and carbohydrate identification, isolation and analysis
Assessment: 2 h class tests and assignments (24%), practical reports (16%); 3 h exam (60%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

DNA Chemistry
BIOC315 P1 W1
(30L-10T-30P-0S-60H-25R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 40% in CHEM220.
Prerequisite Modules: BIOC201, (BIOC202 or 212), RDNA202.
Aim: To provide a detailed account of the chemistry and biochemistry of DNA and aspects of its manipulation.
Content: Molecular structure, enzymology, synthesis and repair of nucleic acids; advanced recombinant nucleic acid methodology, sequencing and analysis.
Practicals: DNA isolation, characterisation and manipulation.
Assessment: 2 h class tests (25%), practical reports and assignments (25%); 3 h exam (50%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Immuono- and Protein Chemistry
BIOC316 P2 W2
(30L-8T-30P-0S-62H-25R-0F-0G-5A-13W-16C)
Prerequisite Modules: BIOC201, (BIOC202 or 212), CHEM220, RDNA202.
Aim: To introduce a biochemical view of immunology and advanced aspects of protein conformation as well as to develop skills in the concomitant laboratory techniques.
Content: Innate and acquired immunity, biochemistry of humoral and cell-mediated immune responses, antibody-antigen interactions, immune cell receptors, cytokines; protein conformation and folding; peptide synthesis.
Practicals: Physico-chemical analysis of proteins and immunochemical techniques.
Assessment: 2 h class tests (25%), practical reports and assignments (25%); 3 h exam (50%).
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Cell Biology & Methods in Cell Biology
BIOC701 P1
(24L-12T-50P-0S-57H-6R-0F-8G-3A-13W-16C)
Aim: To introduce the theoretical aspects of intracellular trafficking of biomolecules.
Content: Topological continuity between organelle lumens and extracellular space; glucoprotein synthesis and trafficking; composition and autoassembly of extracellular matrix; structure and function of cytoskeleton; reciprocity between intracellular and extracellular order; relevance to cellular diseases such as cancer; stem cell biology.
Methods in subcellular fractionation, histochemistry, immunochemistry, various electron microscopy techniques, cell culture and lysosome-endosome trafficking.

**Practicals:** Cell culture and immunocytochemistry applications.

**Assessment:** Assignments (25%), practical reports (25%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.

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**Research Project**

**BIOC702 PY WY**

(0L-20T-320P-8S-109H-10R-0F-12G-1A-26W-48C)

**Aim:** To train students in research methodology through the vehicle of a research project in Pure and Applied Biochemistry.

**Content:** Students will prepare and deliver seminars in selected areas of Biochemistry including fields such as Malaria, Poultry Pathogens, Immunodiagnostics, Trypanosomiasis, Immunotechnology, Immunocytochemistry, Electron microscopy, Cancer, Mechanisms of metastasis, Stem cells, Biochemical Education, Enzyme analysis, Modelling and purification, Biotechnology and undertake a research project selected under the supervision of staff.

**Assessment:** Dissertation and 1h oral presentation (100%).

**DP Requirement:** Not applicable.

*Year-long Module. This module has no supplementary exam.*

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**Antigens and Vaccines**

**BIOC703 P1**

(24L-12T-50P-0S-57H-6R-0F-8G-3A-13W-16C)

**Aim:** To introduce the student to antigen presentation and vaccine design.

**Content:** Vaccine development - the malaria and HIV models; immunological, parasitological, molecular and metabolic considerations for host and parasite. Preparation and evaluation of affinity purified antigens. In silico vaccine design. Molecular Modelling. Antigen processing and presentation.

**Practicals:** Epitope mapping, advanced immunochemical techniques.

**Assessment:** Assignments (25%), practical reports (25%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.

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**Modelling, Visualisation & Information Retrieval**

**BIOC705 P1**

(12L-20T-40P-44S-32H-0R-0F-8G-3A-13W-16C)

**Aim:** To critically evaluate current Biochemistry literature. To give students insight into the use of models, modelling and animations as visualization tools for biochemistry education and research.

**Content:** Biochemistry journal article discussion and presentation. Meaning, type and examples of models. Use of models, modelling and animations as visualization tools in teaching and research. The cognitive process of visualizing and interpreting models. Research methods for identifying visualization difficulties. Improving visual literacy in biochemistry.

**Practicals:** Practical, Tutorials.

**Assessment:** Assignments (75%) and 2 h oral presentations (25%).

**DP Requirement:** Not applicable.

*This module has no supplementary exam.*

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**Advanced Biochemistry Topics**

**BIOC707 P1**

(0L-20T-57P-44S-35H-0R-2G-2A-13W-16C)

**Aim:** To develop skills to access, collect and present scientific information on contemporary topics in Biochemistry.

**Content:** Written and oral presentations on selected topics. Data collection, recording and analysis on selected topics.

**Practicals:** Practical, Tutorials.

**Assessment:** Assignments (70%) and written test (30%).

**DP Requirement:** Not applicable.

*This module has no supplementary exam.*

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**Advanced Biochemical Core Topics 3**

**BIOC708 W2**

(24L-20T-0P-0S-93H-18R-0F-0G-5A-6W-16C)

**Aim:** To instruct students in selected advanced aspects of the control of gene expression and applications of genetic
engineering technology.

**Content:** Role of DNA methylation in eukaryotic DNA and nucleic acid based approaches to the attenuation of gene expression. Industrial, medical and pharmaceutical applications of genetic engineering technologies. Students will critically analyze recent peer-reviewed scientific publications.

**Assessment:** Tests (25%); 3 h exam (75%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials.

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**Advanced Biochemical Core Topics 1**  
BIOC709 W1  
(24L-20T-0P-0S-93H-18R-0F-0G-5A-6W-16C)

**Aim:** To instruct students in gene transfer and methodologies.

**Content:** Selected advanced topics from the areas of gene transfer protocols and reporter gene assay techniques. The module will help develop theoretical competence and capacity in these areas.

**Assessment:** 2 h class tests and assignments (25%); 3 h exam (75%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials.

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**Agric Biochemistry Research Skills**  
BIOC710 PC  
(12L-20T-40P-44S-32H-0R-10G-2A-13W-16C)

**Aim:** To introduce students to contemporary Biochemistry research skills.

**Content:** Qualitative and quantitative analysis, manipulation and interpretation of experimental and in silico data. Statistical analysis of Biochemical data. Financial research planning and management. Animal and human research ethics.

**Assessment:** Assignments (75%) and 2 h oral and poster presentations (25%).

**DP Requirement:** Not applicable.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

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**Specialized Biochemical Techniques 1**  
BIOC711 W1  
(10L-10T-90P-0S-39H-8R-0F-0G-3A-6W-16C)

**Aim:** To instruct students in the practical aspects of mammalian cell culture and the transfection of selected cell lines.

**Content:** The propagation and cryopreservation of mammalian cells including immortal lines. Cell viability assays. Transient or stable transfections and transgene assays will be performed.

**Assessment:** Practical report (50%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.

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**Advanced Biochemical Core Topics 2**  
BIOC713 W1  
(24L-20T-0P-0S-93H-18R-0F-0G-5A-6W-16C)

**Aim:** To instruct students in recombinant DNA technology.

**Content:** Selected topics in recombinant DNA technology.

**Assessment:** 2 h class tests and assignments (25%); 3 h exam (75%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials.

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**Specialized Techniques in Biochemistry**  
BIOC715 W1  
(29L-20T-60P-0S-35H-10R-0F-0G-6A-6W-16C)

**Aim:** To familiarise students with selected advanced biochemical techniques and methodologies.

**Content:** Laboratory safety. Scientific writing, bioethics. Quantitative methodologies, biostatistics. Preparation of reagents and media, culture preservation. Nucleic acid isolation, agarose gel electrophoresis and gel documentation; protein isolation, SDS PAGE, Western blotting. Non radioactive detection techniques. PCR, centrifugation, electron microscopy, HPLC, GC-MS. Introduction to bioinformatics.

**Assessment:** Practicals (30%), theory tests (40%), oral exam (30%).

**DP Requirement:** Class mark of 40%, 80% attendance at tutorials and practicals.
Biological Sciences

Offered in the School of Life Sciences

The Smaller Side of Life

BIOL101 P1 W1  (39L-10T-36P-0S-43H-24R-0F-0G-8A-13W-16C)

Aim: To introduce structure, function and synthesis of biological molecules, structure and function of cells, introductory genetics.


Practicals: Selected from topics above.

Assessment: Tests/assignments (20%), practical reports (20%), 3 h practical test (10%); 3 h theory exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Subminimum to pass: 40% in each exam.

Credit may not be obtained for both BIOL101 and BIOL195.

Life on Earth

BIOL102 P2 W2  (39L-10T-37P-0S-51H-15R-0F-0G-8A-13W-16C)

Aim: To develop basic knowledge and understanding of the diversity of organisms, their origin and their importance.


Practicals: Selected from the topics above. Field trips.

Assessment: Tests/assignments (30%), practical reports (20%); 3 h theory exam (50%).

DP Requirement: Class mark of 40%; attendance at 80% of tutorials and practicals.

Subminimum to pass: 40% in each exam.

Credit may not be obtained for both BIOL102 and BIOL196.

Introductory Biology for Health Sciences

BIOL103 W1  (39L-10T-39P-0S-60H-4R-0F-0G-8A-13W-16C)

Aim: To introduce students to a range of biological topics pertinent to the health sciences.

Content: This module comprises three themes: history and diversity of life, cytology and genetics. Where possible students are shown how these topics apply to real-life situations.

Practicals: Viruses, Archaea, Bacteria, Eukaryotes, Protista, Fungi, Rhodae, Stromenopilae, spore-producing and seed-producing Plantae, biomolecules, mitosis and meiosis, membrane structure and function, structure of plant and animal cells, Hardy-Weinberg principle.

Assessment: Theory tests (20%), assignment (5%), practical reports (10%); 3 h practical exam (25%), 3 h theory exam (40%).

DP Requirement: Class mark of 40%; attendance at 80% of tutorials and practicals.

Subminimum to pass: 40% in each exam.

Service module for College of Health Sciences, not available in the College of Agriculture, Engineering and Science.

Smaller Side of Life (Augmented)

BIOL195 P1 W1  (78L-78T-76P-0S-17H-60R-0F-0G-11A-13W-16FC-16DC)

Aim: To introduce structure, function and synthesis of biological molecules, structure and function of cells, introductory classical genetics.

Content: This module is available only to students registered for the BSc4 (Augmented stream). It covers the syllabus of BIOL101 but, in addition, includes a substantial amount of supplementary material and tuition designed for students who are under-prepared for university-level studies to a maximum of 160 additional hours.

Practicals: See BIOL101.

Assessment: Tests/assignments (20%), practical reports (20%), 3 h practical test (10%); 3 h theory exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.
Age on Earth (Augmented)
BIOL196 P2 W2

Aim: To develop basic knowledge and understanding of the diversity of organisms, their origin and their importance.

Content: This module is available only to students registered for the BSc4 (Augmented stream). It covers the syllabus of BIOL102 but, in addition, includes a substantial amount of supplementary material and tuition designed for students who are under-prepared for university-level studies to a maximum of 160 hours.

Practicals: See BIOL102.

Assessment: Tests/assignments (30%), practical reports (20%); 3 h theory exam (50%).

DP Requirement: Class mark of 40%; attendance at 80% of tutorials and practicals.

Minimum to pass: 40% in each exam.

Credit may not be obtained for both BIOL195 and BIOL101. This module is worth 16 degree credits and 16 foundation credits.

Foundation Biology
BIOL199 PY WY

Corequisite: CHEM199, MATH199, PHYS199, (SCOM103 or 113).

Aim: To develop practical and cognitive science process skills, and basic content in biology.

Content: Nature of Life and biology; diversity & classification of living organisms; continuity of Life, ecological organization; cell structure and function; scientific method; natural selection and evolution; the rocky shore ecosystem; selected aspects from botany or zoology to teach generic academic skills.

Practicals: Related laboratory work and field excursions.

Assessment: June mark (15%), practicals, assignments and tests (15%), 3 h November practical test (20%); 3 h exam (50%).

DP Requirement: Class mark of 40%; 80% attendance at all lectures, tutorials, practicals and field excursions.

Year-long Module. This module is only for students in the Foundation Stream of the BSc4. It carries 20 foundation credits and 4 degree credits. Students may be required to contribute to the cost of field trips.

Biological Sciences Toolkit
BIOL200 P1 W1

Prerequisite Requirement: 64 C at Level 1.

Prerequisite Modules: BIOL101, 102 and STAT130.

Aim: To cover, within a biological/ecological context, experimental design, statistical analysis, and scientific writing.

Content: Experimental/Sampling design, hypothesis & prediction generation in biology. Collection & handling of biological data. Statistics as applied to biological problems, summary and interpretation of biological/ecological data. Training in scientific writing related to above course content.

Practicals: Hypotheses generation and testing, experimental design, biological data collection, computer based biological data analysis, data interpretation, scientific writing. Particular emphasis on reporting research methods, analyses and interpretation.

Assessment: Tests (20%); practical reports (15%); Project (15%); 3 h theory exam (50%).

DP Requirement: Class mark of 40%.

Minimum to pass: 40% in exam.

Plant and Animal Ecophysiology
BIOL204 P1 W1

Prerequisite Requirement: 64C at Level 1.

Prerequisite Modules: BIOL101, 102.

Aim: To provide a basic understanding of major physiological processes of plants and animals, and their relevance, in relation to environmental fluctuations.

Content: Plants: physical environment; germination, growth, flowering and senescence; photosynthesis; mineral
nutrition; water relations; stomatal physiology. Animals: Homeostasis & control theory; thermoregulation; osmoregulation, excretion; circulation; respiration; energy metabolism; endocrinology; nervous system; digestion. Application of key concepts to society.

**Practicals:** Skills covering the above concepts.

**Assessment:** Tests (15%), practical assessments, practical reports and scientific reports (35%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%.

**Subminimum to pass:** 40% in exam.

Credit may not be obtained for both BIOL204 and BIOL216.

### Modern Applications of Molecular Biology

**BIOL205 P2 W2**

**Prerequisite Requirement:** 64C at Level 1.

**Prerequisite Modules:** CHEM110, STAT130.

**Aim:** To introduce the fundamental concepts of molecular biology, their practical applications for biologists, and their relevance to society.

**Content:** Fundamental concepts (genome structure and organization, transcription, translation, control of gene expression) underlying the application of modern molecular biology to: molecular systematics, behavioural and conservation ecology, bioinformatics and society. Applications could include: fingerprinting, Human Genome Project, transcriptomics, forensics.

**Practicals:** Practical exercises linking the theoretical foundations with the applications outlined above.

**Assessment:** Tests and practical reports (50%); 3 h theory exam (50%).

**DP Requirement:** Class mark of 40%.

**Subminimum to pass:** 40% in exam.

### Plant Diversity and Use

**BIOL211 P2**

**Prerequisite Requirement:** 64 C at Level 1.

**Prerequisite Modules:** BIOL102.

**Aim:** To provide an evolutionary framework of the continuity from unicellular organisms through evolution of increasingly complex lifecycles to the explosive radiation of the Anthophyta. To provide skills in plant identification.

**Content:** Algae. Lichens. Liverworts & mosses. Lower vascular plants. Evolution of seeds; radiation of gymnosperms; key innovations. Origin and radiation of angiosperms, their success and diversification into contemporary families.

**Practicals:** Characteristic features, identification & recognition of plant groups, with special emphasis on grasses and trees; weekend field trip(s).

**Assessment:** Assignments (including plant collections) (15%), tests (15%), practical test (10%), essay (10%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%; attendance at field trip(s).

**Subminimum to pass:** 40% in exam.

Students may be required to contribute to the cost of the field trip(s). Credit may not be obtained for both BIOL211 and BIOL212.

### Angiosperm Evolution & Diversification

**BIOL212 W1**

**Prerequisite Requirement:** 64 C at Level 1.

**Prerequisite Modules:** BIOL102.

**Aim:** To develop understanding of angiosperm classification using DNA analyses, cladistic analyses and the latest fossil finds.

**Content:** Angiosperm structure & evolution: phylogenetic principles & structural evolution, angiosperm ancestry, flowering plants as creations of the insects & dinosaurs, angiosperm flower theories, angiosperm time & place of origin. Angiosperm diversification: evolutionary trends; importance of pollination syndromes, classificatory versus cladificatory hypothesis

**Practicals:** Use of diagnostic keys. Prominent & economically important South African flowering plant families.

**Assessment:** Practical reports (10%), plant collection (5%), seminar (5%), theory tests (15%), practical test (15%); 3 h theory exam (60%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.
Credit may not be obtained for both BIOL211 and BIOL212.

Invertebrate Diversity & Conservation
BIOL213 P1 (22L-18T-42P-0S-57H-15R-0F-0G-6A-13W-16C)
Prerequisite Requirement: 64 C at Level 1.
Prerequisite Modules: BIOL102.
Aim: To expose students to the diversity of invertebrates through working with them in natural habitats, and to develop the foundations of scientific skills and approaches in the context of exploring invertebrate diversity.
Content: Origin of and evolutionary trends in invertebrates. Classification and diversity. Identification of major groups.
Practicals: Sampling strategies for invertebrates. Invertebrate diversity and survival in different habitats (marine, freshwater and terrestrial).
Assessment: Tests (15%), scientific report (15%), assignments (20%), 2 h practical test (15%, externally examined); 3 h theory exam (35%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.
Credit may not be obtained for both BIOL213 and BIOL214.

Invertebrate Diversity & Ecology
BIOL214 W1 (12L-24T-42P-0S-62H-15R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64 C at Level 1.
Prerequisite Modules: BIOL102.
Aim: To introduce the diversity and ecological significance of the dominant invertebrates in marine and terrestrial habitats.
Content: Origin of and evolutionary trends in invertebrates. Invertebrate classification and diversity. Identification of major groups of invertebrates, with emphasis on marine phyla including an introduction to protozoans. Ecological importance of dominant marine and terrestrial taxa, emphasising their habitat, mode of feeding, and role in food-web processes.
Practicals: Field trips with subsequent analysis in laboratory; insect collection.
Assessment: Field assessment (10%), field-trip report (10%), insect collection (10%), class tests (20%); 3 h theory exam (50%).
DP Requirement: Class mark of 40%; attendance at field trip.
Subminimum to pass: 40% in exam.
Students may be required to contribute to the cost of the field trip. Credit may not be obtained for both BIOL214 and BIOL213.

Vertebrate Biology
BIOL222 P2 (31L-5T-48P-0S-55H-15R-0F-0G-6A-13W-16C)
Prerequisite Requirement: 64 C at Level 1.
Prerequisite Modules: BIOL102.
Aim: To enable students to acquire an understanding of the relationships and comparative biology of vertebrate animals.
Content: Classification, origin and evolution, anatomy and physiology, adaptive radiation and adaptation, life histories, behaviour, ecology, demography and social organisation of fishes, amphibians, reptiles, birds and mammals.
Assessment: Theory & practical tests (25%), practical reports (25%); 3 h theory exam (50%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.
Rangeland: Plants, Ecology and Management  
BIOL223 P1  
(27L-9T-36P-0S-68H-15R-0F-0G-5A-13W-16C)  
Prerequisite Requirement: 64C at Level 1.  
Prerequisite Modules: BIOL102.  
Aim: To introduce the principles of rangeland ecology and management in conservation, game ranching, agricultural & communal systems. To develop expertise in rangeland research techniques.  
Content: Key ecological principles and applications in range & wildlife management. Responses of grasses to defoliation, grazing systems, veld condition, fodder flow management, ecological & production characteristics of livestock systems, veld burning, rangeland monitoring techniques.  
Assessment: Tests (20%), assignments (10%), practical reports (20%); 3 h exam (50%).  
DP Requirement: Class mark of 40%; attendance at field trip.  
Subminimum to pass: 40% in exam.  

Marine Environment  
BIOL231 W2  
(27L-9T-36P-0S-68H-15R-0F-0G-5A-13W-16C)  
Prerequisite Requirement: 64C at Level 1.  
Prerequisite Modules: MATH133, (BIOL102 or GEOL102).  
Aim: To introduce the geological, chemical, physical & biological processes of the marine environment.  
Practicals: Measurement of particle size, sediment characterization, wave characteristics, flow rates, salinity, temperature, dissolved oxygen, photon flux, biomass and production.  
Assessment: Course work, practical exercises and tests (50%); 3 h exam (50%).  
DP Requirement: Class mark of 40%; attendance at field trip.  
Subminimum to pass: 40% in exam.  

Immune Systems  
BIOL233 W2  
(27L-9T-36P-0S-68H-15R-0F-0G-5A-13W-16C)  
Prerequisite Requirement: 64C at Level 1.  
Prerequisite Modules: BIOC203, BIOL101, 102.  
Aim: To introduce immunology & the functioning of the immune system, relating it to both cellular and molecular biology, but placing it in the context of vertebrate systems.  
Practicals: Appropriate to the above.  
Assessment: Tests (15%), Tutorials (10%), Practicals (10%), Essay (15%); 3 h Exam (50%).  
DP Requirement: Class mark of 40%.  
Subminimum to pass: 40% in exam.  

Cytology & Cellular Biology  
BIOL234 W2  
(29L-9T-36P-8S-56H-15R-0F-0G-7A-13W-16C)  
Prerequisite Requirement: 64C at Level 1.  
Prerequisite Modules: BIOC203, BIOL101, 102.  
Aim: To introduce the science of cell structure and function.  
Content: Theory and use of light and electron microscopy; cell walls, cellulose biosynthesis and specialization; the endomembrane and cytoskeletal systems; organelles; cell communication and signalling, ultrastructural morphology and functions of secretory tissues.
Practicals: Introduction to the principle and practice of light and electron microscopy; application of histo- and cyto-chemical tests to plant and animal cells. Histology.

Assessment: Seminar (5%), Assignment (5%), Theory Test (15%), Practical Test (15%), Practical Reports (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%.

Subminimum to pass: 40% in exam.

Professional Communication for Biologists
BIOL300 P1 W1 (7L-23T-3P-10S-117H-0R-0F-0G-0A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL at Level 2.
Prerequisite Modules: STAT130 or BIOL200.

Aim: To train students to contextualise, critically evaluate, synthesise & express biological information and concepts for a range of audiences.

Content: A sequence of iterative tasks focusing on a particular topic designed to develop core competencies required for the study of biology & its component disciplines. Particular emphasis on skills relating to contextualising, critically evaluating, synthesising & expressing biological information & concepts so that they can be effectively communicated to a range of audiences.

Assessment: Introductory exercise (5%), letter to the editor (15%), critical assessment of School seminars (15%), press conference (15%), multi-component review paper (50% externally examined).

DP Requirement: Not applicable.

Subminimum to pass: 50% weighted average in externally examined components.

This module has no supplementary exam. Available only to students registered for a qualification for which the module is core.

Community Ecology
BIOL303 P1 W1 (30L-6T-36P-37H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL.
Prerequisite Modules: BIOL200 or STAT130.

Aim: To understand the origin, maintenance & consequences of biological diversity in local communities.

Content: Patterns & processes in collections of species from particular places. Topics from, but not restricted to: community patterns; food webs; competition & disturbance in community assembly; species interaction & coexistence; succession; spatial dynamics & species-area theory; macroecological issues, landscape ecology.

Practicals: Field trip(s); sampling methods, data collection; measurement of diversity; classification & ordination; comparing community composition; species-area theory; succession–matrix models.

Assessment: 2 tests (20%), 3 prac & field-trip reports (20%), research-paper review (5%), seminar (5%); 3 h exam (50%).

DP Requirement: Class mark of 40%; attendance at field trips.

Subminimum to pass: 40% in exam.

Students will be required to contribute to the costs of the field trip(s).

Evolution and Systematics
BIOL304 P2 W2 (27L-5T-39P-0S-68H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL.
Prerequisite Modules: BIOL200 or STAT130.

Aim: To understand the processes of evolution, modern debates in evolutionary biology, phylogenetic estimation and biological systematics.


Practicals: Selected from the topics above.

Assessment: Review essay (15%), Test (15%), Practical reports (20%); 3 h exam (50%).

DP Requirement: Class mark of 40%.

Subminimum to pass: 40% in exam.
Applied Biotechnology
BIOL315 P2
(29L-10T-36P-5S-59H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2.
Prerequisite Modules: BIOL101.
Aim: To introduce students to the principles of plant bio- and molecular technology and their applications (in agriculture and industry).
Assessment: Tests (10%), essay (5%), practical reports (20%), seminar (5%); 3 h exam (60%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.
Credit may not be obtained for both BIOL315 and BIOL316.

Animal and Plant Biotechnology
BIOL316 W2
(36L-33T-3P-20S-47H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL modules.
Prerequisite Modules: (BIOL200 or STAT130); BIOL205.
Aim: To introduce students to the basic concepts of genetic engineering and biotechnology and their applications to the fields of agriculture, forestry, animal husbandry, medicine, forensics, etc.
Assessment: Tests (25%), tutorial assignments (10%), poster (15%); 3 h exam (50%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.
Credit may not be obtained for both BIOL316 and BIOL315.

Plant Growth and Development
BIOL321 P1
(29L-10T-36P-0S-64H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2.
Prerequisite Modules: BIOL101, 102.
Aim: To provide understanding of scientific principles with respect to biotic and abiotic factors that play a role in correlative processes.
Content: Scientific principles with respect to biotic and abiotic factors that play a role in correlative processes such as germination, juvenility, rooting, apical dominance, flowering, senescence, abscission and plant movements.
Assessment: Tests/assignments (20%), practical reports (20%); 3 h theory exam (60%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.

Insect Diversity and Evolution
BIOL322 P1
(30L-9T-36P-0S-63H-16R-0F-0G-6A-13W-16C)
Prerequisite Requirement: 64C at Level 2.
Prerequisite Modules: BIOL102.
Aim: To develop an understanding of the evolutionary relationships of insects, their diversity, comparative biology and relevance to human society.
Content: Functional morphology and ontogenetic systems of insects; life histories, ecological interactions, biological requirements, biotic significance and classification of important families of all orders of insects, emphasising evolutionary relationships, adaptations and relevance to human society.
Assessment: Review paper (10%), practical reports (8%), theory and practical tests (12%), insect collection (20%); 3 h exam (50%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.
Advanced Rangeland Ecology
BIOL323 P1
(27L-12T-36P-0S-64H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL.
Prerequisite Modules: BIOL200 or STAT130.
Aim: To provide a grounding in applied rangeland ecology & objective-based management.
Content: Determinants of community composition in natural and transformed rangelands; the roles of disturbance and competition for resources. Productivity, carrying capacity, stocking rates, secondary productivity in complex, dynamic interactive systems. Management & rehabilitation of vegetation types to achieve particular outcomes. Historical & contemporary theories of rangeland function.
Practicals: Manipulative experiments to examine determinants of community composition; long-term ecological trials; transformed rangelands; weekend field trip.
Assessment: Practical reports (10%), assignment (20%), class tests and spot tests (20%); 3 h exam (50%).
DP Requirement: Class mark of 40%; attendance at field trips.
Subminimum to pass: 40% in exam.
Students may be required to contribute to the cost of the field trip(s).

Evolutionary Animal Physiology
BIOL324 P1
(27L-3T-36P-0S-73H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL.
Prerequisite Modules: BIOL200 or STAT130.
Aim: To explore the evolution of physiological diversity and adaptation, following the theme of tracing the fate of energy from the environment to offspring.
Content: Environmental resource availability, gross energy of consumption, metabolizable energy, maintenance energy, net energy, production energy, reproductive energy, energetic basis of fitness, physiological adaptation.
Practicals: Mammalian digestive systems, rumen morphology and physiology, bomb calorimetry, respirometry, telemetric systems, analysis of energetic data, the comparative method, quantitative genetics of energetic parameters, analysis of life-history data.
Assessment: Scientific papers (40%), tests (10%); 3 h exam (50%).
DP Requirement: Class mark of 40%.
Subminimum to pass: 40% in exam.

Reproductive & Behavioural Ecology
BIOL325 P2
(30L-5T-46P-0S-58H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL.
Prerequisite Modules: BIOL200 or STAT130.
Aim: To develop an understanding of evolutionary ecology. To encourage critical thought and the ability to construct and test hypotheses in evolutionary ecology.
Practicals: 10 laboratory exercises and a weekend field trip.
Assessment: Theory tests (20%), reports (12%), mini-project report (18%); 3 h exam (50%).
DP Requirement: Class mark of 40%; attendance at field trip.
Subminimum to pass: 40% in exam.
Students may be required to contribute to the cost of the field trip.

Marine Systems
BIOL341 W1
(27L-5T-46P-0S-58H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL.
Prerequisite Modules: BIOL200 or STAT130.
Aim: To contextualise interactions among marine organisms and between these organisms and their environment, emphasising that many marine ecosystem services vital to the global biosphere emerge only at the ecosystem level.
Content: The Earth as a system. Overviews of marine systems, their ecosystem processes and their future. Ocean systems in relation to biogeochemical cycles, climate and humanity from a local to global perspective.

Practicals: Selected from the topics above, including group work. Field Trip(s).

Assessment: Practical reports (20%), class tests (30%), 3 h exam (50%, externally examined).

DP Requirement: Attendance at field trip(s). Class mark of 40%.

Students will be required to contribute to the costs of the field trip(s).

Marine Ecophysiology
BIOL342 W2  
(27L-9T-36P-0S-67H-16R-0F-0G-5A-13W-16C)

Prerequisite Requirement: 64C at Level 2 including 32C BIOL modules.

Prerequisite Modules: (BIOL200 or STAT130); BIOL204.

Aim: To focus on the physiological functioning of animals, algae and plants in relation to the marine environment.

Content: Animals: feeding, growth and production; respiration and diving mammals; water density and strategies used to achieve neutral buoyancy; osmotic regulation in marine vertebrates and invertebrates; nitrogen excretion and utilisation. Algae and plants: effects of light intensity and quality, temperature, salinity, nutrient status, pigments, osmotic balance on growth, stress and production.

Practicals: Selected from the topics above.

Assessment: Practical reports (25%), class tests (25%); 3 h exam (50%).

DP Requirement: Class mark of 40%.

Subminimum to pass: 40% in exam.

Applied Marine Biology
BIOL343 W2  
(29L-9T-36P-0S-47H-16R-0F-20G-3A-13W-16C)

Prerequisite Requirement: 64C at Level 2 including 32C BIOL modules.

Prerequisite Modules: (BIOL200 or STAT130); BIOL231.

Aim: To provide students with an understanding of practical and conceptual applications of marine biological principles.

Content: Concepts and applications, including marine conservation, mariculture and biotechnology, marine pollution, coastal-zone management, sustainable utilization and fisheries science.

Practicals: Selected from the topics above. Field trip(s).

Assessment: Assignments (50%); 3 h theory exam (50%).

DP Requirement: Class mark of 40%; attendance at field trips.

Subminimum to pass: 40% in exam.

Students may be required to contribute to the cost of the field trip(s).

Parasites and People
BIOL344 W1  
(29L-18T-18P-0S-73H-16R-0F-0G-6A-13W-16C)

Prerequisite Requirement: 64C at Level 2.

Prerequisite Modules: BIOL101, 102.

Aim: To survey animals that cause parasitic disease in people in South Africa, to identify those of public-health importance and to discuss measures to control them.


Practicals: Selected from the topics above.

Assessment: Practical write-ups (15%), test (10%), essay (15%, externally examined), practical test (20%); 3 h theory exam (40%).

DP Requirement: Class mark of 40%.

Subminimum to pass: 40% in exam.
**Functional Cell Architecture**

**BIOL345 W1**

(27L-18T-39P-0S-52H-16R-0F-0G-8A-13W-16C)

**Prerequisite Requirement:** 64C at Level 2.

**Prerequisite Modules:** BIOL205.

**Aim:** To provide an overview of structure, function and coordination at the subcellular, cellular and tissue levels in plants and animals.


**Practicals:** Theory & practice of light microscopy, transmission & scanning electron microscopy and adjunct techniques. Microscopical image recording. Mini-project.

**Assessment:** Theory tests (25%); mini project report (10%); practical test (15%); 3 h theory exam (50%).

**DP Requirement:** Class mark of 40%.

**Subminimum to pass:** 40% in the exam.

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**Pollution and Remediation Biology**

**BIOL347 W1**

(29L-21T-18P-0S-71H-16R-0F-0G-5A-13W-16C)

**Prerequisite Requirement:** 64C at Level 2 including 32C BIOL.

**Prerequisite Modules:** BIOL200 or STAT130.

**Aim:** To apply theoretical concepts from cellular biology to contemporary environmental problems involving pollution.

**Content:** Basic principles of pollution, ecotoxicology and remediation. These include: (1) the nature, sources and ultimate fate of pollutants, (2) the effect of pollutants on all levels of organization, including biochemical, cellular, whole organism, populations, communities and ecosystems, and (3) remediation of polluted ecosystems.

**Practicals:** Preparation and presentation of a scientific poster. Mini-project on a topic selected from above content.

**Assessment:** Tests (25%), Mini-project (15%), Poster presentation (10%); 3 h Exam (50%).

**DP Requirement:** Class mark of 40%.

**Subminimum to pass:** 40% in exam.

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**Applied Plant Physiology**

**BIOL348 W2**

(28L-0T-39P-0S-72H-16R-0F-0G-5A-13W-16C)

**Prerequisite Requirement:** 64C at Level 2 including 32C BIOL.

**Prerequisite Modules:** BIOL200 or STAT130.

**Aim:** To illustrate the importance of whole-plant physiology in the growth and performance of plants in natural and managed ecosystems.

**Content:** Advanced plant water relations: pressure-volume curves; transpiration; modelling of evapotranspiration; hydraulic characteristics. Photosynthesis: response of assimilation to intercellular CO₂; stomatal limitations; water-use efficiency; introduction to chlorophyll fluorescence. Stress physiology: responses of plants to environmental stresses; stress resistance; determinants of plant growth & productivity.

**Practicals:** Modern techniques in plant ecophysiology; mini-project.

**Assessment:** Reports on practical exercises (30%), tests (20%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%.

**Subminimum to pass:** 40% in exam.

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**Seeds and Vegetative Propagation**

**BIOL349 W1**

(29L-15T-36P-0S-58H-16R-0F-0G-6A-13W-16C)

**Prerequisite Requirement:** 64C at Level 2 including 32C BIOL.

**Prerequisite Modules:** BIOL200 or STAT130.

**Aim:** To provide students with an insight into the theoretical information and practical skills relevant to this applied field of plant sciences.

**Content:** Seed structure and development, water in seeds, orthodox and recalcitrant/non-orthodox seeds. Traditional and modern approaches to plant propagation and breeding (e.g. macro- and micropropagation, *in vitro* cultures) and germplasm conservation. Applications to agriculture, forestry and conservation.

**Practicals:** Selected exercises from the topics above.
Assessment: Tests (25%), practical write-ups (25%); 3 h exam (50%).

Subminimum to pass: 40% in exam.

Developmental Biology
BIOL350 W2
(29L-9T-33P-6S-62H-16R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 64C at Level 2 including 32C BIOL modules.
Prerequisite Modules: (BIOL200 or STAT130); BIOL205.
Aim: To provide an overview of core concepts & principles of Developmental Biology and their application to society.
Content: Topics selected from, but not restricted to: Gametogenesis, from sperm to egg to embryo, germ cells, genetic regulation of development, organizing the multicellular embryo (morphogenesis); generating cell diversity (Hox genes, cell determination & differentiation, programmed cell death). Application of selected key concepts to society, including: Reproductive (fertility) technology, development & cancer.
Practicals: Cell culture, fertilization & early development in the sea urchin & chick, environmental effects on development.
Assessment: Practical reports (10%), Seminar (15%), Tests (25%); 3 h exam (50%).

Subminimum to pass: 40% in exam.

Biology/Ecology Research Project
BIOL390 PB WB
(0L-6T-98P-0S-56H-0R-0F-0G-0A-13W-16C)
Prerequisite Requirement: 96C at Level 2 including 48C BIOL.
Prerequisite Modules: BIOL200 or STAT130.
Aim: To introduce students to independent research in biological and/or ecological sciences, thereby improving their problem-solving abilities, and increasing their interest in and enthusiasm for the subject matter.
Content: Conception, design, execution and reporting of a small independent research project chosen from a list appropriate to the student's qualification/specialisation (as approved by the School) and supervised by individual staff members.
Assessment: Performance and attitudes (30%), project write-up (draft (20%), final (50%, externally examined)).

Subminimum to pass: 50% in project write-up.
Offered in Semester 1 and 2. This module has no supplementary exam. Available only to students registered for a qualification for which the module is core and who are in their final or penultimate year of registration.

Marine Biology Research Project
BIOL391 WB
(0L-6T-98P-0S-56H-0R-0F-0G-0A-13W-16C)
Prerequisite Requirement: 96C at Level 2 including 48C BIOL.
Prerequisite Modules: BIOL200 or STAT130.
Aim: To introduce students to independent research in Marine Biology, thereby improving their problem-solving abilities, and increasing their interest in and enthusiasm for the subject matter.
Content: Conception, design, execution and reporting of a small independent research project chosen from a list appropriate to Marine Biology (as approved by the School) and supervised by individual staff members.
Assessment: Performance and attitudes (30%), project write-up (draft (20%), final (50%, externally examined)).

Subminimum to pass: 50% in project write-up.
Offered in Semester 1 and 2. This module has no supplementary exam. Available only to students registered for the Marine Biology Programme.

Biology/Ecology Tools and Skills
BIOL701 P1 W1
(36L-36T-36P-10S-42H-0R-0F-0G-0A-6W-16C)
Prerequisite Requirement: 64C at Level 3 in biological and/or ecological sciences.
Aim: To provide skills for planning, implementing, analyzing and interpreting research in ecology and biology.
Content: Two compulsory sections are (a) Introduction to the philosophy of biology (quarter of module), and (b)
Introduction to statistical analysis for biological research (quarter of module). The remainder will be skills-based options decided in consultation with academic staff, including advanced biological statistics (multivariate techniques), electron microscopy, bioinformatics, radiochemistry, museum techniques, botanical techniques, GIS, ecological field techniques.

Practicals: As appropriate.
Assessment: Performance & attitudes (30%), project write-up (draft (20%), final (50%, externally examined)).
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
This module has no supplementary exam.

Terrestrial Biodiversity
BIOL711 WC
Prerequisite Requirement: 64C at Level 3 in biological sciences.
Aim: To introduce advanced aspects of terrestrial biodiversity classification, measurement and management.
Content: A common assignment and seminar are undertaken by all students after which they may opt to pursue one of three themes: floristic, faunal or ecological diversity. Topics covered will include biological classification, species concepts, reproductive biology, biogeography, patterns and determinants of diversity, interspecific interactions, and biological invasions.
Practicals: Field trips may be undertaken to museums, herbaria, field stations or botanical gardens.
Assessment: Continuous (100%); exercises comprising at least 50% of the final mark externally examined.
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. Students may be required to contribute to the cost of the field trip(s). This module has no supplementary exam.

Parasitology
BIOL712 WC
Prerequisite Modules: BIOL344.
Aim: To provide an overview of some of the aspects of parasitology, notably in the biomedical field, that are currently being debated in the literature.
Content: A selection of three topics that are of current interest to medical parasitologists worldwide. These topics may change from year to year. Examples are: host manipulation by parasites, emerging diseases, drug and insecticide resistance in parasites and arthropod vectors respectively, the DDT dilemma in malaria control, the use of GIS in control-programme planning. Weekly tutorials to discuss issues arising from the assignments.
Assessment: Continuous (100%); exercises comprising at least 50% of the final mark externally examined.
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Biodiversity Dynamics
BIOL713 WC
Prerequisite Requirement: 64C at Level 3 in Biological Sciences.
Aim: To understand biodiversity dynamics through analyses and interpretations of ecosystem processes.
Content: The functioning of ecological systems. Techniques for the analysis of complex systems and for the detection of different order processes. Scaling effects and fractal structures in systems analysis. Assembly rules in community ecology. The approach will be modern, from the perspective of ecosystems being dynamic.
Assessment: Continuous (100%); exercises comprising at least 50% of the final mark externally examined.
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Molecular Ecology and Systematics
BIOL715 WC
**Aim:** To introduce students to basic concepts of molecular systematics, bioinformatics, phylogeography and conservation genetics.

**Content:** Species concepts, population dynamics, data used for molecular systematic analysis, methods used to infer phylogenies, phylogeography and conservation genetics. Basic bioinformatics: sequence retrieval from internet-based sequence databases, multiple sequence alignments and phylogenetic inference using appropriate analysis packages. The mode of delivery will include lectures, seminar presentations by students and hands-on computer-based bioinformatics tutorials.

**Assessment:** Seminar (20%), essay (30%), bioinformatics project (50%, externally examined).

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined component.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

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**Plant Ecophysiology**

**BIOL716 WC**

**Prerequisite Requirement:** 64C at Level 3 in biological sciences.

**Aim:** To illustrate the importance of whole-plant physiology in the growth and performance of plants in natural and managed ecosystems.

**Content:** Tailored to suit the interests of the participants. Key fields followed by case studies. Key fields include: determinants of plant growth, plant-water relations and photosynthesis. Case studies will be selected from the following list: sun/shade adaptations, effects of elevated atmospheric CO₂, relationship between xylem hydraulic conductivity and leaf physiology, and selected examples of stress physiology.

**Assessment:** Continuous (100%); exercises comprising at least 50% of the final mark externally examined.

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

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**Recent Advances in Applied Entomology**

**BIOL721 PC**

**Prerequisite Requirement:** 32C from AGPS308, BIOL213, 322, or suitable alternatives.

**Aim:** To enable students to specialize in topics of their choice from the broad field of applied entomology in order to acquire the most recent information and approaches.

**Content:** Choice of a relevant topic in any two fields of applied entomology, such as systematics, integrated pest management, biological control, forensic science and medical or veterinary entomology.

**Assessment:** Continuous: Seminar (20%), review paper (30%); Final test (50%, externally examined).

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

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**Rangeland Ecology: Soil/Plant Interactions**

**BIOL722 PC**

**Prerequisite Requirement:** 64C at Level 3 in biological and/or ecological sciences.

**Aim:** To consolidate knowledge of important specialist topics in range and wildlife science in the soil/plant continuum.

**Content:** Choice of four specialist topics in consultation with staff. Topics include resource degradation, principles of rehabilitation, revegetation, management to arrest and reverse degradation for sustainability of commercial livestock, communal livestock and game-ranching systems. Review of papers and synthesis of literature interspersed with tutorial discussions.

**Practicals:** Field trip(s) to appropriate locations.

**Assessment:** Assignments (20%), seminars (20%), reports (60%, externally examined).

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam. Students may be required to contribute to the cost of the field trip(s).**
Rangeland Ecology: Plant/Animal Interactions
BIOL723 PC
(12L-36T-20P-10S-82H-0R-0F-0G-0A-7W-16C)
Prerequisite Requirement: 64C at Level 3 in biological and/or ecological sciences.
Aim: To consolidate knowledge of important specialist topics in range and wildlife science in the plant/animal continuum.
Content: Choice of specialist topics in consultation with staff. Topics focus on plant-animal interactions with emphasis on grazing and browsing behaviour, patterns, impacts and management for domestic livestock under different management systems and wild herbivores in game ranching and conservation systems. Review of papers and synthesis of literature interspersed with tutorial discussions.
Practicals: Field trip(s) to appropriate locations, collection, analysis and synthesis of data.
Assessment: Assignments (20%), seminars (20%), reports (60%, externally examined).
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam. Students may be required to contribute to the cost of the field trip(s).

Conservation Ecology
BIOL724 PC
(15L-8T-25P-10S-82H-10R-0F-10G-0A-7W-16C)
Prerequisite Requirement: 64C at Level 3 in ecological or biological sciences.
Aim: To provide students with an understanding of conservation problems ranging from small populations to ecosystems, and the tools and skills required for managing these.
Content: Factors creating small populations, biological implications, and strategies for managing small populations. Case studies of small populations and metapopulations. Experimental approaches to conservation. Holistic conservation at the landscape level.
Practicals: Analysis and interpretation of population data, interpretation of other data. Group project to design a research strategy.
Assessment: Modelling exercises (30%), seminars based on readings (20%), assignments (50%, externally examined).
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Insects and Alien-Plant Control
BIOL726 PC
(10L-14T-36P-0S-100H-0R-0F-0G-0A-7W-16C)
Prerequisite Requirement: 64C at Level 3 in biological and/or ecological sciences.
Aim: To provide an understanding of biological invasions and the management of alien invasive plants, in particular the initiation and management of a biological-control programme against an alien weed.
Practicals: Trips to field sites & research organisations.
Assessment: Practical reports and assignments (60%, half externally examined), research-design report (40%, externally examined).
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam. Students may be required to contribute to the cost of the field trips.

Cytotaxonomy and Biodiversity
BIOL731 WC
(0L-30T-0P-105H-12R-0F-10G-3A-7W-16C)
Prerequisite Requirement: 64C at Level 3 in biological sciences.
Aim: To provide in-depth understanding of speciation and mechanisms of reproductive isolation.
Content: Classification systems. Biological, recognition, phylogenetic concepts of species. Speciation theory.

**Assessment:** Continuous: Tutorial participation (10%), essay (20%), data-set analysis (20%); final test (50%, externally examined).

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

**Topics in Evolutionary Biology**

**BIOL732 PC**

(0L-33T-20P-16S-91H-0R-0F-0G-0A-7W-16C)

**Prerequisite Requirement:** 64C at Level 3 in biological sciences.

**Aim:** To expose students to contemporary methods and recent advances in evolutionary biology.

**Content:** Topics such as: Comparative method; evolutionary physiology; evolutionary biogeography; hominid evolution; measuring phenotypic selection; plant-herbivore coevolution.

**Practicals:** As appropriate to content.

**Assessment:** Assignments (60%), review essay (30%), seminar (10%) (components comprising at least 50% of the final mark externally examined).

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

**Plant Breeding Systems**

**BIOL733 PC**

(16L-4T-7P-13S-107H-10R-0F-0G-3A-7W-16C)

**Prerequisite Requirement:** 64C at Level 3 in biological or agricultural sciences.

**Aim:** To develop an understanding of plant breeding systems.

**Content:** Sexual versus asexual reproduction, outbreeding versus selfing, self-incompatibility mechanisms, heteromorphy, sex expression, determinants of seed production, evolutionary trends, ecological consequences of breeding systems for rarity and colonization ability, mating-system analysis.

**Practicals:** Controlled hand-pollination experiments.

**Assessment:** Continuous: Seminar (25%), essay (25%); final test (50%, externally examined).

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

**Plant Biosystematics**

**BIOL734 WC**

(0L-12T-0P-0S-140H-5R-0F-0G-3A-7W-16C)

**Prerequisite Requirement:** 64C at Level 3 in biological sciences.

**Aim:** To introduce students to advanced aspects of plant biosystematics.

**Content:** Students may choose from a range of topics which include plant biodiversity and classification, phanetics, cladistics, species concepts, reproductive biology, pollination biology and plant biogeography.

**Assessment:** Continuous: Four assignments (80%), Portfolio (20%). All assessments externally examined.

**DP Requirement:** Not applicable.

**Subminimum to pass:** 50% weighted average in externally examined components.

**Offered in either Semester 1 or 2. This module has no supplementary exam.**

**Functional Cell Biology**

**BIOL741 WC**

(0L-30T-0P-0S-130H-0R-0F-0G-0A-7W-16C)

**Prerequisite Requirement:** 64C at Level 3 in cell biology or related subjects.

**Aim:** In-depth exploration of the literature to reveal contemporary views on selected topics in Cell Biology, by means of participatory discussion and critique.

**Content:** A selection of major themes that emphasise intracellular integration of structure and function, drawn mainly from topical review articles and amplified by material from current opinion in Cell Biology.

**Assessment:** Continuous (100%); exercises comprising at least 50% of the final mark externally examined.
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Plant Ultrastructure
BIOL744 WC
(0L-10T-40P-14S-89H-4R-0F-0G-3A-7W-16C)

Prerequisite Requirement: 48C at Level 3 in plant sciences.

Aim: To introduce students to advanced aspects of plant cell structure and function.

Content: A common assignment and seminar are undertaken by all students after which they may opt to pursue one of two themes: secretory structures in important medicinal plant species or secretory structures in halophytes. Topics covered include the endomembrane system; intracellular transport involving ion localization, vesicular traffic and the use of fluorescent proteins to 'light up' secretory pathways. Studies will include use of state-of-the-art equipment in electron microscopy.

Practicals: As required by the topic chosen.
Assessment: Continuous: Seminar (10%), portfolio (10%), assignments (30%); final test (50%, externally examined).

DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Bioprocesses Engineering
BIOL745 WC
(0L-28T-12P-103H-14R-0F-0G-3A-7W-16C)

Prerequisite Requirement: 64C at Level 3 in biological, environmental and/or chemical sciences.

Aim: To expose students to the application of the metabolic processes of microorganisms in solving waste-treatment problems.

Content: A selection of the following topics will be covered: wastewater characterisation, microbial growth kinetics, activated sludge processes, hydrolysis, nitrification/denitrification, biological phosphorus removal, anaerobic digestion processes, methanogenesis, bioenergetics, health implications of waste-treatment technologies, sustainability of waste-treatment technologies.

Practicals: Field visit; spreadsheet-based modelling exercises.

Assessment: Continuous: Participation in discussions (10%), assignments (40%); final test (50%, externally examined).

DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam. Students may be required to contribute to the cost of the field trip.

Plant Biotechnology
BIOL747 WC
(0L-24T-0P-100H-36R-0F-0G-0A-7W-16C)

Prerequisite Requirement: 48C at Level 3 in plant sciences.

Aim: To investigate, discuss and debate the methodologies, applications and risks of plant tissue culture, genetic engineering and other plant biotechnologies.

Content: Various in vitro culture systems, cryopreservation and genetic engineering. Emphasis will be on applications to crop improvement, food production and conservation, public perceptions, risk assessment and patents. Efforts will be directed at including up-to-date topics and technologies as new developments occur.

Assessment: Essays (40%), written critiques of colleagues’ submissions (20%), open-book assignment (40%) (components comprising at least 50% of the final mark externally examined).

DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Cryobiology
BIOL748 WC
(0L-30T-60P-70H-0R-0F-0G-0A-7W-16C)

Prerequisite Requirement: 64C at Level 3 in biological sciences.
Aim: To establish a sound foundation of the theory and practice of cryopreservation relevant to biodiversity conservation, biomedical and commercial spheres, and specialised microscopy.

Content: Overview and historical perspectives; water and biophysics of freezing; fundamentals of cryopreservation; applications of cryobiology; procedures to optimise specimen recovery; in vitro practices; retention of genetic and phenotypic fidelity; cryomicroscopy; etc.

Practicals: The practical application of fundamental principles to achieve survival of cryopreservation of biological material.

Assessment: Continuous (100%); exercises comprising at least 50% of final mark externally examined.

Offered in either Semester 1 or 2. This module has no supplementary exam. Students may be required to contribute to the cost of the field trips.

Desiccation Tolerance in Seeds and Plants

BIOL749 WC

Prerequisite Requirement: 64C at Level 3 in biological sciences.

Aim: To gain an appreciation of the differences and similarities between desiccation sensitivity and tolerance in seeds and vegetative plant parts, by means of participatory discussion and critique.

Content: A selection of major themes that underlie the complexities of acquisition and maintenance of desiccation tolerance in seeds and vegetative plant tissues, compared with similar material that is desiccation sensitive. Discussions will be based on contemporary literature and current research.

Assessment: Continuous (100%); exercises comprising at least 50% of the final mark externally examined.

Offered in either Semester 1 or 2. This module has no supplementary exam.

Biomarkers of Environmental Change

BIOL750 WC

Prerequisite Requirement: 96C at Level 3 in biological and/or environmental sciences.

Aim: To provide an overview of core concepts and principles of Biomarker development and its application in a changing environment.

Content: Topics selected from, but not restricted to: Biomarkers and their application, biomarker characterization, cholinesterases, DNA techniques, mixed function oxygenases, conjugative enzymes, endocrine disrupting compounds, histopathology, limitations to the biomarker approach, from biomarker to ecological effects.

Practicals: Skills covering concepts selected from the above.

Assessment: Practical report (20%), seminar (20%), assignments (60%, externally examined).

Offered in either Semester 1 or 2. This module has no supplementary exam.

Stress Physiology and Plant Genes

BIOL762 PC

Prerequisite Requirement: 64C at Level 3 in biological sciences.

Aim: To elucidate the physiological responses of plants to environmental conditions that deviate significantly from those that are optimal, and to introduce the technologies to genetically alter the responses of plants to stress.


Assessment: Continuous: Assignments (15%), seminars (15%), final test (70%, externally examined).

Offered in either Semester 1 or 2. This module has no supplementary exam.
Advanced Plant Physiology
BIOL763 PC (30L-18T-12P-10S-70H-15R-0F-0G-5A-6W-16C)
Prerequisite Requirement: 64C at Level 3 in biological sciences.
Aim: To provide in-depth insight into how plants function at cellular, tissue and organ levels. To provide opportunities to manipulate plant growth by application of biotechnology techniques.
Practicals: Hormone extraction and manipulation. Secondary-metabolite extraction and identification.
Assessment: Continuous: Tests (7%), assignments (18%), seminars (5%), final test (70%, externally examined).
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Terrestrial African Vertebrate Zoology
BIOL764 PC (10L-20T-50P-15S-40H-0R-0F-20G-5A-7W-16C)
Prerequisite Requirement: 64C at Level 3 in Zoological or Animal Sciences.
Aim: To educate and train students in aspects of the origins and phylogeny, biogeography, environmental physiology, ecology and conservation of terrestrial African vertebrates (reptiles, birds and mammals).
Content: Origins of the African terrestrial vertebrate fauna; phylogeny and inter-relationships; African endemics and endangered species; adaptations to the African environment (unpredictability and extremes); ecology and conservation of keystone and flagship species.
Practicals: Field Trips. Hormone extraction and manipulation. Secondary-metabolite extraction and identification.
Assessment: Test (50%), Assignments (25%), Practicals-project-field course (25%).
DP Requirement: Not applicable.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Marine Biodiversity
BIOL781 WC (4L-30T-0P-10S-98H-15R-0F-0G-3A-7W-16C)
Prerequisite Requirement: 64C at Level 3, of which 32C or equivalent must be in Aquatic/Marine topics.
Aim: To gain understanding of some of the most recent findings and issues involving the diversity of marine organisms and ecosystems, through critical review and analysis of current literature.
Content: International and local conventions for the protection of marine biodiversity; species and ecosystem diversity; diversity and biogeography of marine organisms, with emphasis on southern Africa; detailed analysis of special ecosystems, such as hydrothermal vents, coral reefs, upwelling areas, estuaries, polar oceans, etc.
Assessment: Continuous: Seminars with written reports (50%); final test (50%, externally examined).
DP Requirement: Not applicable.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Fisheries Science
BIOL782 WC (0L-49T-0P-0S-63H-18R-0F-30G-0A-7W-16C)
Prerequisite Requirement: 64C at Level 3 in biological sciences, of which 32C or equivalent must be in Aquatic/Marine topics.
Aim: To provide students with the basic concepts of marine-resource stock assessment, and the nature of fisheries in South Africa, and to expose them to some standard fishery analyses.
Content: Introduction to the theory of fisheries stock assessment and practical assessment modelling; synopsis of the various fisheries sectors in South Africa; mini-project (class task) analysing aspects of a local fishery, possibly including fieldwork.
Practicals: Catch Per Unit Effort (CPUE) assessment; stock-assessment modelling.
Assessment: Tutorials (25%), modelling practicals (25%), mini-project (50%, externally examined).
DP Requirement: Attendance at all tutorials.
Subminimum to pass: 50% weighted average in externally examined components.
Offered in either Semester 1 or 2. This module has no supplementary exam.
Marine Ecosystem Analysis
BIOL784 WC

Prerequisite Requirement: 64C at Level 3 in biological sciences, of which 32C or equivalent must be in Aquatic/Marine topics.

Aim: To understand marine ecosystem functioning through theory discussions and data analyses.

Content: Marine ecosystem structure and functioning, resilience and organization; food-web analysis; species trophic interdependencies; indirect interspecies effects; trophic cascades, including top-down vs. bottom-up effects; species competition and mutualism; trophic-flow networks; nutrient cycling; energy flow; trophic signatures; ecosystem indices. Computer-based exercises to analyse and interpret trophic-flow networks.

Assessment: Continuous (100%); exercises comprising at least 50% of final mark externally examined.

DP Requirement: Not applicable.

Subminimum to pass: 50% weighted average in externally examined components.

Offered in either Semester 1 or 2. This module has no supplementary exam.

Biology/Ecology Research Project
BIOL790 PY WY

Corequisite: BIOL701.

Aim: To gain experience in formulation, planning, execution, analysis and reporting of a research project, and mastery of relevant techniques.

Content: Supervised research project requiring the student to collect, analyse and evaluate data, integrate practical and theoretical skills, develop independent and critical thought, and communicate effectively in the form of written and oral reports. Students will be provided with a list of supervisors and possible research topics. The choice of the research project will be decided by discussion between the student and supervisor.

Assessment: 2 presentations: project proposal & research findings (10%), written project proposal (5%), research report (85%, externally examined).

DP Requirement: Not applicable.

Subminimum to pass: 50% in project write-up.

Year-long module. This module has no supplementary exam.

Applied Cell Biology for Env Engineers
BIOL851 HC

Aim: To acquaint students without a biological background with the basic concepts of general biology, biochemistry & microbiology relevant to environmental engineering.

Content: Biological macromolecules; heredity & molecular biology; prokaryotic & eukaryotic cells; phylogeny of bacteria; microbial ecology; metabolic pathways; bioenergetics; enzyme kinetics; enzyme inhibition & regulation; microbial growth and Monod kinetics; overview of biological processes applied to waste treatment.

Practicals: Use of light microscope; identification of micro-organisms; aseptic laboratory technique; kinetic constants for a simple enzyme-catalysed reaction.

Assessment: Class test (10%), tutorials (10%), practical reports (15%), self-study assignment (15%); 3 h open-book exam (50%).

DP Requirement: Class mark of 40%.

Offered to Engineering students only.

Coursework Marine Biology Dissertation
BIOL880 WB

Prerequisite Requirement: 48C at Level 7, or permission of Dean.

Aim: To generate research analytical and writing skills at the postgraduate level, with emphasis on critical review of literature and collection/processing of new original data.

Content: Literature review, preparation of proposal, collection and analysis of data and samples, critical interpretation of results in relation to management issues.

Assessment: Mini-dissertation (100%).

DP Requirement: Not applicable.

Offered in Semester 1 and 2. This module has no supplementary exam.
Coastal Ecology  
BIOL884 WC  
(6L-18T-0P-16S-115H-2R-0F-0G-3A-7W-16C)  
Prerequisite Requirement: 48C at Level 3 in relevant biological sciences, or permission of Dean.  
Aim: To investigate in depth selected aspects relating to the nature of the South African coastal environment, plant and animal adaptations, ecosystem function and coastal management.  
Content: The nature of the biologically relevant components of the South African coastal environment. Physiological and behavioural adaptations of selected species of the coastal flora and fauna. Ecosystem function. Coastal management.  
Assessment: Continuous: Assignments combining written and oral presentations (50%); final test (50%, externally examined).  
DP Requirement: Not applicable.  
Subminimum to pass: 50% weighted average in externally examined components.  
Offered in either Semester 1 or 2. This module has no supplementary exam.

Biometry  
Offered in the School of Mathematics, Statistics and Computer Science

Multiple Regression Analysis  
BMET314 P1  
(20L-0T-15P-0S-31H-10R-0F-0G-4A-13W-8C)  
Prerequisite Modules: STAT130 or STAT230 or BMET210.  
Aim: To provide an overview of multivariate regression methods, including logistic regression.  
Content: Review of matrix algebra. Multiple linear regression methods, including least squares estimates, the variance-covariance matrix associated with such estimates and the concept of studentized residuals. Various forms of residual analytic methods. Data transformation including the Box-Cox method. Automatic model selection methods including forward, backward, stepwise and all-subsets selection. Logistic regression methods and the concept of odds-ratios.  
Practicals: Computer-based exercises.  
Assessment: Two tests (20%), practical assignments (10%); 2 h exam (70%).  
DP Requirement: 30% Class mark; Minimum 80% of Practical attendance, completion of assignments & tutorials.

Multivariate Analysis  
BMET316 P1  
(20L-0T-21P-0S-25H-9R-0F-0G-5A-13W-8C)  
Prerequisite Modules: STAT130 or STAT230 or BMET210.  
Aim: To train students to use multivariate analysis.  
Content: General principles of multivariate analysis. Principal component analysis, Factor analysis, Canonical correlation analysis, Cluster analysis, Discriminant analysis, MANOVA and other techniques. GENSTAT multivariate analysis.  
Practicals: Computer-based exercises on the above topics.  
Assessment: Two tests (20%), practical assignments (10%); 2 h exam (70%).  
DP Requirement: 30% Class mark; Minimum 80% of Practical attendance, completion of assignments & tutorials.

Practical Advanced Experimental Design  
BMET710 P1  
(19L-0T-18P-0S-29H-10R-0F-0G-4A-13W-8C)  
Prerequisite Modules: BMET222.  
Aim: To train students in practical design and analysis of complex experiments.  
Content: Factorial experiments at 2, 3 and 4 levels. Confounding for incomplete blocks in factorial experiments. Incomplete block designs for non-factorial treatments.  
Practicals: Computer-based exercises on the above topics.  
Assessment: Two tests (30%), two assignments (70%).
**Chemical Engineering**

*Offered in the School of Engineering*

**Chemical Engineering Principles 1**  
**ENCH1EA H1**  
*(20L-14T-0P-0S-30H-10R-0F-0G-6A-13W-8C)*  
**Aim:** To familiarize students with chemical engineering plant flowsheets; the types of unit operations involved; the need for accounting for material and energy within a process plant; and the concepts of conservation of mass and energy within those unit operations.  
**Content:** What is chemical engineering? Systems of units, problem solving skills, block and process flow diagrams, unit operations, conservation of mass and energy, single unit material balances, stoichiometry and reactive material balances. Fundamentals (PT), forms of energy and the 1st law of thermodynamics. Simplified specific heat capacities and their use, heats of mixing, solution and reaction, reactive energy balances.  
**Assessment:** One test (10%), one quiz (5%), project (10%); 3 h exam (75%).  
**DP Requirement:** 80% attendance at tutorials. Satisfactory completion of the project.  

**Chemical Engineering Principles 2**  
**ENCH1EB H1**  
*(20L-11T-0P-0S-32H-8R-3F-2G-4A-13W-8C)*  
**Prerequisite Requirement:** 40% in ENCH1EA  
**Aim:** To familiarize students with the techniques of mass and energy balancing and their use in relation to the operation of chemical engineering processes.  
**Content:** Material balances on multiple unit processes, recycles, multiple independent chemical reactions, element balances; enthalpy: concepts and temperature dependence, specific heat capacity and use of steam tables; energy balances on closed systems and open systems at steady state; phase changes; heat exchangers (concept, energy balances); heats of mixing and solution, heats of formation and Hess's Law to calculate heats of reaction; reactor energy balancing, isothermal and adiabatic reactors.  
**Assessment:** One test (10%), project (20%); 2 h exam (70%).  
**DP Requirement:** 80% attendance at tutorials and to complete the project satisfactorily, as specified in the module outline.  

**Technical Communication for Engineers**  
**ENCH1TC H1 P1**  
*(10L-15T-0P-13S-20H-16R-0F-0G-6A-13W-8C)*  
**Aim:** To develop students' discourse competence in Technical English with the intention of improving their ability to read a range of texts, to write genres important to Engineering students, and to give oral presentations on Engineering topics  
**Content:** Module content is a short research project relating to Engineering. Technical Communication for Engineers is a practical module in which students improve their writing through practical experience of a number of different kinds of writing, students will be supported in their reading in order to improve their ability to extract meaning from Engineering-related texts taken from a range of genres and to use these sources appropriately in writing their own texts in the appropriate academic register. In addition students gain experience in presenting a short talk.  
**Assessment:** Continuous assessment (written assignments, tests and oral presentation).  
**DP Requirement:** Not applicable  
This module has no supplementary examination.  

**Chemicals Engineering Practicals 1**  
**ENCH2CP H2**  
*(4L-0T-15P-0S-40H-14R-0F-0G-7A-13W-8C)*  
**Prerequisite Requirement:** 40% in ENCH2MB  
**Aim:** To equip the student with skills to analyse and interpret experimental data, in addition to being able to undertake experimental studies. To enable the student to work as part of a team in conducting and reporting on tasks scheduled.
To equip the student to communicate effectively both orally and in written format.

**Content:** 5 formal lectures emphasizing oral and written communication styles and standards. There will also be emphasis on data reporting, treatment of experimental data, including statistical analysis.

**Practicals:** Evaporator (illustrates and tests concepts of mass and energy balances); Heat Exchanger (illustrates and tests concepts of heat transfer); Flow (illustrates and tests concepts of fluid dynamics); Refrigeration (illustrates and tests concepts of mechanical thermodynamics); and Corrosion (illustrates and tests concepts of materials of construction).

**Assessment:** Pre-practicals (5%), post-practicals (25%), two formal reports (30%); 2 h exam (40%).

**DP Requirement:** Completion of all post-practical interviews and submission of formal reports.

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**Chemical Engineering Fundamentals**

**ENCH2EF** H2

**Prerequisite Requirement:** 40 % in ENCH1EB.

**Aim:** To study fundamental concepts in heat, mass and momentum transfer.

**Content:** Heats transfer by conduction and convection, critical thickness of insulation, diffusion in gases and liquids, binary and multi-component diffusion, prediction of diffusion coefficient, mass and molar average velocities, integration of the diffusion equation for several cases, chemical potential as true driving force, the nature of fluids, viscosity, pressure and pressure measurement, fluid statics, Newtonian and non-Newtonian fluids, macroscopic mass and energy and momentum balances, detailed derivation and application to fluid flow problems, laminar flow in a tube, flow measurement, psychrometry.

**Assessment:** Tests and quizzes (25%); 3 h exam (75%).

**DP Requirement:** 80% attendance at tutorials.

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**Instrument Technology**

**ENCH2IT** H2

**Prerequisite Requirement:** 40% in ENEL2EE.

**Aim:** Understanding of measurement methods in laboratory and industry, and ability to set up and calibrate instruments.

**Content:** Measurements: standards, units, absolute and relative, range, accuracy, linearity, isolation, filtering, signal ranges, A/D, D/A, discrete, calibration and traceability. Transducers: transduction methods; resistance and reactance change, electromagnetic, semiconductor, thermoelectric. Instruments: flow, pressure, temperature, level, composition, displacement, force, torque, velocity, light, frequency, valves/actuators/positioners.

**Assessment:** Tests and quizzes (10%), one assignment (30%); 2 h exam (60%).

**DP Requirement:** 80% attendance at tutorials. Satisfactory completion of assignment.

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**Mass and Energy Balances**

**ENCH2MB** H1

**Prerequisite Requirement:** 40% in ENCH1EB.

**Aim:** To equip the student with problem solving skills relevant to complex material and energy balances in flowsheeting problems using the principles of conservation of energy and of mass. To equip the student with a range of mathematical tools which can be used to determine solution methods for complex material and energy balance problems.


**Assessment:** Tests and quizzes (25%); 3 h exam (75%).

**DP Requirement:** 80% attendance at tutorials.
Materials of Construction
ENCH2MS H2  (20L-5T-0P-0S-30H-20R-0F-0G-5A-13W-8C)
Prerequisite Requirement: 40% in CHEM171 or CHEM120.
Aim: To introduce students to materials available for engineering applications, and develop the ability to select materials according to their properties.
Assessment: Tests and quizzes (25%); 2 h exam (75%).
DP Requirement: 80% attendance at tutorials.

Oil & Mineral Processes
ENCH2OM H1  (20L-5T-0P-0S-24H-25R-0F-0G-6A-13W-8C)
Prerequisite Requirement: 40% in ENCH1EA.
Aim: To provide an overview of the mineral and petroleum industry in the country. To undertake calculations on grinding and be able to design milling circuits. To convert information on crude oil into a production plan and undertake blending calculations.
Content: An overview of South Africa's minerals industry; terminology; storage of minerals, particle size measurements and modelling of data; grinding; effect of classification on grinding efficiency; material balances; general flowsheets. Terminology; characterisation of oils; discussion of typical refinery flowsheets; description of the major unit operations; basic calculations in blending.
Assessment: Tests, quizzes, one assignment (25%); 2 h exam (75%).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of all assignments.

Thermodynamics 1
ENCH2TD H2  (20L-8T-0P-0S-30H-16R-0F-0G-6A-13W-8C)
Prerequisite Requirement: 40% in MATH238.
Prerequisite Modules: ENCH2MB.
Aim: To enable the candidates to be competent in the following areas of thermodynamics: solution thermodynamics; gas compression; liquefaction of gases and refrigeration; chemical reaction equilibria.
Assessment: Tests and quizzes (20%), one assignment (5%); 2 h exam (75%).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of all assignments.

Workshop Training
ENCH2WS HC  (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)
Aim: Candidates to acquire an appreciation and basic skills in common fabrication techniques, and familiarise themselves with the structure and function of common chemical engineering equipment items.
Content: Practical workshop instruction and experience includes methods of measurement, jointing & welding, material forming, heat treatment, precision drilling, shaping, turning, etc., with fitting (assembly/disassembly). The use of common hand tools, lathes, and drilling & milling equipment will be covered.
Practicals: 100%.
Assessment: Students must earn a duly performed certificate.
DP Requirement: Satisfactory completion of training.

Chemical Engineering Practicals 2
ENCH3CP H2  (5L-0T-18P-0S-40H-4R-0F-10G-3A-13W-8C)
Prerequisite Modules: ENCH2CP and STAT370.
Aim: To equip the student with skills to analyse and interpret experimental data, in addition to, being able to undertake experimental studies. To enable the student to use common statistical methods. To enable the student to work as part of a team in conducting and reporting on tasks scheduled. To equip the student to communicate effectively both orally and in written format.
Content: Design of experiments, analysis of experimental data, regression analysis and error reporting.
Practicals: Residence time distribution; mass transfer across an interface in a stirred cell; fluidisation; cooling tower; pump and fan and vapour-liquid equilibrium.

Assessment: Pre and post practical interviews, written reports, data analysis test. Continuous assessment (100%).

DP Requirement: Satisfactory completion of post-practicals and submission of practical reports as specified in the module outline.

Subminimum Requirements: The completion of post-practicals and the submission of practical reports are required as part of meeting ECSA ELO8 (individual, team and multidisciplinary work).

This module has no supplementary exam.

Chemical Engineering Design
ENCH3SEC H2

Prerequisite Modules: ENCH3HE, ENCH3SL & ENCH2MB.

Aim: To give students an appreciation of the multi-disciplinary nature of design and to consolidate their theoretical knowledge through application to a simulated practical design problem.

Content: Theoretical knowledge gained in the fluid mechanics and heat transfer modules is applied to a design problem containing some open-ended aspects. The design must be optimized to satisfy the plant specifications whilst simultaneously complying with imposed constraints. Simplified cost estimation and HAZOP techniques are utilised.

Assessment: One report (100%) marked according to criteria listed in ECSA Exit Level Outcome 1.

DP Requirement: Not applicable.

Subminimum Requirements: The report must be passed as part of meeting ECSA ELO1 (problem solving).

This module has no supplementary exam.

Fluid Mechanics Design
ENCH3FD H1

Prerequisite Requirement: 40% in ENCH2EF.

Corequisite: ENCH3FM

Aim: To introduce the basic considerations involved in the design of pipe systems and pumps, including the technical principles in their operation, their integration into the process, performance specifications, materials of construction, design standards and codes of practice.

Content: Material and energy balances over the process and the specific item of equipment under design, assessment of process stream properties, assessment of the design condition to meet the performance specification and associated constraints. Literature search for design methodology and alternative design options, pumping of fluids, performance characteristics of rotodynamic machines (pumps and fans), selections of pumps and fans, net positive suction head (NPSH) and pumps in series and parallel arrangements, pipe networks, pipe sizing, design optimization, design report writing.

Assessment: Formal design report at the end of the module (100%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Fluid Mechanics
ENCH3FM H1

Prerequisite Requirement: 40% in ENCH2EF.

Aim: To give the student a thorough understanding of fluid flows and develop sound techniques for solving fluid flow problems encountered in chemical engineering.

Content: The approach is mainly through the macroscopic energy and momentum balances but the differential equations of motion, on which the science of fluid mechanics rests, are also introduced and utilized. Dimensional analysis in fluid mechanics; macroscopic energy and momentum; flow through porous media; particle dynamics in settling; compressible flows; Navier-Stokes equations; non-Newtonian fluid flows.

Assessment: Tests and quizzes (25%); 2 h exam (75%).

DP Requirement: 80% attendance at tutorials.

Heat Transfer
ENCH3HE H1

Prerequisite Requirement: 40% in ENCH2EF.
**Aim:** To enable candidates to design heat-exchange units for a given application and to understand problems in thermal management.


**Assessment:** Tests, quizzes, and one assignment (total 25%); 3 h exam (75%).

**DP Requirement:** 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

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**Materials Processing**

ENCH3MP H2

**Prerequisite Requirement:** 40% in ENCH2EF and ENCH2OM

**Aim:** To equip the student with an understanding of current solids processing unit operations, to apply the fundamentals of heat transfer, fluid mechanics and mass transfer to a variety of unit operations, and to impart the skill to analyse the operation of and design such units.

**Content:** Processing of dry solids: Conveying, pneumatic conveying and fluidization, pressure drop and heat transfer in fluidized beds. Thickening: sedimentation and types of equipment commonly used in industry. Filtration: fundamentals of filtration, pressure drops across filter cakes, types of filters. Crystallization: Nucleation, rate of crystallization, effect of impurities, types of crystallizers.

**Assessment:** Tests and quizzes (25%); 2 h exam (75%).

**DP Requirement:** 80% attendance at tutorials and attendance at field trip.

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**Mass Transfer**

ENCH3MT H2

**Prerequisite Requirement:** 40% in ENCH2EF and 40% in ENCH3TH.

**Aim:** To develop the skills of design and performance assessment in continuous and batch distillation, gas absorption, leaching and liquid-liquid extraction.

**Content:** Industrial separation techniques; diffusion and mass transfer; phase equilibrium, material balances; cascades; absorption, stripping; graphical methods; stage efficiency; mass transfer coefficients; rate-based methods; binary distillation, equilibrium methods and rate-based methods; short cut estimates; batch distillation; liquid extraction; graphical analysis, equilibrium stages; solvent to feed ratios; triangular diagrams; reflux; leaching.

**Assessment:** Two tests, assignment (30%); 3 h exam (70%).

**DP Requirement:** 80% attendance at tutorials. Satisfactory completion of assignment.

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**Process Modelling & Optimisation**

ENCH3PO H2

**Prerequisite Modules:** ENCH3HE, ENCH3FM, MATH354.

**Corequisite:** ENCH3MT or ENCH3RT.

**Aim:** To enable the student to express the known material and energy balance as well as rate equations which govern physical and chemical processes in a mathematical form containing all the information necessary for process simulation. To develop an understanding of the techniques used to optimize chemical processes and familiarize the student with existing commercial optimization solvers.

**Content:** Rules of the model building process, model hierarchy; derivation of models for lumped and distributed parameter systems; numerical solving of nonlinear algebraic equations; solution techniques for ordinary differential equations (ODEs); linearization of nonlinear ODEs, stability analysis; two-point boundary-value problems, techniques for systems with tridiagonal matrices; numerical techniques for partial differential equations; optimization methods, constrained problems and penalty functions, elements of non-integer and integer linear programming, matrix approach in regression analysis.

**Assessment:** MATLAB assignment, two tests (30%); 3 h exam (70%).

**DP Requirement:** 80% attendance at tutorials. Satisfactory completion of all assignments. The module must be passed as part of meeting ECSA ELO1 (problem solving).
Reactor Technology Fundamentals
ENCH3RT H2
Prerequisite Modules: MATH238 & ENCH2EF.
Aim: To communicate the principles and calculation of reaction rates, yields and compositions in well-defined reaction systems including mixed and plug-flow reactors with heat transfer, non-ideal reactors, and catalytic systems.
Assessment: Two tests, assignment (30%); 3 h exam (70%).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of assignment.

Safety and Loss Prevention
ENCH3SL H1
Prerequisite Requirement: 40% in ENCH2MS.
Aim: To instill an awareness and understanding of safe practices in design and operation of chemical engineering processes in all stages of chemical engineering design.
Content: Hazard evaluation procedures. Chemical reaction hazards. Toxicology. The main environmental problems we are facing today. Safety in process design. Impact of engineering activity on the social, industrial and physical environment, impact of technology on society and environment, occupational and public health and safety.
Assessment: Tests & assignments (30%); 2 h exam (70%).
DP Requirement: 80% attendance at tutorials, 4 assignments (out of 6). The module must be passed as part of meeting ECSA ELO7 (impact of engineering activity).

Thermodynamics 2
ENCH3TH H1
Prerequisite Requirement: 40% in ENCH2TD.
Aim: To is enable the candidates to be competent in the following areas of thermodynamics: Vapour-liquid equilibria; Topics in phase equilibria.
Content: Vapour-liquid equilibrium: equality of chemical potential; fugacity as a criterion of equilibrium; departure of vapour-liquid equilibrium from ideal; activity coefficients in binary solutions; Margules and Van Laar equations; activity coefficients in multi-component systems; Wilson equation; NRTL; UNIQUAC; UNIFAC; azeotropes; phase diagrams for various systems together with calculations; phi-phi and gamma-phi approaches to data correlation and prediction. Topics in phase equilibria: equilibrium and stability; liquid-liquid equilibria; vapour-liquid-liquid equilibria; solid-liquid equilibria; solid vapour-equilibria.
Assessment: Tests, quizzes, one assignment (30%); 2 h exam (70%).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of assignment.

Applied Biochemical Engineering
ENCH4AB H2
Prerequisite Requirement: All first and second year modules.
Aim: To acquire specialised skills in the application of biochemical engineering techniques.
Content: The concepts introduced in Biochemical Engineering will be expanded and applied to industrial processes. Microbe/microbe interaction; microbe/environment interaction; anaerobic digestion; activated sludge process; brewing; commercial amino acid production; bio-mineral processing. Independent Learning Section: Students will be required to research case studies.
Assessment: One test, one quiz, one practical, assignment (30%); 2 h exam (70%).
DP Requirement: 80% attendance at tutorials, completion of the self-study assignment (with 50% pass), and completion of the practical satisfactorily, as specified in the module outline.
Subminimum Requirements: The assignment must be passed as part of meeting ECSA ELO9 (independent learning ability).
Chemical Engineering Topics 1
ENCH4CA H1
(10L-6T-0P-10S-28H-20R-0F-0G-6A-13W-8C)
Prerequisite Requirement: Will depend upon subject.
Aim: An optional subject to provide students with specialised knowledge that is not in the syllabus.
Content: Recent developments in chemical engineering science and technology, typically given by a visiting academic or new staff member. An independent study section based on investigation of case studies will be included.
Assessment: One test, assignment; 2 h exam (weighting dependent upon subject).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of all assignments.
The module must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point.

Chemical Engineering Topics 2
ENCH4CB H2
(10L-6T-0P-10S-28H-20R-0F-0G-6A-13W-8C)
Prerequisite Requirement: Will depend upon subject.
Aim: An optional subject to provide students with specialised knowledge that is not in the syllabus. To assesses independent learning ability.
Content: Recent developments in chemical engineering science and technology, typically given by a visiting academic or new staff member. An independent study section based on investigation of case studies will be included.
Assessment: One test, assignment; 2 h exam (weighting dependent upon subject).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of all assignments.
The module must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point.

Coal Technology & Gasification
ENCH4CG H1
(11L-6T-3P-10S-21H-25R-0F-0G-4A-13W-8C)
Prerequisite Requirement: All first and second year modules.
Aim: To communicate the importance, origin, types, properties, handling/storage and the cleaning of coal, major coal processes, and the environmental impact from coal-fired furnaces. To develop independent learning ability.
Practicals: Froth flotation of coal and ash analysis of coal.
Assessment: Test (20%), assignment (10%) (Based on self study); 2 h exam (70%).
DP Requirement: 80% attendance at tutorials. Satisfactory completion of the self-study assignment (with a 50% pass) and completion of the practical.
Subminimum Requirements: The self-study presentation and the assignment must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point, and ELO5 (engineering methods, skills and tools including information technology).

Process Dynamics & Control
ENCH4DC H1
(39L-12T-12P-0S-51H-40R-0F-0G-6A-13W-16C)
Prerequisite Modules: ENCH2IT, ENCH2MB & ENCH3FD.
Aim: To configure basic & advanced control schemes.
Content: Modelling: mass/energy balances; integration; linearisation. Instruments: sensors; transmitters; actuators. Loops: ratio; cascade; override; split-range; adaptive; feedforward. Advanced: DMC; Smith predictor; advanced level control. Laplace: various inputs to 1st & 2nd order systems; characteristic equation; root locus. Frequency: Nyquist, Bode & Nichols; stability; phase & gain margin; P, PI & PID multivariable: Stability; interaction; decoupling; loop-pairing.
Practicals: 1) Reaction-curve tuning of a pump-tank controller; 2) Frequency-response tuning of interacting tanks control.
Assessment: Two tests, two practicals (total 30%); 3 h exam (70%).
DP Requirement: 80% attendance at tutorials and to complete all practicals satisfactorily, as specified in the module outline.

Design Project
ENCH4DP H2
Prerequisite Modules: ENCH4RT, ENCH4MT & ENCH4DC.
Corequisite: ENCH4PE.
Aim: To acquire skills, confidence & vision for a large industrial design project.
Content: Complete project based on an industrial problem. Process design: flowsheet; kinetics; equilibria; mass/energy balances by computer simulation; pinch optimisation; equipment sizing; environmental issues. Operation: instrumentation; control loops; ergonomics; materials handling; operability study and hazard analysis. Engineering: drawings; specification sheets; materials of construction; standards; OSH Act; hazardous areas classification. Project management. Economics.
Assessment: Individual technical memorandum at mid-term (15%); final design report at end (85%).
DP Requirement: Not applicable.
Subminimum requirements: The final Report must be passed as a final assessment point for meeting ECSA ELO3 (engineering design), and as part of meeting ELO5 (engineering methods, skills and tools, including information technology), and ELO8 (individual work).
This module has no supplementary exam.

Environmental Impact Assessment
ENCH4EI H2
Prerequisite Modules: ENCH3SL.
Aim: To provide an understanding of the issues in environmental impact assessment for the land-use planning required for major developments.
Content: Introduction: provision of resources & services including economic benefits; putting a financial value on ecosystems. How we deal with adverse environmental impacts; EIA legislation in South Africa; EIA tools & techniques; EIA case studies; strategic environmental assessment; SEA case study; environmental management plans; environmental audits.
Independent learning section: students are required to generate environmental management plans & conduct environmental audits on a range of South African case studies during the self-study section.
Assessment: 2 assignments, 1 test (30%), 2 h exam (70%).
DP Requirement: 80% attendance at tutorials, completion of the self-study assignments (with a 50% pass).
The module must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point.

Extractive Metallurgy
ENCH4EM H2
Prerequisite Requirement: All first and second year modules. 40% in ENCH3TH.
Aim: To provide students with an understanding of methods used to extract and purify metals, and to estimate extraction efficiency. To develop independent learning ability.
Independent learning section: students are required to investigate and present certain portions of the module to the class. The presentations will be assessed and the subject matter will be included in the test and the final examination.
Practicals: Copper solvent extraction practical. Copper solvent extraction practical. Visit to an industrial plant.
Assessment: Test, presentation and assignment (total 30%); 2 h exam (70%).
DP Requirement: 80% attendance at tutorials, completion of the self-study presentation (with a 50% pass) and completion of the assignment.
Subminimum Requirements: The self-study presentation and the assignment must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point, and ELO5 (engineering methods, skills and tools including information technology).
Laboratory/Industry Project 1
ENCH4LA H1 (0L-0T-60P-0S-95H-0R-0F-0G-5A-13W-16C)
Prerequisite Requirement: Students must be in a position to complete the degree within the year.
Aim: A practical investigation into either an area of current research within the School, or an industrially relevant project linked to local industry.
Content: A practical investigation into either an area of current research within the School, or an industrially relevant project linked to local industry.
Practicals: Test work must be done and written up as a formal report.
Assessment: Oral presentation (20%), Supervisor assessment (20%) Report (60% comprising 50% for project proposal and investigations, experimentation and analysis aspects and 50% for communication aspects).
DP Requirement: Not applicable.
Subminimum Requirements: The oral presentation must be passed as part of meeting ECSA ELO6 (professional and technical communication). The final report must be passed as part of meeting ECSA ELO4 (investigation, experimentation and data analysis) and ELO6 (professional and technical communication) as final assessment points.
This module has no supplementary exam.

Laboratory/Industry Project 2
ENCH4LB H2 (0L-0T-30P-0S-48H-0R-0F-0G-2A-13W-8C)
Prerequisite Requirement: Students must be in a position to complete the degree within the year.
Aim: To give students experience in planning and executing current research test work.
Content: A practical investigation into either an area of current research within the School, or an industrially relevant project linked to local industry.
Practicals: Test work must be done and written up as a formal report.
Assessment: A written report, project presentation and/or poster design (100%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Engineering Management & Labour Relations
ENCH4ML H1 (20L-2T-0P-0S-30H-23R-0F-0G-5A-13W-8C)
Prerequisite Requirement: All first, and at least 96 credits of second year modules, must be completed.
Aim: To provide students with the managerial and legal knowledge and skills they will require in their early professional years.
Assessment: Assignment and two tests (30%); 2 h exam (70%).
DP Requirement: 80% attendance at tutorials and to complete all assignments and tests satisfactorily, as specified in the module outline.
Subminimum Requirements: The assignment must be passed as part of meeting ECSA ELO8 (interdisciplinary, team and individual work).

Mineral Processing
ENCH4MP H1 (10L-6T-6P-10S-24H-20R-0F-0G-4A-13W-8C)
Prerequisite Requirement: All first and second year modules must be completed.
Prerequisite Modules: ENCH3MP.
Aim: To provide students with an understanding of the methods used to concentrate minerals and an ability to assess and optimise plant performance. To develop independent learning ability.
theory. Washability tests and prediction of dense medium separation efficiency. Introduction to magnetic and electrostatic separators. Application of mineral processing in South Africa. **Independent learning section:** Students are required to investigate and present certain portions of the module in the class. The presentations will be assessed and the subject matter will included in the test and final examination.

**Practicals:** Batch flotation practical.

**Assessment:** One test, presentation, practical assignment (total 30%); 2 h exam (70%).

**DP Requirement:** 80% attendance at tutorials, completion of the self-study assignment (with a 50% pass) and completion of the practical assignment.

**Subminimum Requirements:** The self-study presentation and the assignment must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point, and ELO5 (engineering methods, skills and tools including information technology).

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**Advanced Mass Transfer**

**ENCH4MT H1** *(20L-6T-3P-0S-12H-31R-0F-3G-5A-13W-8C)*

**Prerequisite Modules:** ENCH3MT.

**Aim:** Candidates will analyze, model and design advanced mass transfer operations with special reference to conceptualization and computer simulation of unit operations.

**Content:** Multi-component phase equilibria; isothermal and adiabatic flash; bubble and dew points; equation-tearing procedures for multi-component distillation column analysis and simulation; short-cut techniques; enhanced distillation; multi-component batch distillation; membrane separation; adsorption; ion exchange; chromatography.

**Assessment:** Tests and quizzes, one open-ended assignment (total 30%); 2 h exam (70%).

**DP Requirement:** 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

**Subminimum Requirements:** The assignment must be passed as part meeting ECSA ELO5 (engineering methods, skills and tools, including information technology). The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge), and ELO5 (engineering methods, skills and tools, including information technology).

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**Projects & the Environment**

**ENCH4PE H2** *(20L-2T-0P-33H-20R-0F-0G-5A-13W-8C)*

**Prerequisite Requirement:** 40% in ENCH3EC.

**Aim:** The candidate will be familiar with all the steps required in the development of a design project.

**Content:** The funding of the initial investigation. The preliminary plant design including design optimization, hazards, brainstorming, hazardous area classifications, operational safety. Air and water pollution. The financial evaluation of the project, the generation of sensitivities and the financial optimisation of the project. Developing a proposal to the Board. The erection and commissioning of the plant. The post-investment audit. Purpose and understanding of contracts, scheduling and critical path method.

**Assessment:** Two tests and analysis (total 30%); 2 h exam (70%).

**DP Requirement:** 80% attendance at tutorials. Complete all assignments satisfactorily as specified in the module outline.

**Subminimum Requirements:** The assignment must be passed as part meeting ECSA ELO5 (engineering methods, skills and tools, including information technology), as a final assessment point.

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**Paper Making Technology**

**ENCH4PM H2** *(10L-6T-10S-21H-20R-8F-0G-3A-13W-8C)*

**Prerequisite Requirement:** All first and second year modules must be completed.

**Aim:** To introduce candidates to papermaking science & technology. To develop independent learning ability.

**Content:** Overview of the pulp and paper industry, the nature of wood, paper testing, stock preparation, paper chemistry, dry-end operations, recycled fibre operations, paper machine economics. Students are required to review and analyse case studies and literature on some of these components of the module. These are assessed through assignments and in the final examination.

**Practicals:** Physical testing of paper handsheets.

**Assessment:** One hour test (10%), class presentation of self-study assignment (10%), written assignment (5%), laboratory practical (5%); 2 h exam (70%).
DP Requirement: Complete assignment, and laboratory practical satisfactorily, completion of self-study assignment (with 50% pass). Attendance at mill tour.

Subminimum Requirements: The self-study presentation and the assignment must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point, and ELO5 (engineering methods, skills and tools including information technology).

**Petroleum & Synthetic Fuel Processing**

**ENCH4PP H2**

(10L-6T-3P-10S-21H-25R-0F-0G-5A-13W-8C)

**Prerequisite Requirement:** All first and second year modules must be completed.

**Aim:** To acquire an appreciation of the major processes in this industry. Calculation and decision making skills.

**Content:** Petroleum Refining: Reserves; characterization; storage systems; safety; refinery processing; visbreaking; catalytic reforming and isomerization; hydrocracking; catalytic cracking; hydrotreating; alkylation; polymerization and product blending. Hydrogen production; gas processing units; sulfur recovery processes; ecological considerations. Lubricating oils; solvent extraction; dewaxing. Petrochemical feedstocks; aromatics, unsaturates and saturates. Coal: combustion; gasification; liquefaction. Fischer-Tropsch synthesis; reactor technology; process flowsheets.

**Independent learning section:** Students are required to investigate the SASOL Coal to Fuel Processes as a case study (Gasification and Fischer-Tropsch) during the self-study section.

**Assessment:** Two tests, one practical, one assignment (30%); 2 h exam (70%).

**DP Requirement:** 80% attendance at tutorials. Completion of self-study assignment (with 50% pass) and completion of the practical.

**Subminimum Requirements:** The self-study presentation and the assignment must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point, and ELO5 (engineering methods, skills and tools including information technology).

**Applied Reactor Technology**

**ENCH4RT H1**

(20L-6T-6P-0S-24H-20R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENCH3RT.

**Aim:** Understanding of complex issues in industrial installations, involving approximations, economic decisions, solution for conditions in catalytic beds, the effects of heat and mass transfer limitations and the choice of reactor configurations.

**Content:** Thermal effects, mass transfer limitations, complex rate expressions, multiple reactions, axial/radial diffusion, and economic optimization, risk and uncertainty. Case studies based on industrial reactions (SO2 oxidation, NH3 synthesis, phthalic anhydride production in a tubular reactor, batch polymerization of vinyl chloride, fluidised bed catalytic reactor, bio-reactor design). Techniques are developed for the modelling of these systems.

**Practicals:** Catalytic oxidation of carbon monoxide using statistical methods to identify reaction kinetics.

**Assessment:** Two tests, one practical (25%); 2 h exam (75%).

**DP Requirement:** 80% attendance at tutorials and completion of practical as specified in the module outline. The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge).

**Vacation Work**

**ENCH4VW HC**

(0L-0T-0P-0S-0H-0R-0F-0G-0A-12W-0C)

**Aim:** An appreciation of a realistic working environment, enabling candidates to consider their studies in context.

**Content:** This is a requirement for the BScEng (Chemical) degree. Vacation work is to be arranged and undertaken by students during the course of the degree in fields relevant to chemical engineering. A total of 12 weeks must be accumulated. A report on the work conducted is to be submitted to the department within one month of the conclusion of each vacation work period, together with a certificate of progress from the firm concerned, in which the actual period is also stated.

**Assessment:** Reports acceptable in terms of scientific method, synthesis, computer use and presentation.

**DP Requirement:** Satisfactory completion of vacation work reports.

**Wood Pulping Technology**

**ENCH4WP H1**

(10L-6T-0P-10S-23H-20R-8F-0G-3A-13W-8C)

**Prerequisite Requirement:** All first and second year modules must be completed.
Agriculture, Engineering & Science

**Aim:** To introduce candidates to wood pulping science and technology. Exposure to the relative size & importance of the industry in South Africa. To develop independent learning ability.

**Content:** Overview of the pulp & paper industry, the nature of wood, wood handling operations, Kraft pulping, chemical recovery in Kraft process, modifications to conventional Kraft pulping, other chemical pulping processes, mechanical pulping, bleaching. Students are required to review & analyse case studies and literature on some of these components of the module.

**Practicals:** Kraft pulping.

**Assessment:** One hour test (10%), class presentation of self-study assignment (10%), written assignment (5%), laboratory prac. (5%); 2 h exam (70%).

**DP Requirement:** Complete assignment, and laboratory practical, satisfactorily. Completion of the self-study assignment (with a 50% pass). Attendance at the mill tour.

The module must be passed as part of meeting ECSA ELO9 (independent learning ability) as the final assessment point.

**Applied Aquatic Chemistry**
ENCH8AA HC

**Prerequisite Modules:** CHEM171 or CHEM120.

**Aim:** Proficiency in the use of the MINTEQA2 package for the solution of problems involving the solution and absorption of ionic species in water.

**Content:** Illustration of how Aquatic Chemistry can be applied through the use of a geochemical speciation computer package (MINTEQA2). The formulation of a physical problem in terms of a relevant chemical problem; transposing the chemical problem into the geochemical model; interpreting the output from the model, and validating the solution. Equilibrium modelling of aqueous speciation, oxidation and reduction, adsorption, gas phase partitioning, solid phase saturation states and precipitation/dissolution of metals.

**Assessment:** One assignment, one test; 3 h exam (weighting subject to assignment).

**DP Requirement:** 40% on test, satisfactory completion of assignment.

**Advanced Pulping Technology**
ENCH8AP HC

**Aim:** Candidates will have an understanding of the processes and Technology involved in the production of pulp for paper making purposes.

**Content:** Pulping raw materials, mechanical and part-mechanical pulping processes, chemical pulping processes, pulp washing, screening and cleaning, oxygen delignification, pulp bleaching and chemical recovery processes. The topics will examine both the principles involved and the equipment currently used.

**Assessment:** Assignments (40%); 3 h exam (60%).

**DP Requirement:** Class mark of 40%.

**Advanced Chemical Engineering Topics**
ENCH8AT HC

**Aim:** To supplement post graduate research with formal course work on subjects at an advanced level.

**Content:** Specialised topics will be identified.

**Assessment:** One test (30%); 3 h exam (70%).

**DP Requirement:** Class mark of 40%.

**Biological Effluent Treatment Processes**
ENCH8BP HC

**Aim:** Candidates will be able to perform calculations and make decisions concerning the operation of biological effluent treatment processes.


**Assessment:** One assignment, one test; 3 h exam.

**DP Requirement:** Class mark of 40%.
Cleaner Production
ENCH8CP HC (20L-12T-0P-0S-30H-12R-0F-0G-6A-13W-8C)
Aim: To introduce the concepts and tools of cleaner production in industrial processes. The module will provide the students with an integrated outlook on the design and management of material and energy flows to minimise waste and environmental impacts.
Content: Integrated material supply chains; industrial ecology; life cycle assessment; pinch analysis for water and heat conservation; waste minimisation; material substitution.
Assessment: Continuous assessment, two tests; 3 h exam (weighting subject to assignment).
DP Requirement: 40% average on tests.

Environmental Engineering Process Principles
ENCH8EP HC (40L-30T-3P-0S-72H-10R-0F-0G-5A-13W-16C)
Aim: Understanding and application of material and energy balances, mass transfer, basic reactor modelling concepts and solutions of ordinary and partial differential equations typically used in modelling and design of environmental engineering processes.
Content: Diffusion, dispersion, mixing, material balances, energy balances, elementary and non-elementary reaction kinetics, rate limitations, simple reactor models (plug flow, perfectly mixed batch and flow reactors, plug flow with dispersion, tanks in series), residence time distribution analysis and modelling, mathematical solution procedures.
Assessment: Two tests (20%), one practical report (10%); 3 h exam (70%).
DP Requirement: 40% average on tests, satisfactory completion of practical.

Industrial Wastewater Treatment
ENCH8IW HC (25L-14T-0P-0S-25H-10R-0F-0G-6A-13W-8C)
Aim: This module will provide students with an overview of industrial wastewater treatment options and the selection of a treatment sequence to achieve compliance with discharge standards.
Content: Industries and their effluents; waste characterisation; quality objectives; regulatory aspects; unit operations: flow equalisation, pH correction, precipitation, redox, settling, cake filtration, sorption; advanced oxidation processes; ion exchange.
Assessment: Two tests, one assignment, one presentation; 3 h exam (weighting subject to assignment).
DP Requirement: 40% average on tests, satisfactory completion of assignment and presentation.

Paper Chemistry
ENCH8PC HC (30L-24T-0P-0S-69H-34R-0F-0G-3A-13W-16C)
Aim: Candidates will have an understanding of the principles involved in the various chemical treatments of the paper making process.
Content: Properties of interfaces, macromolecules and colloids, surface tension, adhesion and wetting; adsorption; surfactants; polymers in solution; interaction of polymers with solid surfaces; stability of lyophobic colloids; effects of polymers on colloid stability; and paper coating chemistry and rheology of coating colours.
Assessment: Assignments (40%); 3 h exam (60%).
DP Requirement: Class mark of 40%.

Pulp & Paper Environmental Issues
ENCH8PP HC (24L-4T-0P-0S-29H-20R-0F-0G-3A-13W-8C)
Aim: Candidates will have an understanding of impact of pulp and paper manufacturing operations on the environment and measures to take to minimise this effect.
Content: The South African regulatory environment, water and energy management and control, solid waste disposal, air pollution controls, environmental management systems, waste minimization and cleaner production/sustainable consumption.
Assessment: Assignments (40%); 3 h exam (60%).
DP Requirement: Class mark of 40%.
Advanced Papermaking Technology
ENCH8PT HC  
Aim: Candidates will have an understanding of the processes and technology involved in the production of tissue, paper and paperboard products.
Content: Paper making raw materials with an emphasis on recycled fibre, principles and processes of stock preparation; wet end operations; paper and tissue drying operations; finishing operations; coating operations; paper grades and uses and paper testing methods (off- and on-line).
Assessment: Assignments (40%); 3 h exam (60%).
DP Requirement: Class mark of 40%.

Wood Chemistry
ENCH8WC HC  
Prerequisite Modules: CHEM241, CHEM251, CHEM261.
Aim: Candidates will have an understanding of the structure and chemical composition of wood and how the processes of chemical delignification occur.
Content: The structure of wood, the chemical composition of wood; the chemistry of Kraft Pulping, sulphite pulping, oxygen delignification and bleaching chemistry.
Assessment: Assignments (40%); 3 h exam (60%).
DP Requirement: Class mark of 40%.

Chemical Technology
Offered in the School of Chemistry and Physics

Chemical Analysis
CTEC233 P2  
Prerequisite Modules: CHEM110, CHEM120; MATH130 or 133.
Aim: To show the role and importance of analytical chemistry in industry and society and to provide basic theory and practical skills in "wet analytical" techniques.
Content: Analytical methodology, titrimetric and gravimetric methods of analysis, errors and uncertainties in measurements, principles of calibration, industrial applications.
Assessment: Tests (10%), practicals (30%); 3 h exam (60%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

Environmental Analysis
CTEC313 P2  
Prerequisite Modules: CHEM230; either APCH231 or CTEC233.
Aim: To introduce students to strategies and techniques used in the chemical analysis of environmental samples.
Content: Reasons for environmental analysis, types of environmental sample, obtaining a representative sample, sample preservation and treatment, methods for separating and determining the analyte.
Practicals: Sampling and analysis of real systems, use of modern instrumental methods of analysis.
Assessment: Test (8%), practical reports (25%); 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

Materials
CTEC323 P1  
Prerequisite Modules: CHEM210, 220.
Corequisite: CHEM330, 340.
Aim: To introduce students to metals, composites and polymers highlighting the role of catalysts in industry.
Content: Metals, organic polymers, composite materials, catalysis.
Practicals: Synthesis and characterization of materials.
Assessment: Tests (10%), practical reports (23%); 3 h exam (67%).

Process Technology

CTEC333 P1

Prerequisite Modules: CHEM220.

Aim: To introduce students to some important industrial chemical processes.

Content: Petrochemical and downstream processes, preparation of polymers, production of chemicals by fermentation processes.

Practicals: Manual and automated industrial manipulations.

Assessment: Tests (7%), practicals (26%); 3 h exam (67%).

DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

Industrial Chemistry

CTEC343 P2

Prerequisite Requirement: 40% in CHEM330.

Prerequisite Modules: CHEM230.

Aim: To make students aware of the link between the traditional subjects of chemistry and chemical engineering.

Content: The industrial manufacturing process, qualitative and quantitative process flow diagrams, unit operations and unit processes, mass and energy balances on steady state systems - recycle, bypass and purge, heat exchangers and steam tables, industrial separations and applications of phase chemistry.

Practicals: Phase chemistry; problem-solving workshops; flow sheet simulation using computer software; industrial project. The module includes field trips.

Assessment: Tests (8.25%), practicals (24.75%); 3 h exam (67%).

DP Requirement: Class mark 40%, 80% attendance at practicals and workshops, 100% attendance at tests.

Students may be required to contribute to the cost of field trips.

Business Management

CTEC733 P1

Aim: To introduce science students to the tenets of business and management.

Content: Macroeconomics and microeconomics, planning, organizing and staffing, leading, controlling, decision making, strategic and operations planning, ethics, entrepreneurship and intrapreneurship, managing change in organizations.

Assessment: Assignments (30%); 3 h exam (70%).

DP Requirement: Class mark 40%.

Industrial Chemistry

CTEC743 P1

Aim: To introduce students to advanced concepts in industrial process analysis.

Content: Topics selected from (amongst others): advanced mass and energy balances, mass transfer, reactor design, technological economics.

Assessment: Tests (10%), assignments (20%); 3 h exam (70%).

DP Requirement: Class mark 40%.

Operations Management in Chemical Technology

CTEC773 P2

Aim: To give students a working knowledge of how systems that create goods or provide services are managed effectively.

Content: Plant location and layout; types of process; production planning; inventory control; MRP, MRP2 and JIT; supply chain management; quality assurance - ISO 9000 & 14000. Benchmarking; project management - Gantt charts, critical path method. Financial management - accounting and economic appraisal.

Assessment: Assignments (33%); 3 h exam (67%)

DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.
Chemistry

Offered in the School of Chemistry and Physics

Special Science
CHEM100 H1

Aim: To introduce nursing students to basic chemistry and physics relevant to their discipline.
Content: Chemistry: Units of measurement, properties of matter, radioactivity, chemical bonding and chemical reactions, the gaseous state, solutions, suspensions, colloids and emulsions, acids, bases and salts, organic chemistry, carbohydrates, lipids and proteins. Physics: Mechanics, statics, torque, equilibrium, work, energy, power, elastic and thermal properties of matter, mechanics of fluids, pressure, density, viscosity, cohesion, waves, sound, light, nerve conduction, ionizing radiation, ultrasound, x-ray and radionuclide imaging.
Assessment: Tests (20%); two 2 h exams (80%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

For students in the School of Nursing only.

General Principles of Chemistry
CHEM110 PB WB

Aim: To introduce the principles and practice of chemistry.
Content: Introduction to: quantitative chemistry, types of reaction, atomic spectroscopy, electronic configuration, bonding, gases, thermochemistry, kinetics, and gas and solution equilibria.
Practicals: Volumetric analysis, measurement of physical quantities, shapes of molecules.
Assessment: Tests (9%), quizzes (5%), practical reports (19%), 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.
Credit may not be obtained for both CHEM110 and either of CHEM161 or CHEM195.

Chemical Reactivity
CHEM120 PB WB

Prerequisite Requirement: At least 40% in CHEM110.
Aim: To present the physical and descriptive inorganic and organic aspects of introductory chemistry.
Content: Phase equilibria and colligative properties, buffers, electrochemistry, nomenclature, reactions, main group elements, solid state structures, acid/base behaviour of oxides, and industrial chemistry of sulfur, phosphorus, nitrogen and the halogens.
Practicals: Physical measurements, qualitative analysis, organic techniques.
Assessment: Tests (9%), quizzes (5%), practical reports (19%), 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.
Credit may not be obtained for both CHEM120 and either of CHEM171 or CHEM196.

Chemical Engineering Chemistry 1
CHEM161 H1

Aim: To introduce the principles and practice of chemistry.
Content: Introduction to: quantitative chemistry, types of reaction, atomic spectroscopy, electronic configuration, bonding, gases, thermochemistry, kinetics, and gas and solution equilibria.
Practicals: Volumetric analysis, measurement of physical quantities, shapes of molecules.
Assessment: Tests (8%), practical reports (25%); 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.
For Engineering students only. Credit may not be obtained for both CHEM161 and either of CHEM110 or CHEM195.

Chemistry & Society 1
CHEM163 P1

Aim: To provide students with an overview of the role chemistry plays in everyday life.
Content: Revision of the mole; energy in chemical reactions; kinetics; equilibrium; gas laws; solubility; acids and
bases; redox chemistry; electrochemical processes.

**Practicals**: Measurement of physical constants.

**Assessment**: Tests (7%), practical reports (26%); 2 h exam (67%).

**DP Requirement**: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

For Engineering students only.

Chemical Engineering Chemistry 2  
CHEM171 H2  
(36L-9T-36P-0S-44H-30R-0F-0G-5A-13W-16C)

**Prerequisite Requirement**: 40% in CHEM161.

**Aim**: To present the physical and descriptive inorganic and organic aspects of introductory chemistry.

**Content**: Phase equilibria and colligative properties, buffers, electrochemistry, nomenclature, reactions, main group elements, solid state structures, acid/base behaviour of oxides, and industrial chemistry of sulfur, phosphorus, nitrogen and the halogens.

**Practicals**: Physical measurements, qualitative analysis, organic techniques.

**Assessment**: Tests (8%), practical reports (25%); 3 h exam (67%).

**DP Requirement**: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

For Engineering students only. Credit may not be obtained for both CHEM171 and either of CHEM120 or CHEM196.

Chemistry & Society 2  
CHEM173 P2  
(18L-9T-18P-0S-24H-8R-0F-0G-3A-13W-8C)

**Aim**: To provide students with an overview of the role chemistry plays in everyday life.

**Content**: The Periodic Table - elements, trends and classification; bonding - covalent, ionic and metallic; chemical and physical properties arising from bonding - some specific examples; polymers - PVC, Teflon, Nylon-6,6, silicones, polyethylene, additives, physical properties; explosives.

**Practicals**: Qualitative analysis.

**Assessment**: Tests (7%), practical reports (26%); 2 h exam (67%).

**DP Requirement**: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

For Engineering students only.

Chemistry for Engineers 1A  
CHEM181 H1  
(18L-5T-18P-0S-24H-12R-0F-0G-3A-13W-8C)

**Aim**: To provide students with the basic chemical knowledge and expertise necessary to understand the chemical behaviour and properties of materials used by engineers.

**Content**: Units, measurements; elements; compounds and reactions; mole; bonding in compounds. Cements, silicates and silicones. Stoichiometry; gases and gas laws, Henry's Law. Thermochemistry.

**Practicals**: Introduction to the measurement of chemical properties; study of chemical behaviour of simple substances.

**Assessment**: Tests (8%), Practicals (25%); 2 h Exam (67%).

**DP Requirement**: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

For Engineering students only.

Chemistry for Engineers 1B  
CHEM191 H2  
(18L-5T-18P-0S-24H-12R-0F-0G-3A-13W-8C)

**Prerequisite Requirement**: 40% in CHEM181.

**Aim**: To provide students, who would now have some basic chemical background, with further information and skills needed to understand how substances behave chemically.


**Practicals**: The practical study of inorganic and organic materials.

**Assessment**: The practical study of inorganic and organic materials.

**DP Requirement**: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

For Engineering students only.
General Principles of Chemistry (Augmented)
CHEM195 P1 W1 (72L-18T-72P-0S-86H-60R-0F-0G-12A-13W-16FC-16DC)
Aim: To introduce the principles and practice of chemistry.
Content: This module is available only to students registered for the augmented stream of the BSc4. It covers the syllabus of CHEM110 but, in addition, includes a substantial amount of supplementary material and tuition designed for students who are under-prepared for university-level studies to a maximum of 160 hours.
Practicals: Volumetric analysis, measurement of physical quantities, shapes of molecules.
Assessment: Tests (8%), quizzes (3%), practical reports (22%), 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.
Credit may not be obtained for both CHEM195 and either of CHEM110 or CHEM161. This module is worth 16 degree credits and 16 foundation credits.

Chemical Reactivity (Augmented)
CHEM196 P2 W2 (72L-18T-72P-0S-88H-60R-0F-0G-10A-13W-16FC-16DC)
Prerequisite Requirement: At least 40% in CHEM110 or CHEM195.
Aim: To present the physical and descriptive inorganic and organic aspects of introductory chemistry.
Content: This module is available only to students registered for the Augmented stream of the BSc4. It covers the syllabus of CHEM120 but, in addition, includes a substantial amount of supplementary material and tuition designed for students who are under-prepared for university-level studies to a maximum of 160 hours.
Practicals: Physical measurements, qualitative analysis, organic techniques.
Assessment: Tests (8%), quizzes (3%), practical reports (22%), 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.
Credit may not be obtained for both CHEM196 and either of CHEM120 or CHEM171. This module is worth 16 degree credits and 16 foundation credits.

Foundation Chemistry
CHEM199 PY WY (60L-20T-65P-0S-25H-50R-0F-0G-20A-26W-20FC-4DC)
Corequisite: BIOL199, MATH199, PHYS199, (SCOM103 or 113).
Aim: To ensure that students with an inadequate grounding in chemistry develop a level of theoretical knowledge and practical and problem-solving skills to enable them to succeed in a BSc programme.
Content: Energy and matter; substances - elements, compounds and mixtures; chemical reactions; solutions - solubility and concentration; separation of mixtures; atomic structure - electronic configuration and the Periodic Table; compounds - bonding and nomenclature; the mole; reactions in aqueous solution.
Practicals: Observation and measurement.
Assessment: Tests (21%), Practicals (12%); 3 h exam (67%).
DP Requirement: 40% Class mark plus 80% attendance at all lectures, practicals, tutorials and field work.
Year-long Module. This module is only for students in the Foundation Stream of the BSc4. It carries 20 foundation credits and 4 degree credits.

Inorganic Chemistry
CHEM210 P1 W1 (27L-9T-36P-0S-44H-39R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 55% in CHEM120.
Prerequisite Modules: CHEM110.
Aim: To develop a theoretical and content base for inorganic chemistry.
Content: Molecular orbital theory of diatomic molecules, coordination chemistry: ligands and complexes, introduction to solid state chemistry, descriptive main group element chemistry.
Practicals: Synthesis and characterization of main group and coordination compounds.
Assessment: Tests (10%), practical reports (25%); 3 h exam (65%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

Organic Chemistry
CHEM220 P1 W1 (27L-9T-36P-0S-43H-40R-0F-0G-5A-13W-16C)
**Syllabus**

**Prerequisite Requirement:** 55% in CHEM120.

**Prerequisite Modules:** CHEM110

**Aim:** To introduce students to carbonyl, aromatic and aliphatic chemistry and basic spectroscopic methods used in the identification of organic compounds.

**Content:** An introduction to nuclear magnetic resonance spectroscopy, stereochemistry, carbonyl chemistry, the chemistry of aromatic compounds and alkenes, substitution and elimination reactions.

**Practicals:** The preparation and characterization of organic compounds.

**Assessment:** Tests (15%), practicals (18%); 3 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**Physical Chemistry**

**CHEM230 P2 W2**

**Prerequisite Requirement:** 55% in CHEM120; at least 24C of appropriate MATH at Level 1.

**Prerequisite Modules:** CHEM110.

**Aim:** To introduce students to the principles of the discipline of physical chemistry, and to develop an appreciation of its quantitative aspects and the way in which it underpins the whole of modern chemistry.

**Content:** Chemical thermodynamics, chemical equilibrium, equilibrium electrochemistry, kinetics, introduction to spectroscopy.

**Practicals:** Measurement and calculation of thermodynamic, kinetic and spectroscopic data.

**Assessment:** Tests (8%), practical reports (25%); 3 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**Applied Organic Chemistry for Chem Eng**

**CHEM241 H1**

**Prerequisite Modules:** CHEM161 and CHEM171.

**Aim:** To provide students with a basic understanding and relevant skills in selected areas of organic chemistry relevant to chemical engineers.

**Content:** The reaction of aliphatic and aromatic functional groups. Polymers. Petrochemical. Sugars. Proteins and Pharmaceutical chemistry. Spectroscopic methods.

**Practicals:** Six 3 hr practicals relating to the course content.

**Assessment:** Tests (15%), practicals (18%); 2 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**For Engineering students only.**

**Applied Physical Chemistry for Chem Eng**

**CHEM251 H2**

**Prerequisite Modules:** CHEM161 and CHEM171.

**Aim:** To provide students with a basic understanding and relevant skills in selected areas of physical chemistry.

**Content:** Properties of gases, chemical thermodynamics, chemical equilibrium, equilibrium electrochemistry.

**Practicals:** Measurement of physical quantities.

**Assessment:** Tests (8%), practicals (25%); 2 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**For Engineering students only.**

**Applied Inorganic Chemistry for Chem Eng**

**CHEM261 H1**

**Prerequisite Modules:** CHEM161 and CHEM171.

**Aim:** To provide students with a basic understanding and relevant skills in selected areas of inorganic chemistry.

**Content:** Co-ordination compounds, solvent extraction, kinetics of substitution. Ionic solids, slags and mattes. Descriptive chemistry of 3-d metals, platinum metals, uranium. Hydrometallurgy and pyrometallurgy: extraction processes for copper, nickel cobalt, gold, platinum metals, uranium.

**Practicals:** Preparation and reactions of co-ordination complexes.

**Assessment:** Tests (11%), practicals (22%); 2 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals, 100% attendance at tests. For Engineering students only.

**Inorganic Chemistry**
CHEM310 P2 W2  
(27L-9T-36P-0S-44H-39R-0F-0G-5A-13W-16C)

**Prerequisite Modules:** CHEM210.

**Aim:** To build a strong theoretical and content base in inorganic chemistry, appropriate for an exit level module.

**Content:** Crystal field theory and molecular orbital theory of transition metal complexes. Transition metal chemistry: variable oxidation states and solution chemistry. Sigma-donor and pi-acceptor ligands, focusing on coordinated CO and its reactivity. Magnetic and electrical properties of transition metal oxides.

**Practicals:** Synthesis of transition metal and organometallic compounds: characterization and qualitative analysis.

**Assessment:** Tests (10%), practical reports (25%); 3h exam (65%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**Organic Chemistry**
CHEM320 P2 W2  
(27L-9T-36P-0S-43H-40R-0F-0G-5A-13W-16C)

**Prerequisite Modules:** CHEM220.

**Aim:** To introduce students to the structure and synthesis of carbocyclic and heterocyclic compounds as well as to more advanced applications of carbonyl chemistry and spectroscopic analysis.

**Content:** Heterocyclic and carbocyclic chemistry. Selected topics from: conformational analysis, biological organic molecules and spectroscopy.

**Practicals:** The preparation and characterisation of organic compounds.

**Assessment:** Tests (15%), practicals (18%); 3 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**Physical Chemistry**
CHEM330 P1 W1  
(27L-9T-36P-0S-66H-17R-0F-0G-5A-13W-16C)

**Prerequisite Requirement:** At least 24C PHYS at Level 1.

**Prerequisite Modules:** CHEM230.

**Aim:** To deepen knowledge and understanding of the underlying principles of physical chemistry and to develop skills in their application.

**Content:** Advanced aspects of chemical thermodynamics and kinetics. Surface chemistry. Quantum Chemistry. Molecular spectroscopy.

**Practicals:** Measurement of physicochemical properties; recording, calculation, manipulation and interpretation of data; proper methodology in scientific report writing.

**Assessment:** Tests (8%), practical reports (25%); 3 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**Instrumental Analysis**
CHEM340 P1 W1  
(27L-9T-36P-0S-66H-17R-0F-0G-5A-13W-16C)

**Prerequisite Requirement:** At least 24C PHYS at Level 1.

**Prerequisite Modules:** CHEM230.

**Aim:** To introduce students to instrumental methods of analysis.

**Content:** Atomic spectroscopy; chromatography; spectroscopic analysis; electroanalytical methods; solid-state analysis.

**Practicals:** Instrumental methods of qualitative and quantitative analysis.

**Assessment:** Tests (8%), practicals (25%); 3 h exam (67%).

**DP Requirement:** Class mark 40%, 80% attendance at practicals, 100% attendance at tests.

**Inorganic Chemistry**
CHEM711 W1  
(23L-0T-45P-0S-66H-23R-0F-0G-3A-13W-16C)

**Aim:** To introduce students to advanced study in Inorganic chemistry.

**Content:** Sections chosen from the following topics: Inorganic and organotransition metal chemistry. Catalysis.

**Practicals:** Mini projects based on the above topics.
**Assessment:** Practical work (20%); 3 h exam (80%).
**DP Requirement:** Class mark 50%; 80% attendance at practicals.

### Organic Chemistry
CHEM721 W1

**Aim:** To introduce students to advanced study in organic chemistry.
**Content:** Reactions and mechanisms of oxidation-reduction reactions commonly used in organic synthetic chemistry. Chirality and stereochemistry, analytical methods, determination of enantiomeric purity; asymmetric synthesis. The retrosynthetic approach to designing syntheses of organic molecules.

**Practicals:** Organic synthesis.
**Assessment:** Practical reports (20%); 3 h exam (80%).
**DP Requirement:** Class mark 50%; 80% attendance at practicals.

### Physical Chemistry
CHEM731 W1

**Aim:** To introduce students to molecular symmetry, photochemistry and advanced chemical kinetics.
**Content:** Symmetry elements and symmetry operations. Point groups, Schoenflies notation, character tables; vibrational spectroscopy; atomic and molecular orbitals. Basic concepts of photochemistry, principles of absorption and emission of radiation, experimental techniques, applications. Activated complex theory.

**Practicals:** Mini projects based on the above topics.
**Assessment:** Practical work (20%); 3 h exam (80%).
**DP Requirement:** Class mark 50%; 80% attendance at practicals.

### Inorganic and Physical Chemistry
CHEM733 P1

**Aim:** To introduce students to advanced studies in Inorganic and Physical Chemistry.
**Content:** Mechanisms and rates of inorganic reactions, organometallic chemistry and homogeneous catalysis, advanced chemical thermodynamics, surface chemistry and dynamic electrochemistry.

**Assessment:** Tests (10%), assignments (10%); 3 h exam (80%).
**DP Requirement:** Class mark 40%.

### Analytical Chemistry
CHEM741 W1

**Aim:** To introduce students to advanced studies in analytical methods
**Content:** Sampling and sample preparation methods. Separation science. Spectrometry and other detection techniques.

**Practicals:** Laboratory exercises involving skills training in selected instrumentation/methods.
**Assessment:** Practical work (20%); 3 h exam (80%).
**DP Requirement:** Class mark 50%; 80% attendance at practicals.

### Organic and Analytical Chemistry
CHEM743 P1

**Aim:** To show how the principles of chemistry can be used in advanced applications of Organic and Analytical Chemistry.
**Content:** Use of advanced NMR, mass spectroscopy and other spectroscopic techniques for structural elucidation. Pericyclic reactions. Stereocentrol in organic synthesis. Advanced synthetic organic chemistry. Advanced instrumental analysis.

**Assessment:** Tests (10%), assignments (10%); 3 h exam (80%).
**DP Requirement:** Class mark 40%.
Group Theory & Spectroscopy
CHEM753 P1 (18L-2T-0P-0S-48H-8R-0F-0G-4A-13W-8C)
Aim: To provide students with a thorough but understandable introduction to molecular symmetry and group theory as applied to the spectroscopy of inorganic complexes.
Content: Identification of symmetry elements, point group identification, use of point group multiplication tables, application of group theory to spectroscopy, electronic states of atoms and molecules - term symbols, advanced crystal field theory.
Assessment: Test (10%), assignments (10%); 3 h exam (80%).
DP Requirement: Class mark 40%.

Special Topics in Chemistry
CHEM763 P2 (105L-18T-0P-0S-120H-67R-0F-0G-10A-13W-32C)
Aim: To allow students to specialize in their chosen areas of advanced chemistry.
Content: Topics selected from (amongst others) - bioinorganic chemistry; strategies in drug synthesis and design; symmetry in the solid state; natural products, isolation and characterisation; isolation and properties of the lanthanides and actinides; thermodynamics of reaction equilibria in solution; kinetic theory and its application to inorganic complexes.
Assessment: Tests (10%), assignments (20%); 2 x 3 h exams (70%).
DP Requirement: Class mark 40%.

Chemistry Electives
CHEM781 (60L-0T-0P-0S-202H-52R-0F-0G-6A-13W-32C)
Aim: To enable students to specialise in various areas of Chemistry.
Content: Students select from a range of topics. Examples of topics offered are: waste disposal, environmental analysis, bioinorganic chemistry, catalysis, supramolecular chemistry, medicinal chemistry, solid phase peptide synthesis, synthesis and biosynthesis of natural products, molecular spectroscopy, statistical thermodynamics, photochemistry of nucleic acid bases and solution chemistry.
Assessment: Assignments (20%); 2 x 3 h exams (80%).
DP Requirement: Class mark 40%.

Chemistry Project I
CHEM791 W2 (0L-0T-0P-0S-320H-0R-0F-0G-0A-13W-32C)
Aim: To introduce students to the process of scientific research.
Content: Students will undertake a research project selected from a list proposed by members of staff. Topics will change from year to year.
Assessment: Project execution (10%), written report (70%), oral presentation (20%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Chemistry Project
CHEM793 PY (0L-0T-320P-8S-132H-0R-0F-20G-0A-26W-48C)
Aim: To introduce students to the process of scientific research in Chemistry and communication of scientific information.
Content: Workshops on software for chemists, generic skills, structure elucidation techniques, advanced quantitative analysis, literature review essay, preparation of research proposal, laboratory work, preparation of project report, seminar presentations.
Practicals: Use of advanced instrumental techniques for structure elucidation and quantitative analysis.
Assessment: Workshop assignments (10%), literature review essay (10%), research proposal (5%), laboratory performance (10%), seminar presentations (15%), project report assessment (50%).
DP Requirement: Not applicable.
Year long module. This module has no supplementary exam.
Civil Engineering

Offered in the School of Engineering

Introduction to Civil Design
ENCV1ED H2
(10L-39T-3P-0S-24H-0R-0F-0G-4A-13W-8C)

Prerequisite Requirement: ENME1DR (40%).

Aim: To introduce students to design, of simple structures in particular, and with the emphasis on graphical methods.


Practicals: Ballista construction.

Assessment: Class mark (40%); 4 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Engineering Practice Workshop
ENCV1EP H2
(0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Aim: Development of communication and management skills; introduction to practical aspects of engineering.

Content: One week workshop in the mid-year vacation covering basic management (including OHS, conflict resolution, group work, management, writing skills, ethics); informal graphical communications; introduction to practical aspects of civil engineering.

Practicals: Group project, site visits

Assessment: Coursework comprising individual and group assignments (100%).

DP Requirement: 100% attendance.

Fluids 1
ENCV2FL H2
(20L-8T-9P-0S-28H-12R-0F-0G-3A-13W-8C)

Prerequisite Requirement: 40% in MATH142 & (PHYS110 or 151).

Aim: To introduce fundamental concepts of fluid dynamics/hydraulics and develop foundational knowledge and problem solving skills for subsequent modules in applied fluids engineering.

Content: Fundamental concepts relating to the characteristics of fluids: continuum formulation, viscosity, pressure. Fluid statics - the hydrostatic pressure distribution, forces on submerged surfaces, stability of floating bodies. Governing principles of fluid motion: continuity, energy and momentum conservation and simple applications. Introduction to steady flow in pipes.

Practicals: Laboratory practicals demonstrating the principles of hydrostatics, energy and momentum conservation.

Assessment: Class mark (40%); 2 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Civil Engineering Materials
ENCV2MT H1
(21L-5T-9P-0S-26H-16R-0F-0G-3A-13W-8C)

Prerequisite Requirement: ENME1EM (40%)

Aim: To introduce practical materials technology to enable understanding of the links between materials and design technologies and the behaviour and interaction of the material with its environment.

Content: Overview of stress, strain, elasticity and deformation behaviour. Introduction to timber, steels, aluminium and its alloys, concrete technology.

Practicals: Three practicals covering metals in tension, timber in bending and compression and concrete mix design and testing.

Assessment: Class mark including test(s), tutorials and practical reports (40%); 2 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Materials Workshop Course
ENCV2MW H2
(0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)
**Prerequisite Requirement:** DP for ENCV2MT

**Aim:** To introduce students to the practical use of concrete and structural steel. Students will be able to design and specify concrete for special applications and erect a basic steel truss as a group project.

**Content:** One week Workshop in the mid-year vacation covering practical aspects of reinforced concrete and structural steel construction. Lectures and visits to construction sites.

**Practicals:** Assembly of steel trusses.

**Assessment:** 100% attendance and on successful completion of the assignments/tests, students will be awarded a certificate of proficiency.

**DP Requirement:** Not applicable.

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**Structures 1**
ENCV2SA H1

**Prerequisite Requirement:** 40% in MATH141 & MATH142.

**Aim:** To introduce the student to elementary structural analysis and theory of strength of materials.

**Content:** Structural idealisation, trusses, axially loaded members, torsion, shear force and bending moment, stresses in bars and beams, analysis of stress and strain.

**Practicals:** Three practicals related to stress and strain.

**Assessment:** Class mark including test(s), tutorials and practical reports (40%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Structures 2**
ENCV2SB H2

**Prerequisite Requirement:** ENCV2SA (40%).

**Aim:** To be able to understand and use various techniques to determine deformation of structures, analyse three-pinned arches and suspension cables, understand the concepts of influence lines (IL) and determine IL of structural systems, analyse columns of different types, understand the concept of torsion in structures.

**Content:** Column buckling, deflection of beams, energy methods, influence lines, three-pinned arches, suspension cables, two-dimensional frames.

**Practicals:** Buckling tests and making of a truss and a tower out of sheet metal.

**Assessment:** Tests (40%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Structural Design 1**
ENCV2SD H2

**Prerequisite Requirement:** ENCV2SA (40%)

**Aim:** To provide students with the limit state concepts in structural design and how they are applied in basic reinforced concrete and structural steel design.

**Content:** Structural design limit states, loads and material factors. Reinforced concrete concepts and design of beams for bending, shear, torsion and deflection. Structural steelwork design of connections, ties, struts and beams. Assignment relating to rc beams and steel.

**Assessment:** Class mark (40%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Civil CADD Workshop**
ENCV3CW H2

**Prerequisite Requirement:** DP for ENCV3ST.

**Prerequisite Modules:** ENCV2DE or ENCV2SD.

**Aim:** To develop a basic proficiency in CAD.

**Content:** One week Workshop in the mid-year vacation where candidates are introduced to software packages for design and drawing and will prepare a typical example project.
Assessment: 100% attendance and on successful completion of the assignments, students will be awarded credit for this module

DP Requirement: Not applicable

Fluids 2
ENCV3FA H1 (40L-24T-16P-0S-51H-24R-0F-0G-5A-13W-16C)
Prerequisite Modules: ENCV2FL.
Aim: Develop the fundamental theory & applications of fluid dynamics/hydraulics in civil & environmental engineering.


Practicals: 3 lab experiments demonstrating the fundamental principles of fluid flow systems e.g. energetics, boundary layers and separation.

Assessment: Class mark (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Fluids 3
ENCV3FB H2 (39L-10T-9P-77H-20R-0F-0G-5A-13W-16C)
Prerequisite Requirement: 40% in STAT370.
Prerequisite Modules: ENCV2FL.
Aim: Develop the fundamental theory & applications of fluid dynamics/hydraulics in civil & environmental engineering.

Content: Fundamentals of open channel flows (steady uniform/non-uniform, unsteady). Hydrology for water resources management, and flood hydrology. Reservoir and channel routing. Dams & hydraulic structures (weirs, flumes, spillways, culverts, etc). River & canal engineering. Other selected topics & applications such as sediment transport, water waves & coastal engineering.

Practicals: 3 lab experiments demonstrating the fundamental principles of open channel hydraulics e.g. energetics, hydraulic jumps, flood routing, weirs, etc.

Assessment: Class mark (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Geotechnical Engineering Studies 1
ENCV3G1 H1 (40L-24T-16P-0S-51H-24R-0F-0G-5A-13W-16C)
Prerequisite Modules: GEOL215.
Aim: To introduce the fundamental concepts of Geotechnical Engineering with reference to basic characteristics and physical properties of the soils. Soils behaviour in presence of static and dynamic water. Foundational knowledge for geotechnical engineering.

Content: Introduction to Soil Mechanics, origin and composition of soils, soil classification, basic physical properties of soils, description of soils, water in soils, introduction to stresses in soils (total, effective and pore water stresses). Compaction tests, methods and interpretation of test results. Analysis of settlement of engineering works, stress distribution in soils and consolidation settlements on clays. Fundamentals of shear strength for dry soils, shear box tests and frictional model. Drained and undrained shear strength analysis.

Practicals: Execution and analysis of soils laboratory tests and field trip.

Assessment: Tutorials and practical reports (40%); 2 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Geotechnical Engineering Studies 2
ENCV3G2 H2 (39L-9T-20P-66H-20R-1F-0G-5A-13W-16C)
Prerequisite Modules: ENCV3G1.
Aim: To provide basic information and skills in geotechnical investigations, in the analysis of physical and geotechnical properties of soils in relation to the stability of slopes and in the estimation of settlement of structures on
sands and clays.

**Content:** Soil as a foundation for structures and as a material of construction. Soil formation, classification, its physical and mechanical properties, soil-water systems. Bearing capacity and settlement of shallow and deep foundations. Slope stability. Geotechnical investigations, sampling techniques and determination of soil parameters. Settlement of granular soils. Stress distribution in soil.

**Practicals:** Site visit for collection of soil sample and execution of appropriate laboratory tests and submission of geotechnical investigation report.

**Assessment:** Class mark including test(s), tutorials, and practical report (40%). 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Mathematical Systems**

ENCV3MS H2

(20L-17T-0P-0S-26H-12R-0F-0G-5A-13W-8C)

**Prerequisite Requirement:** STAT370 (40%).

**Prerequisite Modules:** MATH238, 248.

**Aim:** To develop skills in the formulation and numerical solution (primarily using spreadsheet software) of simple mathematical models.


**Assessment:** Class mark (40%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Structural Design 2**

ENCV3SD H2

(42L-10T-0P-44H-48R-6F-0G-10A-13W-16C)

**Prerequisite Requirement:** ENCV2SD (40%), ENCV3ST (40%)

**Aim:** To introduce the students to further applications of reinforced concrete and structural steel design not previously considered in second year.

**Content:** Concrete flooring systems, in situ beam/slab systems, flat slabs, concrete columns under bending, concrete foundation systems, reinforced concrete and steel framed buildings, behaviour of and design of plate girders, monosymmetric and class 4 beams, steel columns with bending, frames, steel beam to column connections (including prying action), base connections, lattice girders and trusses. Introduction to bracing systems and wind loading. Plastic design of beams. Mini design project involving reinforced concrete and steel.

**Assessment:** Test(s), tutorials and project (40%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Structures 3**

ENCV3ST H1

(40L-20T-18P-50H-26R-0F-0G-6A-13W-16C)

**Prerequisite Requirement:** ENCV2SA (40%), ENCV2SB (40%).

**Aim:** To introduce the compatibility and equilibrium methods of analysing indeterminate structures.

**Content:** Analysis of indeterminate structures by compatibility (strain energy, virtual work, moment area) and equilibrium methods: slope deflection, moment distribution, matrix methods. Symmetry, skew-symmetry, closed structures. Arches. Influence lines of indeterminate structures. Model analysis Approximate methods of analysis. Introduction to finite elements. Computer applications.

**Practicals:** Assignment involving use of computer software for structural analysis.

**Assessment:** Class mark (40%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

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**Transport 2**
ENCV3TP H2
Prerequisite Requirement: 40% in ENCV3G1 & ENCV3TT.
Prerequisite Modules: GEOL215
Aim: To introduce examples of planning and design processes used in Transport networks and systems and prepare the student for later evaluation and design of such systems.
Content: Planning and design of elements of road transport networks and systems, such as road pavements, parking layouts, and earthworks planning including the material aspects thereof.
Practicals: Bituminous material properties and grading, design of asphalt mixes and surface seals.
Assessment: Class mark (40%); 2 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Transport 1
ENCV3TT H1
Prerequisite Requirement: Must be in third year of study.
Aim: To develop students’ appreciation and understanding of the fundamentals of the interaction between and the evolution of transportation, land use development and economic development. To expand on this knowledge, appreciation and understanding of the underlying theory and principles of transport - particularly in so far as these relate to the planning/design of basic transport network.
Content: General introduction to transportation engineering including such aspects as: historical development, system and network characteristics, and transport vehicle and user characteristics leading to traffic engineering and analytical transportation planning theory and application.
Assessment: Class mark (40%); 3 h examination (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Civil Engineering Design Project
ENCV4DE H2
Prerequisite Requirement: Has passed all preceding core modules in the program.
Aim: To independently research a relevant Civil Engineering issue and produce a professionally presented portfolio.
Content: Investigation into a field of Civil Engineering involving a literature survey, conceptual and detailed computation and design in varying proportions, summarised in a professionally presented manner in a report with design calculations and construction drawings. Typical topics could include the following: An industrial site development, buildings, roads, parking and retaining walls. A freeway interchange with adjoining roads. A dam and ancillary works.
Assessment: Based on a detailed design report (including drawings), and an oral examination. Module divided into two portions: group work (25%) and individual portion (75%). A pass mark for the individual portion is required as a sub-minimum. Students are required to show competence in each ECSA outcome relevant to this module as specified in the module documents.
DP Requirement: Not applicable.
No supplementary examination is allowed, but in marginal cases the examiners may allow a 1-week upgrade process to address minor deficiencies. If such an upgrade is successful, a passing grade of 50% will be awarded.

Dissertation
ENCV4DS H2
Prerequisite Requirement: Has passed all preceding core modules in the program.
Aim: The candidate will be able to independently research a Civil Engineering issue and present their findings. To develop and consolidate research & reporting skills.
Content: Investigation into a field of Civil Engineering involving a literature survey, experimentation, and computation in varying proportions, summarised in a professionally presented research document. Typical topics could include the following: Hydrological investigations such as reservoir reliability. Transportation investigations such as secondary trips to shopping centres. Labour intensive construction methods.
Assessment: Written dissertation (70%), oral presentation/examination (30%). Students are required to show
competence in each ECSA outcome relevant to this module as specified in the module documents.

**DP Requirement**: Satisfactory completion of a research proposal and a preliminary literature review in the initial stages of the project.

No supplementary examination is allowed, but in marginal cases the examiners may allow a 1-week upgrade process to address minor deficiencies. If such an upgrade is successful, a passing grade of 50% will be awarded.

**Ground and Structural Engineering**

**ENCV4GS H1**

(39L-18T-0P-0S-51H-40R-7F-0G-5A-13W-16C)

**Prerequisite Modules**: ENCV3G1, ENCV3G2, ENCV3SD & ENCV3ST.

**Aim**: To introduce advanced concepts and techniques in Geotechnical Engineering and Structures in a context where there is interdependence of one on the other, using a major project.

**Content**: Bearing capacity analysis, Limit State Design using partial factors, retaining structures, prestressed concrete, selected advanced structures topics such as yield line analysis, plastic analysis of frames.

**Assessment**: Tests, assignments and tutorials: (40%); 3 h exam (60%).

**DP Requirement**: Students are required to attend all tutorials/lectures and complete all practicals satisfactorily, as specified in the module outline.

**Transport and Environmental Management**

**ENCV4TE H1**

(39L-11T-0P-0S-72H-32R-2F-0G-4A-13W-16C)

**Prerequisite Modules**: ENCV3TT.

**Aim**: To introduce basic aims and principles of management, which are integrated into practical examples in environmental and transport infrastructure management.

**Content**: Introduction to the basic management and ecological cycles as well as the social, financial, and legal environments into which the technical concepts of civil engineering are integrated. Applications in the natural and built environment in conformance with the world conservation strategy and more detailed study of the management and design of (transport) infrastructure systems to fulfil all requirements.

**Assessment**: Assignment (40%); Two 2 h exams (60%).

**DP Requirement**: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

**Vacation Work**

**ENCV4VW HC**

(0L-0T-0P-0S-0H-0R-0F-0G-0A-12W-0C)

**Aim**: An appreciation of a realistic working environment, enabling candidates to consider their studies in context.

**Content**: This is a requirement for the BScEng (Civil) degree. Vacation work is to be arranged and undertaken by students during the course of the degree in fields relevant to chemical engineering. A total of 12 weeks must be accumulated. A report on the work conducted is to be submitted to the department within one month of the conclusion of each vacation work period, together with a certificate of progress from the firm concerned, in which the actual period is also stated.

**Assessment**: Reports acceptable in terms of scientific method, synthesis, computer use and presentation.

**DP Requirement**: Satisfactory completion of vacation work reports.

**Water and Environmental Engineering**

**ENCV4WE H1**

(39L-10T-0P-0S-86H-20R-0F-0G-5A-13W-16C)

**Prerequisite Requirement**: 40% in ENCV2FL, ENCV3FA & ENCV3FB.

**Aim**: To introduce the principles of environmental & sanitary engineering, and pollution control. The role of hydrological and geohydrological mechanisms in control of transport of pollutants through the environment is introduced. Pollutant degradation mechanisms are presented. The link between water resources management & environmental engineering is introduced.

**Content**: Fundamentals of environmental engineering and water resources management (quality & quantity). Qualitative characterisation of wastewaters (domestic and industrial). Basic design and management of waste water treatment plants. Pollution dispersion in environmental systems. Introduction to solid waste management.

**Assessment**: Class mark (40%); 3 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Dissertation
ENCV801 HY

Aim: The student will: 1. Undertake detailed literature review as a way of information search; 2. Carry out detailed investigations (theoretical and practical) as a way of solving civil engineering projects; 3. Write and put together a detailed report of the investigations carried out to a scientifically acceptable standard.

Content: An individual investigation into an assigned problem relevant to the area of the specialization using established research techniques such as literature surveys, data collection, experimental, analytical or numerical work.

DP Requirement: Not applicable.
This module has no supplementary exam.

Water Resources Planning & Management
ENCV804 HC

Aim: The student should be able to: 1. Identify the phases in planning & the management of various water developments including the major sources & uses of water; 2. Estimate water demands for various water uses; 3. Be exposed to the use of modelling & optimization methods in the allocation and utilization of scarce water resources.

Content: Basic components and areas of water resources development, water demands and allocation for various uses: Economic, social and environmental issues in water resources development. The use of simulation and optimization in planning and management, multi-objective approaches to water resources planning and management. The use of computer models in water resources development.

Assessment: Assignments (30%); 2 h exam (70%).

DP Requirement: Satisfactory completion of tutorials and assignments.

Advanced Hydrology
ENCV813 HC

Aim: The student should: 1. Understand the physical processes of the land phase of the hydrological cycle; 2. Have reasonable knowledge of hydrological data measurement and processing techniques; 3. Be aware of the problem of inadequacy of hydrological data and ways of dealing with this; 4. Be able to apply typical flood models, water balance models and hydrogeological models; 5. Be aware of the global climate change problem and its potential hydrological implications.

Content: Advanced hydrological processes, overland flow, channel flow, river-aquifer interactions, drought occurrence, spatial and temporal distribution, floods: prediction, flood peak estimation, design flood, flood modelling, recent trends in occurrence and magnitudes of droughts and floods, data fitting techniques, approaches for dealing with inadequate hydrological data, water balance modelling, hydrogeological modelling, synthetic data generation. Application of selected modelling packages e.g. HEC1, HYMAS, MODFLOW etc.

Assessment: Assignments (30%); 2 h exam (70%).

DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Pollution and Control
ENCV817 HC

Aim: The student should be able to: 1. Understand the problem of pollution to physical environment; 2. Suggest remedial action plan to contain the adverse impact of pollution.

pollution and run-off. Soil conservation practices.

**Assessment:** Assignments (30%); 2 h exam (70%).
**DP Requirement:** Satisfactory completion of tutorials and assignments.

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**Advanced Groundwater Hydrology**
ENCV834 HC

Aim: At the end of the module, the student should be able to: 1. Understand methods of modelling water flow in aquifers and gain experience on groundwater modelling using numerical methods; 2. Analyse the effects of pumping on the productivity of aquifers.


**Assessment:** Assignments (30%); 2 h exam (70%).
**DP Requirement:** Satisfactory completion of tutorials and assignments.

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**Hydraulics of Pipelines**
ENCV837 HC

Aim: At the end of the module, the student should be able to analyse and design water distribution networks including water hammer devices.


**Assessment:** Assignments (30%); 2 h exam (70%).
**DP Requirement:** Satisfactory completion of tutorials and assignments.

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**Open Channel Flow**
ENCV838 HC

Aim: At the end of the module, the student should: 1. Be able to apply hydraulic flood routing methods; 2. Have adequate knowledge on the theory and design of open channels; 3. Be able to analyse the dam break problem and estimate the associated losses.


**Assessment:** Assignments (30%); 2 h exam (70%).
**DP Requirement:** Satisfactory completion of tutorials and assignments.

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**Concrete Pavements**
ENCV8CP HC

Aim: To introduce students to state-of-the-art practice and research in rigid pavement design and performance.

Content: Fundamental principles underlying the design of rigid pavements and industrial floors on the ground. Current practice with respect to design, construction, equipment, jointing, mix requirements and properties and behaviour modelling of concrete pavements.

Practicals: A field trip may be arranged.

**Assessment:** Assignments (30%); 2 h exam (70%).
**DP Requirement:** Satisfactory completion of tutorials and assignments.

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**Concrete Technology**
ENCV8CT HC

Aim: To introduce the student to state-of-the-art practice and research in the field of concrete technology.

Content: Concrete technology, including topics such as durability, dimensional stability, special concrete mixes and construction techniques.

Practicals: A field trip may be arranged.

**Assessment:** Assignments (30%); 2 h exam (70%).
**DP Requirement:** Satisfactory completion of tutorials and assignments.
Structural Design
ENCV8DS HC (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: To enable students to understand the underlying principles of selected topics in structural design; and to be able to apply the theory in practice.
Content: Selected topics in advanced structural design.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Fluid Dynamics
ENCV8EF HC (40L-22T-0P-0S-79H-15R-0F-0G-4A-13W-16C)
Aim: To develop an understanding of flow (air or water) in the natural environment & to develop the skills to apply this knowledge to the analysis & prediction of environmental flows
Assessment: Assignments, practical reports (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Impact Assessment
ENCV8EI HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)
Aim: To enable the student to: 1. perceive likely impacts of the planned activity on the environment; 2. apply methodologies to quantify the likely impacts for decision making.
Content: Methods of impact analysis. Prediction and assessment of the physical, sociological, legal and economic environment. Effect of the changed environment on man. Role of environmental engineering in the prevention of environmental stress. Planning and policy, administration and organization of natural resources development and public health. Land use planning and landscape design. The module will aim at exploring interactions between human activities and natural or man made systems, linking them to the concept of environmental sustainability and to environmental impact assessment (EIA) procedures. It focuses on both strategic EIA and project EIA, and discusses examples from EIA systems used in different countries.
Assessment: Assignments (30%); 2 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Sanitary Engineering
ENCV8ES HC (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: The module will introduce the students to the fundamentals of environmental sanitary engineering, especially with reference to pollution of water systems, waste waters treatment (municipal waste waters, landfill leachate and mine effluents), solid waste management and control of gaseous emissions. It will provide an outlook in the design and management of solid/liquid waste disposal techniques and control of environmental impacts of liquid/solid/gaseous emissions.
Content: Fundamentals of environmental engineering and solid/liquid waste management.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Advanced Soil Mechanics
ENCV8GA HC (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: The module will provide advanced knowledge for geotechnical modules in the Civil Engineering post graduate programme and provide a basis for pursuing research in related areas. The module will introduce the students to the advanced concepts of Geotechnical Engineering with reference to engineering characteristics of the soils. It will enable the students to understand the behaviour of soils in the presence of static and dynamic water. The module will also cover the shear strength of soils under drained and undrained conditions and elastic response to static loads.
Content: Soil composition and soil structure. Steady State flow, 2D and 3D seepage, transient flow. Compressibility

**Assessment:** Assignments (30%); 3 h exam (70%).

**DP Requirement:** Satisfactory completion of tutorials and assignments.

### Rock Mechanics

**ENCV8GB HC**

**Aim:** The module will introduce the students to the fundamental concepts of Rock Mechanics with reference to basic characteristics and physical properties of the rocks. It will, also, enable the students to study, understand and predict rock mass behaviour and to design rock slopes and underground openings. The module will provide basic knowledge for pursuing research in the related areas.

**Content:** Physical properties and classification of intact rock and rock masses, rock exploration, engineering properties of rock, stresses in rock near underground openings; Rock tunnelling, rock slope stability, bolting, blasting, grouting and rock foundation design.

**Assessment:** Assignments (30%); 3 h exam (70%).

**DP Requirement:** Satisfactory completion of tutorials and assignments.

### Introduction to Environmental Geotechnics

**ENCV8GE HC**

**Aim:** To introduce students to the environmental principles of geotechnics.

**Content:** Waste and tailings disposal and retention sites; groundwater flow and the transport of contaminants; legal aspects of environmental geotechnics; site remediation.

**Assessment:** Assignments (30%); 3 h exam (70%).

**DP Requirement:** Satisfactory completion of assignments and tutorials.

### Advanced Foundation Design

**ENCV8GF HC**

**Aim:** The candidate will be able to: evaluate and compare foundation systems for a project; to analyse and design foundations according to limit state principles using partial safety factors; make design decisions based on the information emanating from the analysis and designs.

**Content:** Analysis, design and testing of foundation systems such as piles, basements, rafts and spread footings in terms of ultimate and serviceable states.

**Assessment:** Assignments (30%); 3 h exam (70%).

**DP Requirement:** Satisfactory completion of tutorials and assignments.

### Site Investigation

**ENCV8GS HC**

**Aim:** Students will be introduced to a comparative understanding of site investigation covering the 3rd World and 1st World practices.

**Content:** Field techniques of in-situ testing, drilling and sampling and their effects on the quality of the information gained. Description of field profiling and interpretation of field data. Laboratory testing and interpretation of field data.

**Assessment:** Assignments (30%); 3 h exam (70%).

**DP Requirement:** Satisfactory completion of tutorials and assignments.

### Landfill Design and Management

**ENCV8LD HC**

**Aim:** The module will introduce the students to the fundamentals of solid waste disposal in landfills, focussing on design parameters, operation techniques, lining systems, leachate and biogas extraction and control systems. The module will give an outlook on the legal framework regarding waste disposal by landfill (South African Minimum Requirements for waste disposal by landfill) on the management and control of general and hazardous waste, landfill design techniques, siting and permitting procedures for new landfills.

**Content:** Legal framework regarding waste disposal by landfill, landfill design and operation, leachate and biogas
Numerical Methods
ENCV8NM HC 
Aim: Introduction to the concepts and applications of systems thinking and numerical methods as relevant to management and planning in civil engineering.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Pavement Design
ENCV8PD HC 
Aim: To introduce students to state of the art practice and research in the field of flexible pavement design and performance, including life prediction.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Pavement Materials
ENCV8PM HC 
Aim: To introduce students to state of the art practice and research in characterisation, testing, specification, construction and environmental performance prediction of pavement materials.
Content: Behaviour and fatigue characteristics of subgrade soils, aggregates, stabilised materials, bitumen, bituminous mixes and surface seals. Specifications for construction, quality control and compaction techniques. Materials requirements for design.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of tutorials and assignments.

Public Transport
ENCV8PT HC 
Aim: To develop students' appreciation and understanding of the underlying theory and principles of the supply and demand characteristics of public transport systems.
Content: The role of public transport, service characteristics of various urban transport systems. Problems associated with operations and demand characteristics are treated and also the characteristics and aspirations of system users. The principles of planning public transport interchanges are covered.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of assignments/test and project.

Prestressed Concrete Theory and Design
ENCV8SA HC 
Aim: To enable students to understand the underlying principles of prestressed concrete, and to be able to apply the theory in practice.
Assessment: Assignments (30%); 3 h exam (70%).
DP Requirement: Satisfactory completion of assignments and tutorials.

Advanced Reinforced Concrete Structures
ENCV8SB 
Aim: To introduce students to the basic principles of advanced reinforced concrete structures.

Assessment: Assignments (30%); 3 h exam (70%).

DP Requirement: Satisfactory completion of assignments and tutorials.

Structural Dynamics
ENCV8SD HC

Aim: To enable students to understand the underlying principles of structural dynamics and to be able to apply the theory in practice. The main purpose of the module is the emphasis on potential dynamic magnification of static effects.

Content: Equations of motion of elastic systems are established and solved in the cases of systems with single, multiple and an indefinite number of degrees of freedom. Free, damped and forced vibrations are dealt with, followed by application to practical cases. Where mathematical solution is not feasible, recourse is made to numerical techniques. Earthquake behaviour is also considered.

Assessment: Assignments (30%); 3 h exam (70%).

DP Requirement: Satisfactory completion of assignments and tutorials.

Structural Theory
ENCV8ST HC

Aim: To introduce students to advanced structural theory.

Content: Advanced structural theory covering static and dynamic behaviour, with linear and non-linear analysis techniques using the finite element method.

Assessment: Assignments (30%); 3 h exam (70%).

DP Requirement: Satisfactory completion of assignments and tutorials.

Transport Control
ENCV8TC HC

Aim: To develop students’ appreciation and understanding of the underlying theory and principles of road intersection/junction operation and various road traffic control measures.

Content: Concepts of capacity and level of service are treated and an outline is given of road Traffic System Management (TSM) techniques whilst most emphasis is placed on the behaviour (e.g. gap acceptance), service performance and control of traffic at intersections/junctions – including the principles of traffic signal timing and coordination.

Assessment: Assignments (30%); 3 h exam (70%).

DP Requirement: Satisfactory completion of tutorials and assignments.

Transport Development
ENCV8TD HC

Aim: To develop students’ understanding and appreciation of the effects of land use development and socio-economic characteristics on the demand for transport systems and also the environmental effects of transport systems - particularly in respect of the development of residential townships.

Content: An appreciation is given of the interaction between transport and land use development including: the effect of land use development on the demand for transport, socio-economic influences on transport demand, the environmental effects of transport systems - specifically noise and road accidents.

Assessment: Assignments (30%); 3 h exam (70%).

DP Requirement: Satisfactory completion of assignments/test and project.

Transportation Planning
ENCV8TP HC

Aim: To develop students’ understanding of the interaction between transport and land use and also the theory and principles of analytical transportation planning.

Content: An appreciation is given of the interaction between transport and land use development including the
practical outcomes of integrated versus no planning. Analytical transportation planning is treated in some detail including the relative merits of the various models that can be used to simulate; trip generation, trip distribution, modal split and traffic assignment. Data requirements and collection are treated as well as forecasting of demographic data and scenario techniques.

**Assessment:** Assignments (30%); 3 h exam (70%).

**DP Requirement:** Satisfactory completion of assignments/test and project.

**Urban Hydrology**
ENCV8UH HC

**Aim:** After completing the module, the student should be able to: 1. use typical flood model and storm water drainage design packages; 2. undertake optimal outline designs of urban storm water drainage systems; 3. identify the typical pollutants in urban storm water and approaches for minimising their impacts.

**Content:** Methods of flood peak estimation, flood hydrograph estimation methods, the HEC model, design floods, storm water drainage design – roof, road and drains, drainage network optimization, economic cost of flooding, quality of urban runoff, environmental impacts of urban storms, potential use of urban storm water.

**Assessment:** Assignments (30%); 2 h exam (70%).

**DP Requirement:** Satisfactory completion of assignments and tutorials.

**Principles of Water Quality & Legislation**
ENCV8WQ HC

**Aim:** The student should be: 1. acquainted with water quality parameters relevant to various beneficial uses of water; 2. acquainted with various legislative measures to protect the water resources for future use.


**Assessment:** Assignments (30%); 2 h exam (70%).

**DP Requirement:** Satisfactory completion of assignments and tutorials.

**Design of Water/Wastewater Treatment Plants**
ENCV8WT HC

**Aim:** To introduce the fundamentals of the design of potable water and waste waters treatment (municipal wastewaters) systems. To give an outlook in integrated approaches for the design of potable and waste waters treatment/purification plants.

**Content:** Qualitative and quantitative characterisation of raw water and wastewater. Basic design and management of potable and wastewater treatment plants including: hydraulic design, mixing units, physical units (mechanical pre-treatments, flotation, sedimentation), granular media filtration, biological units (activated sludge systems, anaerobic systems), chemical treatments and disinfection; sludge handling, treatment and disposal. Introduction to natural treatment systems and plants for rural communities.

**Assessment:** Assignments (10%), project (20%), test (10%); 3 h exam (60%).

**DP Requirement:** Satisfactory completion of assignments/test and project.

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**Computational Physics**

*Offered in the School of Chemistry and Physics*

**Computational Quantum Mechanics**
CPHY311 P1

**Prerequisite Modules:** PHYS231.
Corequisite: PHYS361.

Aim: To introduce the field of quantum mechanics in a practical, problem-solving manner using the computer as a tool.


Practicals: Students are required to attend weekly practicals and to submit a mini-project.

Assessment: Continuous: 3 projects (60%), tests (40%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Random Systems
CPHY312 P1

Prerequisite Modules: PHYS231.

Aim: To introduce physical systems governed by random processes and the use of random numbers in numerical techniques and simulations.

Content: Generation and transformation of uniform and non uniform random deviates; Monte Carlo integration; random walks, molecular dynamics, the diffusion equation; cluster growth models, percolation; the Ising model and the mean field approximation.

Assessment: Continuous: 5 projects (60%), tests (40%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Comp Statistical Physics & Thermodynamics
CPHY321 P2

Prerequisite Modules: CPHY212.

Corequisite: PHYS362.

Aim: To apply computational techniques to the study of statistical and thermodynamical systems.

Content: Enumeration of quantum states; spin 1 paramagnetic system; ideal gas in the canonical ensemble; kinetic theory of gases; and system of independent distinguishable harmonic oscillators.

Assessment: Continuous: projects and tests (100%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Computational Solid State Physics
CPHY322 P2

Prerequisite Requirement: At least 40% in PHYS361.

Prerequisite Modules: CPHY212,

Corequisite: PHYS362.

Aim: To study solid state systems using computational techniques.

Content: Crystal structure; energetics of solids; X-ray diffraction; lattice dynamics; and electronic structure.

Assessment: Continuous: projects and tests (100%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Computer Science

Offered in the School of Mathematics, Statistics and Computer Science

Introduction to Computer Science
COMP100 P1 W1

(39L-0T-36P-0S-63H-16R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Either Matric Maths HGD or SGA or NSC Maths at Level 5.

Aim: To introduce students to the basics of computer science.


Assessment: Class mark 50% (at least 2 theory tests (25%), at least 1 practical test (10%), practicals / assignments / tests (15%)), 3 h exam (50%), with a sub-minimum of 40% on both.

DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Credit may not be obtained for both COMP100 and either of ISTN100 or ISTN101.

Computer Programming

COMP102 P2 W2

Prerequisite Modules: COMP100.

Aim: To introduce students to programming in a high level language.


Assessment: Class mark 50% (at least 2 theory tests (25%), at least 1 practical test (10%), practicals/assignments/tests (15%)), 3 h exam (50%), with a sub-minimum of 40% on both.

DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Computer Literacy for the Humanities

COMP104 H1

Aim: To provide non-science students with a basic knowledge of popular computer packages.


Assessment: Class mark 50% (at least 3 theory tests (40%), at least 6 practicals/assignments (10%), 2 h exam (50%), with a sub-minimum of 40% on both.

DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Credit may not be obtained for COMP104 and any other COMP module or ISTN100 or ISTN101.

Computing for Natural Scientists

COMP106 P2 W2

Prerequisite Requirement: 40% in MATH133 or MATH130 or STAT130.

Aim: To enable Life Science students to make effective use of computers in communicating, researching information, managing and analysing data, and presenting their findings as reports or presentations.


Assessment: Class mark 50% (Theory tests (20%), practical tests (20%); practical assignments (10%)), 3h exam (50%), with a sub-minimum of 40% on both.

DP Requirement: 40% class mark, attendance at 80% of the practicals.

Object-Oriented Programming

COMP200 P1 W1

Prerequisite Modules: COMP102, MATH130.

Aim: To introduce students to the fundamentals of object-oriented programming.


Assessment: Class mark 50% (at least 2 theory tests (25%), at least 1 practical test (20%), at least 1 assignment/quiz (5%)), 3 h exam (50%), with a sub-minimum of 40% on both.

DP Requirement: At least 40% for continuous assessment, attendance at 80% of the practicals.
Data Structures
COMP201 P2 W2
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Requirement: At least 40% in COMP200.
Prerequisite Modules: MATH140.
Aim: To introduce students to the fundamentals of data structures.
Assessment: Class mark 50% (at least 2 theory tests (25%), at least 1 practical test (20%), at least 1 assignment/quiz (5%)), 3 h exam (50%), with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Internet Technologies
COMP203 P2
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Modules: MATH130, COMP102.
Aim: To introduce students to the fundamentals associated with the development of web-based client server systems.
Content: Scripting as a programming paradigm. Models for the implementation and interaction of clients and servers. Security and performance issues in distributed systems. Persistence of user generated data.
Assessment: Class mark (A minimum of 2 tests, both theoretical and practical (30%), assessment of project work (15%), assignments/quizzes (5%)), 3 h exam (50%) with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Computer Organisation and Architecture
COMP204 W2
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Modules: COMP102, MATH130.
Aim: To develop an understanding of computer architecture and assembly language programming.
Assessment: Class mark (30%) (at least 2 theoretical or practical tests (20%), practicals / assignments / quizzes (10%)), 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: 40% class mark, attendance at 80% of the practicals.

Comparative Programming Languages
COMP300 W2
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Modules: COMP200 and COMP201.
Aim: To introduce students to various programming language paradigms.
Assessment: Class mark 30% (2 tests (20%), practicals/assignments/quizzes (10%)), 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Software Design
COMP301 W2
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Modules: COMP200, 201.
Aim: To introduce students to the principles of software design.
Assessment: Class mark 50% (at least 2 tests (25%), project (25%)), 3 h exam (50%), with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.
Artificial Intelligence
COMP304 P2 W2

Prerequisite Modules: COMP200 and COMP201.
Aim: To introduce students to Artificial Intelligence concepts.
Assessment: Class mark 30% (2 tests (20%), practicals/assignments/quizzes (10%)), 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Translators, Compilers & Interpreters
COMP305 W1

Prerequisite Requirement: At least 40% in COMP204.
Prerequisite Modules: COMP200, 201.
Aim: To introduce students to Translators, Compilers & Interpreters.
Assessment: Class mark 30% (2 tests (20%), practicals/assignments/quizzes (10%)), 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Database Systems
COMP306 W1

Prerequisite Modules: COMP200 and COMP201.
Aim: To make students familiar with Database concepts.
Assessment: Class mark 30% (2 tests (20%), practicals/assignments/quizzes (10%)), 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Graphics & Modelling
COMP307 W2

Prerequisite Modules: COMP200 and COMP201.
Aim: To introduce students to a modern 3D-modelling language.
Assessment: Class mark (30%) (2 tests (20%), practicals/assignments/quizzes (10%)), 3 h exam (70%) with a sub-minimum of 40% on both.
DP Requirement: Class mark 40%, attendance at 80% of the practicals.

Computer Systems
COMP313 P1 W1

Prerequisite Modules: COMP200, 201.
Aim: To introduce Operating Systems and Data Communication concepts.
Assessment: Class mark 30% (2 tests (20%), practicals assignments / quizzes (10%)), 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: 40% Class mark, attendance at 80% of the practicals.
Theory of Computation
COMP314 P2 W2
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Modules: COMP200, 201, 16C of Level-2 MATH.
Aim: To introduce computability theory and algorithm complexity.
Assessment: Class mark 30% (2 tests (15%), practicals / assignments / quizzes (15%)); 3 h exam (70%), with a sub-minimum of 40% on both.
DP Requirement: 40% class mark, attendance at 80% of the practicals.

Advanced Programming
COMP315 P1 W1
(29L-0T-36P-0S-73H-16R-0F-0G-6A-13W-16C)
Prerequisite Modules: COMP200, 201.
Aim: To introduce advanced programming techniques necessary for the development of large, complex software.
Assessment: Class mark 50% (At least 2 tests (25%), practical assignments/programming project (25%)) 3 h exam (50%) with a sub-minimum of 40% on both.
DP Requirement: 40% class mark, attendance at 80% of the practicals and satisfactory completion of programming project.

Honours Project
COMP700 PY WY
(0L-0T-0P-0S-320H-0R-0F-0G-0A-26W-32C)
Aim: To get students to tackle a large programming project.
Content: Project topics from computer science.
Assessment: Proposal (5%), Design (10%), Oral presentation (10%), Mini-thesis & demo (75%).
DP Requirement: Not applicable.
Year Long Module. This module has no supplementary exam.

Image Processing and Computer Vision
COMP702 WC
(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)
Aim: To introduce students to image processing and computer vision.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %); Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Artificial Intelligence
COMP703 PC WC
(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)
Aim: To give students an in-depth coverage of artificial intelligence.
Content: In-depth coverage of one or more areas of artificial intelligence such as expert systems, game-playing, genetic algorithms, automated theorem proving, natural language processing.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %); Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.
Neural Networks
COMP704 PC WC
Aim: To introduce students to neural networks.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50%): Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Mathematical Modelling
COMP705 PC WC
Aim: To introduce students to mathematical modelling.
Content: Use of the symbolic, numeric and graphical capabilities of the symbolic manipulation package, Mathematica. Various modelling problems.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50%): Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Simulation Modelling
COMP706 WC
Aim: To introduce students to simulation.
Content: Simulation strategies and applications. Simulation languages and tools. Model development, implementation and validation. Simulation statistics.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50%): Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Cryptography & Network Security
COMP707 WC
Aim: To introduce students to cryptography & network security.
Content: Topics from modern cryptography, including symmetric & public-key cryptosystems, digital signature schemes, information theory, principles of network security.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50%): Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Advanced Operating Systems
COMP708 WC
Aim: To give students access to advanced operating systems concepts.
Content: Real time issues in multi-user operating systems. Distributed operating systems including cluster and grid computing. Concurrency. Parallel machine models.
Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50%): Assignments (both written and practical) and project work (individual or groupwork) (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Language Translation Systems
COMP709 PC
Aim: To introduce students to language translation systems.
Content: Syntax and semantics of languages. Levels of programming languages. Elements of formal grammars.
Lexical and syntactic analysis. Languages with rigid format and their translation. Translation, compilation and interpretation of high level programming languages.

**Assessment:** Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

**DP Requirement:** Not applicable.

**Offered in either Semester 1 or Semester 2. This module has no supplementary exam.**

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**Bioinformatics**

COMP710 PC

(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

**Aim:** To introduce students to bioinformatics.

**Content:** Basic genetic processes. Review of mathematical, computational and statistical background. Comparison of sequences. Multiple sequences alignment. Fragment reassembly. Protein structure prediction. Statistical processes in genetics. Project related to student background. Special topics.

**Assessment:** Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

**DP Requirement:** Not applicable.

**Offered in either Semester 1 or Semester 2. This module has no supplementary exam.**

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**Medical Informatics**

COMP711 WC

(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

**Aim:** To introduce students to medical informatics.

**Content:** Selected topics from Medical Informatics, Medical coding, image archiving, patient records, hospital networks.

**Assessment:** Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

**DP Requirement:** Not applicable.

**Offered in either Semester 1 or Semester 2. This module has no supplementary exam.**

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**Computer Graphics**

COMP712 PC WC

(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

**Aim:** To introduce students to computer graphics.

**Content:** Graphic systems, fundamental techniques in graphics, basic rendering, basic geometric modelling, programming. Topics from visualization, virtual reality, computer animation, multimedia data technologies, compression and decompression. Multimedia applications and authoring, multimedia servers and file systems. Networked and distributed multimedia systems. Recent topics.

**Assessment:** Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

**DP Requirement:** Not applicable.

**Offered in either Semester 1 or Semester 2. This module has no supplementary exam.**

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**Distributed Systems**

COMP713 PC

(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

**Aim:** To introduce students to distributed systems.

**Content:** Distributed computing fundamentals. Collaboration technology and groupware fundamentals. Distributed operating systems concepts. Modelling and analysis of distributed systems. Security issues in distributed systems.

**Assessment:** Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

**DP Requirement:** Not applicable.

**Offered in either Semester 1 or Semester 2. This module has no supplementary exam.**

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**Distributed Databases**

COMP714 WC

(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

**Prerequisite Requirement:** COMP306
Aim: To introduce students to distributed databases.

Content: Distributed database design. Concurrency control in distributed databases. Distributed transaction management, query processing and optimization in distributed databases. Data replication, reliability and fault tolerance in distributed database systems. Heterogeneous distributed databases, and introduction to parallel database systems.

Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

DP Requirement: Not applicable.

Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Advanced Networks
COMP716 WC 
(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

Aim: To give students an advanced knowledge of networks.

Content: Selected topics from Computer Networks.

Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

DP Requirement: Not applicable.

Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Contemporary Topics in Computer Science A
COMP717 PC WC 
(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

Aim: To give students access to a current hot topic in Computer Science.

Content: Topics in computer science, dependent on staff expertise and availability.

Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

DP Requirement: Not applicable.

Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Contemporary Topics in Computer Science B
COMP718 PC WC 
(19L-0T-13P-0S-106H-16R-0F-0G-6A-13W-16C)

Aim: To give students access to a current hot topic in Computer Science.

Content: Topics in computer science, dependent on staff expertise and availability.

Assessment: Continuous assessment (100%): At least 2 formal Tests (Practical / programming and/or theory based tests) (50 %): Assignments (both written and practical) and project work (individual or groupwork) (50%).

DP Requirement: Not applicable.

Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Crop Science

FOR UNDERGRADUATE PROGRAMME IN CROP SCIENCE – See Rule AES-BScAg2 and Agricultural Plant Sciences

Dietetics & Human Nutrition

Offered in the School of Agricultural, Earth and Environmental Sciences

DIET1: Weight, Diabetes, Heart disease
DIET237 P2 
(39L-0T-39P-0S-57H-20R-0F-0G-5A-13W-16C)
Prerequisite Modules: BIOC201, MPHY200, NUTR224.
Corequisite: BIOC212, HPHY200.
Aim: To develop an in-depth understanding of the causes, treatment and prevention of major lifestyle diseases.
Content: Obesity, underweight, diabetes, hypoglycaemia, coronary heart disease, hypertension.
Practicals: Problem solving.
Assessment: Tests (20%), prac evaluation (13%); 3h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Research Methods: Dietetics & Human Nutrition
DIET311 P1
Prerequisite Modules: NUTR224.
Aim: To give students a further understanding of the research processes used in nutrition and dietetic research, and enable them to evaluate the literature and write a literature review.
Content: Reviewing the literature; the research process; research ethics; methodology available to determine dietary intakes; use of quantitative and qualitative research methods in nutrition and dietetics; how to plan and write analytical seminars.
Practicals: Research methods and process.
Assessment: Test (16%), assignments (17%); 2 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Diet 2: Diet Therapy - Medical
DIET350 P1
Prerequisite Modules: BIOC201, 212, DIET237, HPHY200.
Aim: To develop an understanding of assessment, consistency modifications, cystic fibrosis, gastrointestinal disease, food allergies, cancer, malnutrition and infections.
Content: Assessment, consistency modifications, gastrointestinal disease, infections, cancer, food allergies, diarrhoea, TB, HIV/AIDS.
Practicals: Problem solving, visits to hospitals and clinics, case studies.
Assessment: Prac evaluation (17%), 2 tests (16%); 3 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Behavioural Science for Dietetics
DIET351 P2
Prerequisite Modules: DIET237.
Aim: To introduce basic aspects of human science from the perspective of the discipline of psychology. These aspects, combined with the development of basic counselling skills, are intended to enhance the ability of the Dietetics graduate to function effectively across a range of professional settings.
Content: Paradigms and their application to health and health care practice; health, illness and behaviour; human development; human behaviour and behaviour change; psychiatric disorders; professional development (e.g. dealing with death and dying, self care).
Practicals: Basic counselling skills. Group facilitation. Basic assessment skills.
Assessment: Assignments (23%), oral assessment (10%); 2 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Diet 3: Diet Therapy - Surgical
DIET360 P2
Prerequisite Modules: DIET350.
Aim: To develop an understanding of hyperalimentation, renal disease, liver disease and hypermetabolic conditions such as surgery, trauma, sepsis, burns.
Content: Renal disease, liver disease, gallbladder disease, pancreatic disease, hyperalimentation, hypermetabolism, surgery, trauma, sepsis, ARDS, burns.
Practicals: Problem solving, visits to hospitals and clinics, case studies.
Assessment: Prac evaluation (17%), 2 tests (16%); 3 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Therapeutic Dietetics Internship
DIET711 PY (41L-0T-35P-7S-40H-30R-482F-0G-5A-12W-64C)

Prerequisite Requirement: BScDiet degree.
Aim: To become competent in the therapeutic nutritional care of patients in a hospital setting.
Content: Medical, surgical and paediatric diseases and complications requiring dietary intervention.
Practicals: Students work in a hospital for the duration of the module.
Assessment: Minimum of 75% for multiple-choice questionnaire required before commencement of practice placement (0%). Professional competence during placement (14%, submin50%), case study (5%), assignments (8%), pharmacology test (2%), journal club presentation (2%), oral exam (2%); 3h exam (67%, submin 40%).
DP Requirement: 40% Class mark.
12 week module offered during the course of the year.

Electrical, Electronic & Computer Engineering

Offered in the School of Engineering

Electrical Design 1
ENEL1ED H2 (20L-5T-5P-0S-31H-15R-0F-0G-4A-13W-8C)

Aim: To be able to: Make an oral presentation on technical subject matter. Analyse and synthesize formal problem definitions. Synthesize and present structured and documented solutions incorporating Pseudo-code, Flow diagrams, Matlab code. Deploy such solutions in Matlab or build physical models/prototypes where required. Appreciate and incorporate basic design methodology
Practicals: Project Design of an electrical/electronic instrument
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all practicals and assignments satisfactorily, as specified in the module outline.

Computer Methods 1
ENEL2CA H1 (20L-10T-10P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite Modules: ENCH1TC, ENEL1ED.
Aim: To introduce the basic concepts of writing procedural code with sequence, selection and repetition. The representation of data in arrays, passing of data and storage in files. Presentation of structured and documented solutions to selected data processing problems.
Content: Procedures, selection and looping control structures, basic data representation and file access, algorithms, programs and computers.
Practicals: Programming assignments covering major aspects of the module content.
Assessment: Coursework and tests (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Computer Methods 2
ENEL2CB H2 (20L-10T-10P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite Modules: ENEL2CA.
Aim: To extend the computer programming paradigms presented in ENEL2CA: Programming for graphical user interfaces; event driven programming; Object oriented programming and application frameworks. These four concepts will be illustrated with a suitable programming language and application development system/framework to instil a good grasp of these concepts and how they are applied to large software projects to enhance productivity and reliability through good code encapsulation, documentation and re-use.
Content: The chosen language syntax; coding for the event driven paradigm; the concepts and tenets of Object
Oriented Programming; an introduction to application frameworks and the use of one typical framework; developing a system using all these paradigms.

Practicals: Programming Assignments covering major aspects of the module content.

Assessment: Coursework and tests (30%); 2 h exam (70%).

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Applied Computer Methods
ENEL2CM H1  
Aim: To provide an introduction to using software based solutions to solve engineering problems. Analysis, representation and manipulation of data. Analysis and representation of selected data processing problems. The structured top-down, algorithmic approach to solving engineering problems. Using Matlab as a medium for the deployment of software solutions; data processing and presentation; system analysis and high level mathematical computation.

Content: Programs and computers. Matrices and data structures. Data analysis, presentation and manipulation. Matlab programming. Program design, debugging and verification. Solution to numerical and non-numerical mathematical problems. Matlab applications for Chemical Engineering.

Assessment: Coursework and tests (30%); 2 h exam (70%).

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Data Structures & Algorithms
ENEL2DS H2  
Aim: To provide an understanding of data structures and algorithms used in computers.

Content: Survey of data structures. Arrays: stacks & queues, linked list, trees, graphs, symbol tables, files. Introduction to algorithmic complexity. Selection of algorithms from: sorting, searching, numerical and string processing.

Assessment: Coursework and tests (30%); 2 h exam (70%).

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Electrical Principles 1
ENEL2EA H1  
Prerequisite Modules: (PHYS152 or PHYS120), MATH132, MATH141

Aim: To provide the necessary background to enable students to solve simple electrical circuits using circuit theorems and analysis techniques and apply the theory of magnetic fields to the analysis of fundamental electrical devices.


Practicals: Four 3-hr laboratory practicals.

Assessment: Class mark (30%); 3 h exam (70%).

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Principles 2
ENEL2EB H2  
Prerequisite Modules: ENEL2EA.

Aim: To provide an introduction to electronic systems, analogue and digital electronics and measurement principles. To provide practical reinforcement of the theoretical material through laboratory sessions.

applications in simple circuits. BJT amplifier circuits: load lines. Small-signal models and analysis of amplifier circuits in the three basic configurations. Digital building blocks: digital information, binary number system, base conversions, binary addition and subtraction, sign-magnitude representation and binary codes. Combinational logic, truth tables, combinational gates, gate implementation, steady state and dynamic behaviour of CMOS gates, physical representation of binary states, logic families, Boolean algebra, logic minimisation including QM, applying MSI devices. Introduction to sequential logic, latches, flip flops, counters and registers, timers and oscillators. Digital systems: introduction to A/D and D/A conversion. Measurement principles: precision and accuracy, resolution and range.

Assessment: Class mark (30%); 3 h exam (70%).

Subminimum Requirements: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electronic Engineering
ENEL2EC H2
Prerequisite Modules: ENEL2EL.
Aim: To understand the frequency spectra of some periodic and non-periodic signals. Analyse and test the performance of some simple analogue and digital circuits.
Content: Signals and waveforms. Frequency response of simple filter circuits, the decibel and Bode plots. Amplifiers, the operational amplifier and their use in various linear circuits. Diode and transistor characteristics and their applications in simple analogue and digital circuits. Digital information. Combinational logic circuits, logic gates and logic families. Sequential logic circuits, flip flops, registers, latches and counters. A/D and D/A conversion techniques.
Assessment: Class mark (30%); 3 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Design 2
ENEL2ED H2
Prerequisite Modules: ENEL2EA.
Corequisite: ENEL2EB.
Aim: To introduce electrical instrumentation and measurement techniques, the use of transducers in measurement and the principles of electrical and electronic design.
Content: Instrumentation: standards and definitions (units, absolute and relative measurement, instrument range, accuracy, linearity, calibration and traceability). Electrical measurements: deflecting instruments, measurement of AC and DC voltages and currents, measurement of resistance, inductance and capacitance, use of digital and analogue oscilloscopes (bandwidth, triggering modes, loading). Linear least squares curve fitting for linear parameter models. Transducers including bridge based sensors. Elementary error analysis. Instrumentation amplifiers: noise, grounding and shielding. Electronic design: lectures and tutorial assignments on aspects of electronic engineering design. Design exercises will be performed by groups of students. Magnetic circuit design: Design, construction and testing of a non-linear magnetic circuit device.
Practicals: Practical design of electrical/electronic devices.
Assessment: Self-study report, design, laboratory report (30%); 2 h exam (70%).
DP Requirement: Performed all assignments satisfactorily, as specified in the module outline.

Electrical & Electronic Engineering
ENEL2EE H1
Prerequisite Modules: (PHYS120, 152 or 162), MATH132, MATH141
Aim: To introduce electrical and electronic engineering fundamental principles and their applications to Chemical Engineering students.
Content: Ideal circuit elements: voltage and current sources, resistance, capacitance, network theorems, transient response, average and rms values, frequency response. Phasor methods, impedance and admittance, active and reactive power. AC circuit theorems, single and three phase power circuits, transformers, electrical machines including induction motors. Semiconductor devices: Ideal and pn diode, rectifiers. Bipolar junction transistor (BJT) characteristics, switching circuits and small-signal amplifiers. Logic gates, combinational systems, sequential systems consisting of latches, registers, shift registers and counters. Frequency spectra, RC filters, Bode diagrams.
Operational amplifiers as amplifiers and comparators. Use of oscilloscope and multimeter, measurement techniques.

**Assessment:** Class mark (30%); 3 h exam (70%).

**DP Requirement:** Performed all laboratory practicals satisfactorily, as specified in the module outline.

**Electrical Engineering**
ENEL2EL H1

**Prerequisite Modules:** (PHYS120 or 152), MATH132, MATH141.

**Aim:** To Introduce Electrical Engineering fundamental principles and their applications to Mechanical Engineering students.

**Content:** Ideal linear circuit elements; mesh and nodal analysis of resistive networks; network theorems; transient response of simple circuits; average and RMS; alternating current and phasor methods; DC machines; single phase transformers; transmission and distribution of electrical power; industrial application of machines.

**Assessment:** Coursework and tests (30%); 3 h exam (70%).

**DP Requirement:** Performed all laboratory practicals satisfactorily, as specified in the module outline.

**Environmental Engineering**
ENEL2EN H2

**Aim:** Students will cultivate an appreciation for the environment, will know environmental legislation, how to implement appropriate environmental management strategies and environmental impact assessments and be aware of ISO standards and of how to implement them.

**Content:** Environmental awareness; environmental issues; integrated environmental management; legislation and regulations; environmental parameters; environmental cost; environmental impact assessment (EIA); monitoring of the environment; management plans; ISO standards. Impact of engineering activity and technology on society and the physical environment. Occupational and public health and safety.

**Assessment:** Tests (25%); 3 h exam (75%).

**DP Requirement:** Performed all assignments satisfactorily.

**Field Theory**
ENEL2FT H2

**Prerequisite Modules:** (PHYS120 or 152), MATH238.

**Corequisite:** MATH248.

**Aim:** To introduce basic concepts to enable students to solve static electric and magnetic field problems and understand how force and charge cause these fields.

**Content:** Electrostatics: conservation of charge, Coulomb's law, electric field intensity, Kirchhoff's laws, power and energy relationships, Gauss's theorem, divergence theorem, capacitance, energy stored. Electromagnetics: forces between moving charges, magnetic field, forces between current elements, Biot-Savart law, Ampere's circuital law, Lorentz's equation, generated and induced emf, Faraday's laws, Maxwell's equations.

**Assessment:** Coursework and tests (30%); 2 h exam (70%).

**DP Requirement:** Performed all laboratory practicals satisfactorily, as specified in the module outline.

**Nuclear & Semiconductor Physics**
ENEL2NP H2

**Prerequisite Modules:** PHYS120 or 152.

**Aim:** Knowledge and understanding of, and an ability to apply nuclear physics and semiconductor physics appropriate for Electrical Engineering students.

**Content:** Nuclear Physics (13L): atomic structure, wave nature of particles, introduction to quantum mechanics, nuclear structure, radioactive decay, nuclear reactions, reactors, biological effects of radiation, safety and environmental issues. Semiconductor Physics (13L): energy band theory, semiconductors, doping, charge carriers, pn junction, diode, field effect devices, bipolar junction transistors, introduction to power devices.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** Performed all laboratory practicals satisfactorily, as specified in the module outline.

**Physical Electronics 1**
ENEL2PA H1  
Prerequisite Modules: (CHEM181 and 191) or (CHEM163 and 173).

Aim: To assess materials by their properties for their suitability in electrical and electronic applications. Calculate electronic transport properties of materials and their optical, thermal and magnetic responses. Characterise the properties of p-n junctions and bipolar transistors.


Assessment: Class mark (30%); 2 h exam (70%).

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Physical Electronics 2
ENEL2PB H2  
Prerequisite Modules: ENEL2PA.

Aim: Understand the working of semiconductor components, apply equivalent circuit models and assess frequency limitations. Characterise the operation and limitations of semiconductor devices.


Assessment: Class mark (30%); 2 h exam (70%).

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Software Engineering 1
ENEL2SE H2  
Prerequisite Modules: (CHEM181 and 191) or (CHEM163 and 173).

Aim: To teach students how to write properly structured computer software to a professional standard.

Content: The activities that make up a typical software development lifecycle including requirements elicitation and analysis, system design and object design. Software development lifecycle modelling. Design and development methodologies. The use of UML in software development activities.

Assessment: Coursework and tests (30%); 2 h exam (70%).

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Workshop Course
ENEL2WS H2  
Prerequisite Modules: ENEL2PA.

Aim: Expose students to safety requirements and basic equipment they will use in design workshops and in preparation for their vacation work.


Practicals: All instruction takes place in laboratories & workshops.

Assessment: A duly performed certificate of competence.

DP Requirement: Attendance of module.

Analogue Electronics 2
ENEL3AE H2  
Prerequisite Modules: ENEL3TA.

Aim: To introduce students to the techniques used to design and analyse complex analogue electronic circuits containing passive and discrete active components for practical application. To expose students to more complex design and analysis issues such as frequency response and feedback.


Assessment: Class mark (30%); 2 h exam (70%).
**Computer Engineering Design 1**
ENEL3CA H1  
(10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

**Corequisite:** ENEL3TA.

**Aim:** Design and implement practical product oriented system. Apply theoretical engineering knowledge to practical design. Effectively communicate design concepts in written report and orally. Judge the merit and correctness of solutions to problems. Communicate the logic and detailed approach to problem solving. Work as part of a design team tasked with providing a design solution. Understand the nuances of the social issues confronting business in South Africa.

**Content:** Design studies and seminars will be conducted on selected topics of interest.

**Practicals:** Build, test and characterise analogue and digital circuits.

**Assessment:** Continuous assessment (30%), Final Assessment (79%).

**DP Requirement:** Not applicable.  
This module has no supplementary exam.

**Computer Engineering Design 2**
ENEL3CB H2  
(10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

**Prerequisite Modules:** ENEL2WS, ENEL3CA, ENEL3DS.

**Aim:** To give students the opportunity to participate in the design of computer hardware and software systems. The design process is formally structured to simulate a formal design approach. The design techniques build on those acquired in ENEL3CA.

**Content:** Design studies and seminars will be conducted on selected topics of interest to computer engineering students.

**Assessment:** Report marks (25%), presentation marks (25%), final assessment (50%).

**DP Requirement:** Not applicable.  
This module has no supplementary exam.

**Computer Methods 3**
ENEL3CC H1  
(20L-0T-20P-0S-25H-10R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENEL2CB

**Aim:** Using a high-level independent programming language to explore software systems with a focus on cooperative engineering application development. This will incorporate the use of advanced object orientated programming and basic user interface design.

**Content:** High-level object orientated programming, associated tools and techniques, cooperative engineering application.

**Assessment:** Coursework and test (30%); 2 h exam (70%).

**DP Requirement:** Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO5 (engineering method skills and tools including information technology).

**Communications**
ENEL3CO H2  
(39L-10T-12P-0S-84H-9R-0F-0G-6A-13W-16C)

**Prerequisite Modules:** MATH354, STAT370.

**Aim:** Analyse signals in the frequency domain. Analyse random signals in terms of probability distributions, power spectral densities and correlation. Understand the need for modulation in communication. Understand methods for modulating and demodulating analogue signals. Understand sampling theorem and pulse modulation systems. Understand effects of noise in analogue modulation systems.

**Content:** Spectral analysis, random variables and processes, amplitude modulation, frequency modulation, the sampling theorem, pulse modulation systems, noise in communication systems.

**Assessment:** Class mark (30%); 3 h exam (70%).

**DP Requirement:** Performed all laboratory practicals satisfactorily, as specified in the module outline.
Control Systems 1
ENEL3CS H2
Prerequisite Modules: ENEL3SS, MATH354.
Aim: Understand about feedback systems and feedback design.
Content: Block diagrams, feedback and feedforward systems; system specifications in the time and frequency domain; linear system stability; root locus analysis. Nyquist stability theorem; system compensation; differential sensitivity and relative stability; Nichols chart design for tracking and disturbance rejection; PID controllers.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electronic Design 1
ENEL3DA H1
Corequisite: ENEL3TA
Aim: Design and implement practical product oriented system. Apply theoretical engineering knowledge to practical design. Effectively communicate design concepts in written report and orally. Judge the merit and correctness of solutions to problems. Communicate the logic and detailed approach to problem solving. Work as part of a design team tasked with providing a design solution. Understand the nuances of the social issues confronting business in South Africa.
Content: Design studies and seminars will be conducted on selected topics of interest.
Practicals: Build, test and characterise analogue and digital circuits.
Assessment: Continuous assessment (30%), final assessment (70%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Electronic Design 2
ENEL3DB H2
Prerequisite Modules: ENEL2WS, ENEL3DA, ENEL3TA, ENEL3DS.
Corequisite: ENEL3AE, ENEL3DE.
Content: Design studies and seminars will be conducted on selected topics of interest to electronic engineering candidates.
Practicals: Build, test and characterise analogue and digital circuits & systems.
Assessment: Class mark (reports, presentations and lab work) (50%), final assessment (written report & oral presentation) (50%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Digital Electronics
ENEL3DE H2
Prerequisite Modules: ENEL2EB.
Aim: To provide a study of the design and analysis sequential circuits and to provide an introduction to VHDL.
Content: S-R latch, D-latch, D-FF, S-R FF, J-K FF and T-FF; analysis of hazard effects in sequential circuits; the synchronous finite state machine analysis; the synchronous finite state machine design; feedback sequential circuits analysis; feedback sequential circuits design; sequential MSI components; introduction to VHDL; implementation of digital circuits using VHDL.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Digital Systems
ENEL3DS H1

Prerequisite Modules: ENEL2CA.
Aim: Design microprocessor-based systems including peripheral hardware. Analyse a specific requirement and generate appropriate microcontroller hardware and software.
Content: Basic microcontroller architecture, bus timing, assembly language programming, design and development cycle, compilation and linkage. Peripherals, timers, I/O, device interfacing, synchronous and asynchronous I/O. Serial communication protocols. Interrupts, ISRs, prioritisation, triggering, latency. Event driven programme design. Some advanced topics relating to memory architectures, DSP’s and other topics.
Assessment: Class mark (30%); 3 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Design 3
ENEL3EA H1

Prerequisite Modules: ENEL2EA, ENEL2EB, ENEL2FT.
Corequisite: ENEL3MA.
Aim: Model and analyse electromagnetic actuators using the Finite Element Method. To work in a team in a structured way.
Content: Principles of finite element analysis of magnetostatic fields, modelling and analysis of electromagnetic circuits and actuators with the help of the finite element method, design and optimisation of electromagnetic actuators based on finite element analysis of the magnetic field. Selection of materials and design of electrical machines and actuators using finite element techniques.
Practicals: Design & testing of machines & actuators.
Assessment: Project reports, design tutorials, mini design project, test.
DP Requirement: Not applicable.
Subminimum Requirements: Students must pass the outcome assessment as part of the requirements of ECSA ELO5 (engineering methods, skills and tools including information technology) and ECSA ELO8 (working in a team).
This module has no supplementary exam.

Electrical Design 4
ENEL3EB H2

Prerequisite Modules: ENEL3DS ENEL3SS, ENEL2WS, ENEL3TA.
Aim: To understand electrical engineering applications of embedded microcontroller systems. To work in a team in a structured way.
Content: Design and test simple microprocessor systems. Real-Time embedded system control. Design, simulation, building and testing of real time embedded control systems. Interfacing to power electronic devices.
Assessment: Project reports, design tutorials, mini design project, test.
DP Requirement: Not applicable.
Subminimum Requirements: Students must pass the outcome assessment as part of meeting the requirements of ECSA ELO5 (engineering methods, skills and tools including information technology) and ECSA ELO8 (working in a team).
This module has no supplementary exam.

E-M Theory
ENEL3EM H2

Prerequisite Modules: ENEL2FT & MATH248.
Aim: Analyse EM fields, transmission lines and matching problems. Understand EMI/EMC.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.
Electrical Machines 1
ENEL3MA H1
Prerequisite Modules: ENEL2EL or ENEL2EA.
Aim: Understand the characteristics and applications of various electrical machines and mechanical loads. Predict electrical and mechanical characteristics of different electrical machines with loads and appreciation of temperature rise. Understand AC to DC current conversion techniques.
Content: DC machines, armature windings, efficiency and speed control. Single and 3-phase transformers, equivalent circuits, phasor diagrams, efficiency, regulation, autotransformers and 3-phase power measurement. Induction motors, equivalent circuits, performance calculations and starting. AC to DC conversion.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Perform all laboratory practicals satisfactorily, as specified in the module outline.
Subminimum Requirements: The assignment must be passed as part of meeting the requirements of ECSA ELO8 (multidisciplinary work). The assignment must be performed in a team, which includes both mechanical and electrical engineering students. The assignment will include mechanical and electrical components (such as matching mechanical load to machine specifications, motor-gearbox design).

Electrical Machines 2
ENEL3MB H2
Prerequisite Modules: ENEL3MA.
Aim: Understand the operation of synchronous machines and their electrical characteristics and testing techniques. Apply phasor-diagram techniques to arrive at numerical solutions for the electrical variables. Understand the operation, analyse and compare the performance of small AC motors under different steady-state operating conditions.
Content: Principles of cylindrical rotor synchronous machines, phasor diagrams, equivalent circuits, torque/load-angle relationships, open and short circuit characteristics, stability and the P-Q chart. Operation and comparison of different types of fractional power and single phase motors.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Power Electronics 1
ENEL3PE H2
Prerequisite Modules: ENEL2EA & ENEL2EB.
Content: Power switching devices: the switching principle, static and dynamic performance, and heat sinks. Power diodes, packages, snubber circuits, series and parallel operation, ratings, various power transistor types, characteristics and ratings. AC-to-DC conversion, various configurations of AC controllers and DC-to-DC conversion using buck and boost regulators.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Power Systems 1
ENEL3PS H2
Prerequisite Modules: ENEL3MA.
Corequisite: ENEL3MB, ENEL3EM.
Aim: Introduction to the field of power systems, power system control, operation and economics.
Assessment: Class mark (30%); 3 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Software Engineering 2
ENEL3SF H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)
Prerequisite Modules: ENEL2CA, ENEL2SE.
Aim: To provide a broad view of both quality assurance and testing so that students will have a broad awareness of many of the activities that contribute to managing the quality of a software product.
Content: Introduction: software life cycle, role of testing and quality assurance (QA), risk management. Test design techniques: exploratory testing, testing design techniques, system testing, test documentation. Bug isolation and reporting. Static testing; process improvement; overview of automated testing. Object oriented software engineering techniques: an in-depth view to using UML in the design and development of object-oriented software projects.
Assessment: Coursework and tests (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Systems & Simulation
ENEL3SS H1 (20L-5T-6P-0S-33H-12R-0F-0G-4A-13W-8C)
Prerequisite Modules: MATH238, MATH248, (ENEL2EA or ENEL2EL).
Corequisite: MATH354.
Aim: Understand how to model, simulate and analyse dynamic systems.
Content: First-principles, state space models of non-linear lumped parameter systems; numerical simulation - theory and practical implementation; linear systems - models, solutions and analysis; input-output descriptions and frequency domain methods; Bode plots; discrete time systems.
Assessment: Coursework and tests (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Analogue Electronics 1
ENEL3TA H1 (20L-5T-6P-0S-24H-20R-0F-0G-5A-13W-8C)
Prerequisite Modules: ENEL2EB.
Aim: To introduce the techniques used to design and analyse simple analogue electronic circuits containing passive and discrete active components for practical application.
Content: The BJT differential amplifier: configurations, input resistance, output resistance, differential gain, common-mode rejection ratio, common-mode input resistance, current mirrors and multistage amplifiers. s-domain analysis of filters and tuned amplifiers: Butterworth and Chebyshev low pass, high pass and band pass filter responses and their implementation using passive LCR networks and active components in Sallen & Key and biquad circuits. Normalised filter design using frequency and impedance transformations. Field-effect transistors: structure, operation and characteristics of enhancement and depletion type MOSFET’s. MOSFET biasing. MOSFET single-stage amplifier configurations. CMOS digital logic inverter and analogue switch.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Design & Analysis of Algorithms
ENEL4AA H1 (14L-6T-12P-0S-29H-15R-0F-0G-4A-13W-8C)
Prerequisite Modules: ENEL2DS, ENEL3CC.
Aim: To present the fundamental techniques for designing efficient computer algorithms, proving their correctness, and analyzing their running times.
Content: Review of algorithm design and analysis: time and space complexity; average and worst-case analysis; asymptotic notation; measuring the asymptotic growth functions; summations; recurrence relations. Divide and Conquer: Max-dominance. Review of sorting and lower bounds: analysis of mergesort, quicksort and heapsort, lower bounds on comparison-based sorting, linear time sorting, randomized selection. Graph algorithms: graph representations, depth-first and breadth-first search, directed acyclic graphs, minimum spanning trees, and shortest paths. Techniques for problem solving - dynamic programming: knapsack, chain-matrix multiplication, all-pairs shortest paths; longest common subsequence. Technique for problem solving - greedy algorithms: Huffman codes,
activity selection. NP-completeness: non-determinism, the classes P and NP, NP-complete problems, polynomial reductions, approximations.

**Assessment:** Coursework and tests (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (Investigation, experimentation and data analysis).

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**Acoustics**

**ENEL4AC H1**

(20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENEL3AE.

**Aim:** Understand vibration in physical systems, the performance of microphones and loudspeakers, the propagation of sound waves in rooms, the design of rooms for good speech intelligibility and how to control the radiation of sound from one room to another.

**Content:** Electrical, mechanical and acoustical analogies. Propagation of sound waves in different media. Microphones, pressure, pressure-gradient and combination types. Loudspeakers, radiation impedance and factors affecting their performance. Loudspeaker enclosures. Sound in enclosed spaces, reverberation, hearing and speech intelligibility, and sound transmission through walls. Acoustic measurements.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** Performed all laboratory practicals satisfactorily.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2: (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Artificial Intelligence**

**ENEL4AI H2**

(14L-6T-12P-0S-32H-12R-0F-0G-4A-9W-8C)

**Prerequisite Modules:** ENEL3CC.

**Aim:** This module affords candidates the opportunity of self-study in one or more topics in the field of artificial intelligence.

**Content:** Suitable topics are chosen by each candidate in consultation with the lecturer concerned at the start of the module. From the topics students should acquire skills to synthesize and present structured and documented solutions incorporating structured knowledge (fuzzy logic), and/or learnt knowledge (artificial neural networks) and adaptive neuro-fuzzy inference models. Deploy such solutions in simulation environments and/or programming languages like ANSI-C where necessary.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Automation**

**ENEL4AM H2**

(14L-6T-12P-0S-26H-12R-4F-0G-6A-9W-8C)

**Prerequisite Modules:** ENEL3SS, ENEL3CS.

**Aim:** Understand the automation process.

**Content:** The automation process; quality control, including ISO9000; automation technology (PLC's, SCADA, DCS and embedded systems); function and specification of measurement systems and actuators; process modelling; hazard analysis and safety systems; control and operability studies; batch control; historisation; artificial intelligence; embedded and low-cost automation. Manufacturing execution systems.

**Practicals:** Extended laboratory project; industrial tour.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).
Computer Engineering Design 3
ENEL4CA H1 (0L-10T-44P-7S-85H-11R-0F-0G-3A-13W-16C)
Prerequisite Modules: ENEL3CA, ENEL3DS, ENEL3CB, ENEL3AE, ENEL3DE.
Aim: To provide a vehicle for students to participate in and understand the engineering design process from the initial proof-of-concept and determination of need, through the market analysis, product specification, pre-prototype and prototype production and final prototype test and characterization phases. To provide a high stress situation in which group participation and co-operation is an essential in order to foster group working. To provide a situation where multiple, group presentations are required, one of which must be multi-media and concentrate on the non-technical aspects of the design such as financial viability, marketability, aesthetics and usability. To provide a module where entrepreneurial abilities are emphasized in order to prepare students for a probable life of self-employment.
Content: Design studies and seminars conducted on selected topics.
Practicals: Group laboratory design project.
Assessment: Continuous assessment (50%), final assessment (50%).
DP Requirement: Not applicable.
Subminimum Requirements: The module must be passed as part of meeting ECSA ELO1 (problem Solving), ECSA ELO2 (application of scientific and engineering knowledge) and, ECSA ELO3 engineering design). The team work component must be passed as part of meeting ECSA ELO8 (individual, team and multidisciplinary working).
This module has no supplementary exam.

Computer Engineering Design Project
ENEL4CB H2 (0L-0T-126P-0S-194H-0R-0F-0G-0A-13W-32C)
Prerequisite Modules: ENEL4CA.
Aim: Develop the skills necessary to interpret project specifications and plan the necessary work. Demonstrate an independent ability to solve Electronic Engineering design problems. Demonstrate the ability to assess the feasibility of design ideas, work safely and independently. Present ideas by means of written report, oral presentation with audio-visual aids and by means of a poster.
Content: Perform an individual design to an agreed specification. Present the design by means of a written report and an oral. Exhibit the design project at the School of Electrical and Electronic Open Day.
Practicals: Individual laboratory design project.
Assessment: Continuous assessment (25%), final assessment (75%).
DP Requirement: Students are expected to work consistently throughout the semester on their projects. Each student's performance on both the interim oral and interim report will be used to make a decision on the award of a duly performed certificate for the module.
Subminimum Requirements: The project must be passed as part of meeting ELO1 (problem solving), ELO2 (application of scientific and engineering knowledge and, ELO3 (engineering design). The report writing and oral component must be passed as part of meeting ELO6 (professional and technical written and oral communication).
This module has no supplementary exam.

Distributed Computing Systems
ENEL4CC H2 (20L-6T-12P-0S-26H-10R-0F-0G-6A-13W-8C)
Prerequisite Modules: ENEL4OS.
Aim: To design and program multimedia, client-server, web-based, and collaborative systems as well as parallel systems. To develop middleware, e.g., using distributed objects based software, such as CORBA, to interface databases, centralized services and legacy software systems.
Content: Introduction to distributed computing. GUI's, event handling, exceptions, manipulating images, and animations. Client-server systems, networking with sockets and streams. Concurrency, including Multithreading. Parallel computing, domain and functional partitioning, message passing and performance measurements. Collaborative systems, i.e., mobile agents, including security and reliability models.
Practicals: Two project-assignment.
Assessment: Test and projects (30%); 2 h exam (70%).
DP Requirement: None.
Subminimum Requirements: A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).
E-Commerce Systems
ENEL4CM H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Aim: To teach students about developments in e-commerce systems.

Content: Introduction to e-commerce; goals for e-commerce; b2b and b2c concepts; communication and computing infrastructure requirements; back-office system architectures; databases; data warehousing; ERP system integration; user side tools; security issues; legal issues; money management; some case studies.

Practicals: Laboratory work.

Assessment: Coursework and tests (30%); 2 h exam (70%).

Subminimum Requirements: A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Computer Architecture and Organisation
ENEL4CO H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite Modules: ENEL3DS.

Aim: To teach students about the hardware used in computer systems.

Content: Computer architecture; instruction set; number representation; redundant number system; mixed radix system; residue number system; addition principles and structure; carry-ripple adder; carry skip adder; carry look-ahead adder; multiplication of signed numbers; Booth's algorithm; floating point arithmetic; data and control pipelining; effects on performance; the MIPS computer; superscalar computers.

Assessment: Coursework and tests (30%); 2 h exam (70%).

Subminimum Requirements: A 50% average mark on practicals is required as part of meeting ELO4 (investigation, experimentation and data analysis).

Control Systems 2
ENEL4CS H1 (20L-2T-12P-0S-30H-12R-0F-0G-4A-13W-8C)

Prerequisite Modules: ENEL3SS & ENEL3CS.

Aim: Understand more about control systems and robust feedback design.

Content: Parametric and non-parametric system identification; frequency domain and quantitative feedback design; digital implementation; introduction to non-linear systems.

Assessment: Class mark (30%); 2 h exam (70%).

Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Electronic Design 3
ENEL4DA H1 (0L-20T-46P-11S-70H-16R-0F-0G-0A-13W-16C)

Prerequisite Modules: ENEL3DA, ENEL3DS, ENEL3DB, ENEL3AE, ENEL3DE.

Aim: Function in self-managed group projects. Have a good awareness of the full scope of the engineering design process. Design a reasonably complex electronic system to match an approved, self-generated product specification. Understand the importance of time and project management and be able to apply common tools to this end. Be aware of a variety of CAD tools to be used in the design process and able to apply some of these tools to create and/or implement a design.

Content: Design studies and seminars conducted on selected topics.

Practicals: Group laboratory design project.

Assessment: Continuous assessment (50%), final assessment (50%).

DP Requirement: Not applicable.

Subminimum Requirements: The module must be passed as part of meeting ECSA ELO1 (problem solving), ECSA ELO2 (application of scientific and engineering knowledge) and, ECSA ELO3 (engineering Design). The team work component must be passed as part of meeting ECSA ELO8 (individual, team-work and multidisciplinary working).
This module has no supplementary exam.

Digital Communications
ENEL4DC H1

Prerequisite Modules: ENEL3CO.
Aim: Characterise digital sources. Determine the information capacity and noise budget of digital communication systems. Understand the effects of noise in digital modulation systems. Analyse the performance of forward error correction systems. Understand optimum receiver and signal space concepts. Perform a system-level design of digital communication systems.

Content: Waveform coding; PCM, DPCM and Delta modulation. Information theory; entropy, coding of discrete sources, mutual information, channel capacity. Modulation; PSK, DEPSK, DPSK, FSK, MSK, Mary PSK and QAM. Data transmission; the optimum filter for a base-band signal receiver; the matched filter; coherent reception. Coding theory; block codes, convolutional codes, performance of coded systems.

Assessment: Class mark (30%); 2 h exam (70%).

DP Requirement: None.

Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Digital Processes
ENEL4DP H1

Prerequisite Modules: ENEL3DS, ENEL3DE.
Aim: The student will be able to write VHDL descriptions for circuits to be implemented on FPGA’s. Apply microprocessors in the solution of an embedded processor design problem. Analyse the potential performance of an embedded processor design. Create complex logic circuits on FPGA’s and use a software package to synthesize the solution.

Content: Embedded Processors: the study of small general purpose micro-controllers for use in embedded applications. Programmable Logic Devices: the study of selected PLD’s and the design tools required to use them for complex digital sub-systems.

Assessment: Class mark (30%); 2 h exam (70%).

DP Requirement: None.

Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Digital Signal Processing
ENEL4DS H1

Prerequisite Modules: ENEL3SS.
Aim: To understand the use of z-transforms in the analysis of discrete linear time invariant systems. Design of FIR and IIR filters using MATLAB and implementation on a DSP chip. Applications of DSP techniques in at least one of the following areas: speech and image processing, communications, medicine.

Content: The z-transform and its application to LTI systems. Frequency analysis of signals and systems. Design of FIR and IIR filters. Finite word length effects. The DFT and the FFT. Multirate DSP. The TMS320C50 DSP.

Assessment: Class mark(30%); 2 h exam (70%).

DP Requirement: None.

Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Data Communications
ENEL4DT H1

Prerequisite Modules: ENEL3CO.
Aim: Classify communication networks. Analyse the performance of large-scale communication networks. Design a
digital data communications network to match desired criteria.

**Content:** Introduction to computer networks, switching techniques, classes of networks, network structure and protocol layers. The physical layer and medium access modes. The data link layer, error detection and correction and flow control. The network layer, internetworking, bridges, routers and gateways. The transport layer. The session layer. The presentation layer. The application layer, remote file access, electronic mail, virtual terminals and directory services.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Electrical Design 5**
ENEL4EA H1

**Prerequisite Requirement:** Passed at least 10 Level-3 ENEL modules, ENEL3EA, ENEL3EB.

**Aim:** Develop the skills necessary to interpret design specifications, plan and execute a design procedure so as to meet such specifications. Demonstrate through project work an independent ability to solve Electrical Engineering design problems. Demonstrate through practical work the ability to assess the feasibility of design ideas, work safely and independently. Present ideas by means of written report and oral presentation with audio-visual aids.

**Content:** Design studies and seminars will be conducted on selected topics.

**Practicals:** Laboratory design project.

**Assessment:** Interim and final written reports and interim and final oral presentations.

**DP Requirement:** Not applicable.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO1 (problem solving), ECSA ELO2 (application of scientific and engineering knowledge), ECSA ELO3 (engineering design) and, ECSA ELO8 (individual working).

**This module has no supplementary exam.**

**Engineering Business**
ENEL4EB HB

**Aim:** Explain what corporate business is, the different sectors of businesses, sizes of enterprises, business strategy and planning. Read a business balance sheet and measure the performance of the business. Understand marketing principles. Understand the use of labour in business and some industrial relations issues. Be able to explain the role of the engineer in fulfilling business strategy. Explain the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.


**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO7 (impact of engineering activity). The professionalism assignment must be passed as part of meeting ECSA ELO10 (engineering professionalism).

**Analogue Electronics 3**
ENEL4EC H1

**Prerequisite Modules:** ENEL3AE.

**Aim:** Analyse complex analogue systems as used in the electronics industry. Design and synthesize analogue circuits to match specific requirements. Analyse and compensate for component non-linearities.

**Content:** The analysis and design of electronic circuits used in communication systems, digital systems, integrated circuits, instrumentation systems and data acquisition systems.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (30%); 2 h exam (70%).
Agriculture, Engineering & Science

**Electronic Design Project**
ENEL4ED H2

**Prerequisite Modules:** ENEL4DA

**Aim:** Develop the skills necessary to interpret project specifications and plan the necessary work. Demonstrate an independent ability to solve Electronic Engineering design problems. Demonstrate the ability to assess the feasibility of design ideas, work safely and independently. Present ideas by means of written report, oral presentation with audio-visual aids and by means of a poster.

**Content:** Perform an individual design to an agreed specification. Present the design by means of a written report and an oral. Exhibit the design project at the School of Electrical and Electronic Open Day.

**Practicals:** Individual laboratory design project.

**Assessment:** Continuous assessment (25%), final assessment (75%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis). Further, the practicals must be designed by the student and this must be demonstrated.

**Engineering Entrepreneurship**
ENEL4EE HB

**Aim:** To identify entrepreneurial characteristics & ability. To be aware of the various types of enterprises. To understand the need to set goals & objectives. To develop a simple business plan. To understand the need for marketing and selling. To identify key operating ratios of an enterprise. To be aware of how people are managed. To be aware of legal commitments of an enterprise.


**Assessment:** Class mark (20%); 2 h exam (80%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO7 (impact of engineering activity).

**Electrical Design Project**
ENEL4EP H2

**Prerequisite Modules:** ENEL4EA.

**Aim:** Develop the skills necessary to interpret project specifications and plan the necessary work. Demonstrate an independent ability to solve Electrical Engineering design problems. Demonstrate the ability to assess the feasibility of design ideas, work safely and independently. Present ideas by means of written report, oral presentation with audio-visual aids and by means of a poster.

**Content:** Perform an individual design to an agreed specification. The scope of the project must be approved by the Electrical Engineering discipline to ensure its suitability to allow students to meet the required exit-level outcomes. Present the design by means of a written report and an oral report. Exhibit the design project at the School of Electrical, Electronic and Computer Engineering Open Day.

**Practicals:** Laboratory work as determined by the requirements of the project.

**Assessment:** Continuous assessment (25%), final assessment (75%).

**DP Requirement:** Students are expected to work consistently throughout the semester on their projects. Each student's performance on both the Interim Oral and Interim Report will be used to make a decision on the award of a duly performed certificate for the module.
duly performed certificate for the module.

**Subminimum Requirements:** The project component must be passed as part of meeting ECSA ELO1 (problem solving), ECSA ELO2 (application of scientific and engineering knowledge), ECSA ELO3 (engineering design). The report writing and oral component must be passed as part of meeting ECSA ELO6 (professional and technical written and oral communication).

**This module has no supplementary exam.**

**Embedded Systems**
ENEL4ES H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENEL3DS.

**Aim:** To teach students about various microprocessor, micro controller and digital signal processing chips available and how to use some of them.

**Content:** The concept of embedded systems; embedded system architecture; CPU types (single chip to complex DSP processor systems); bus systems; I/O systems; ALU capabilities; memory systems; addressing modes; assembler languages; high-level embedded languages; operating systems; use of embedded processing; case studies of various applications.

**Assessment:** Coursework and tests (30%); 2 h exam (70%).

**DP Requirement:** None

**Subminimum Requirements:** A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**High Voltage Engineering 1**
ENEL4HA H1 (20L-2T-18P-0S-25H-10R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENEL3PS.

**Aim:** To provide candidates with the necessary theoretical and practical understanding of the design principles and performance of high voltage insulating materials.

**Content:** Generation and measurement of high voltages for testing purposes. Conduction processes in highly insulating materials. Gas discharges and the streamer mechanism. Processes that lead to failure of gaseous, liquid and solid insulation. Non-destructive testing techniques for evaluating high voltage equipment.

**Practicals:** Laboratory session plus report.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**High Voltage Engineering 2**
ENEL4HB H2 (14L-6T-8P-0S-32H-15R-0F-0G-5A-9W-8C)

**Prerequisite Modules:** ENEL3EM, MATH354, ENEL4HA.

**Aim:** To provide candidates with the necessary theoretical and practical understanding of the design principles of high voltage power systems and the performance of outdoor insulation.

**Content:** Numerical techniques for calculating electric field distributions in typical geometries. Partial discharge testing. Performance of outdoor insulators in polluted environments. Insulation co-ordination and transmission line design principles. Self-study through literature review related to the design, operation and maintenance of high voltage equipment.

**Practicals:** One 8 hour laboratory session plus report.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Internet Engineering**
ENEL4IE H2
(14L-8T-12P-0S-30H-10R-0F-0G-6A-13W-8C)

**Prerequisite Modules:** ENEL4DT.

**Aim:** To teach students about the history and development of the engineering concepts embodied in the Internet.

**Content:** Introduction to TCP/IP and associated protocols (HTTP, FTP, SNMP, SMTP, CGMP etc); IPv4, IPv6, mobile IP; TCP vs UDP; uni-, multi- and broad-cast addressing and traffic; programming using sockets; datalink access; client/server concepts; Internet standards; typical Internet applications; client/server programming

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None

**Subminimum Requirements:** A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Illumination**

ENEL4IL H2
(14L-6T-12P-0S-28H-12R-3F-0G-5A-9W-8C)

**Aim:** To understand the theory and application of illumination.


**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting the requirements of ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Instrumentation**

ENEL4IN H1
(20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENEL3TA, ENEL3MB.

**Aim:** To introduce instrumentation and instrumentation systems & their engineering design; the selection of primary sensors, principles behind process instrumentation. To design instrumentation amplifiers for low level primary signals. To learn electromagnetic interference effects and mitigating strategies.


**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Image Processing**

ENEL4IP H2
(20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENEL4DS.

**Aim:** To learn how digital images are acquired and processed to achieve objectives including image enhancement and data reduction.

**Content:** Human visual and image processing system. Digital images and types, image structure, parameters and pixels, image file formats, processing mathematics, image acquisition: hardware, optics, noise. Image processing and analysis: pixel operators, image transforms, image enhancement, image restoration, morphology, image
segmentation, image compression and quality assessment metrics.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Electrical Machines 3**
ENEL4MA H1 (20L-2T-12P-0S-31H-10R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENEL3MA, ENEL3MB, ENEL3CS, ENEL3PS and ENEL3SS.

**Aim:** Analyse salient pole synchronous machines. Test synchronous machines and measure their basic parameters. Analyse simple electromechanical converters. Deal with simple cases of transient behaviour of synchronous and dc machines. Analyse and calculate performance of closed loop speed control systems of dc motors.

**Content:** Salient pole synchronous machines, two-axis theory of synchronous machines, principles of electromechanical energy conversion, generalised machine theory, primitive machine, transient behaviour of synchronous machines, transient behaviour of dc machines, closed loop control of dc machines.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Electrical Machines 4**
ENEL4MB H2 (18L-6T-12P-0S-24H-15R-0F-0G-5A-9W-8C)

**Prerequisite Modules:** ENEL3MA.

**Aim:** Analyse induction machines working in various modes (motoring, generating, braking). Deal with cases of transient behaviour of induction machines, including thermal and mechanical transients. Test and model induction machines.

**Content:** Analysis of induction machines using equivalent circuit, dynamic braking of induction motors, plugging of induction motors, induction generator, deep bar and double cage induction motors, thermal and mechanical transient behaviour of induction motors, analysis of induction machines using d-q axis theory.

**Practicals:** Two laboratory sessions.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Microwave Systems**
ENEL4MS H2 (14L-6T-12P-0S-36H-8R-0F-0G-4A-9W-8C)

**Prerequisite Modules:** ENEL3EM.

**Aim:** Analyse and solve simple high frequency networks. Design simple passive microwave components. Explain the operation of some microwave measurement equipment. Analyse and design small signal microwave amplifiers.

**Content:** S parameters. Spectrum and network analyzer operation. Microstrip design and synthesis with reference to; frequency dependence, loss mechanisms, discontinuity models. Passive microstrip circuits including: multi-section impedance transformers and matching networks. Stepped impedance filters, power dividers, directional couplers and hybrid junctions. Coupled transmission line theory. Microwave CAD: circuit analysis and component models at high frequencies. Small signal microwave amplifiers; specified gain, low noise, biasing and construction.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4
Agriculture, Engineering & Science

Operations Research
ENEL4OR H2
(14L-6T-12P-0S-30H-14R-0F-0G-4A-9W-8C)
Aim: The student will be able to use a methodology effectively by identifying the various courses of action available in a complex operational problem and recommend the best course.
Assessment: Coursework and tests (30%); 2 h exam (70%).
DP Requirement: None.
Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Operating Systems for Engineers
ENEL4OS H1
(20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)
Prerequisite Modules: ENEL3CC.
Aim: The student will be able to: Understand the issues involved in concurrent programming including, synchronisation, deadlock, scheduling, memory management, security as used in a typical operating system such as UNIX.
Content: Concurrency issues; process management; threads; inter-process communication; synchronisation; deadlocks; scheduling; memory management; security. UNIX / Linux and Windows examples.
Assessment: Coursework and tests (30%); 2 h exam (70%).
DP Requirement: None.
Subminimum Requirements: A 50% average mark on practicals required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Power Electronics 2
ENEL4PA H1
(20L-2T-12P-0S-29H-12R-0F-0G-5A-13W-8C)
Prerequisite Modules: ENEL3PE.
Aim: The candidate will be able to: understand DC and AC variable speed drives. Select variable speed drives for various industrial applications. Understand regenerative operation of variable speed drives. Understand the basics of harmonics on the mains. Appreciate how variable speed drives are affected by quality of supply.
Practicals: Two 6-hr laboratory practicals.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: None.
Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Power Electronics 3
ENEL4PB H2
(14L-6T-12P-0S-32H-12R-0F-0G-4A-9W-8C)
Prerequisite Modules: ENEL4PA.
Aim: This is a self-study module. The candidate will be able to: Understand basic Power Electronics Systems in

Practicals: Two 6-hr laboratory practicals.

Assessment: Coursework and tests (50%); 2 h exam (50%). Student must demonstrate independent learning ability to meet ECSA exit-level outcome 9.

DP Requirement: None.

Subminimum Requirements: The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge) and ECSA ELO9 (independent learning ability). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Real Time Computing
ENEL4RC H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Aim: This is a self-study module where students will investigate and study issues involved in designing computer systems that are able to operate at speeds enabling real time processing of digital signals.

Content: Real-time system concepts; hard real-time and embedded systems; timing and scheduling as applied to periodic and aperiodic processes; hard vs soft deadlines; predictability, granularity and determinacy; rate monotonic and earliest deadline scheduling; real-time software and operating systems; real-time languages; real-time software design; reliability and fault tolerance in hardware and software; case studies.

Assessment: Coursework and tests (50%); 2 h exam (50%).

DP Requirement: None.

Subminimum Requirements: Students must demonstrate independent learning ability to meet ECSA ELO9.

Selected Topics in Electrical Engineering 1
ENEL4SA H1 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

Prerequisite Requirement: Has completed at least 96 credits of level 3 plus any other specialist pre-requisite required by the module lecturer.

Aim: This is a self-study module. To give students the opportunity to study in a specialty field in electrical engineering that is not covered in existing modules and for which there is a demand by a number of students, but subject to availability of suitable lecturing staff.

Content: This module covers topics selected from new & current disciplines in the field of electrical engineering. The selected topics are directed towards increasing the students’ working knowledge of the latest technologies and analytical techniques in electrical engineering.

Practicals: There may be two 6-hr laboratory practicals.

Assessment: Coursework and tests (50%); 2 h exam (50%).

DP Requirement: Pass the laboratory practical or equivalent assignment.

Selected Topics in Electrical Engineering 2
ENEL4SB H2 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

Prerequisite Requirement: Has completed at least 96 credits of level 3 plus any other specialist pre-requisite required by the module lecturer.

Aim: This is a self-study module. To give students the opportunity to study in a specialty field in electrical engineering that is not covered in existing modules and for which there is a demand by a number of students, but subject to availability of suitable lecturing staff.

Content: This module covers topics selected from new and current disciplines in the field of electrical engineering. The lectures are directed towards increasing the students’ working knowledge of the latest technologies and analytical techniques in electrical engineering.

Practicals: There may be two 6-hr laboratory practicals.

Assessment: Coursework and tests (50%); 2 h exam (50%).

DP Requirement: Pass the laboratory practical or equivalent assignment.

Superconductivity
ENEL4SC H2 (14L-6T-12P-0S-37H-7R-0F-0G-4A-9W-8C)

Prerequisite Modules: ENEL2PB.
Aim: To provide an insight into applications of superconductors and a thorough understanding of properties, limitations and behaviour of superconducting electrical and electronic devices. The module also gives an overview of the current development in the field and creates awareness of the nonlinear behaviour of superconducting devices.


Practicals: One 6-hr laboratory practical.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: None.

Subminimum Requirements: Students who fail the outcome assessment will fail the module. The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Security and Encryption
ENEL4SE H1
Prerequisite Modules: MATH349.
Aim: To teach students about security and encryption systems and their applications.
Content: Encryption system concepts; cyphers; block & stream cypher systems; concepts of authentication, verification, non-repudiation; examples of popular cypher systems, DES, PGP, RSA, RC2, DH; key management; certificates & certification agencies; Biometrics. database and its security.
Assessment: Coursework and tests (30%); 2 h exam (70%).
DP Requirement: None.
Subminimum Requirements: A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Power System Stability
ENEL4SS H2
Prerequisite Modules: ENEL3CS, ENEL4MA, ENEL4WA
Aim: To Introduce the concepts of interconnected power systems and the factors that influence their operation. To introduce typical stability problems in modern systems, causes and approaches. The students will also be exposed to the levels of mathematical model required to analyse different power system stability phenomena.
Content: The stability problem and the characteristics of modern power systems. Equipment characteristics and modelling; synchronous machines; AC transmission; excitation systems; prime movers; control of active and reactive power. Small-signal, transient and voltage stability in power systems; subsynchronous oscillations. Methods of improving stability.
Practicals: Two 6-hr laboratory practicals.
Assessment: Class mark (30%); 2 h exam (70%).
DP Requirement: None.
Subminimum Requirements: The module must be passed as part of meeting the requirements of ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

Selected Topics in Computer Engineering 2
ENEL4ST H2
Prerequisite Requirement: Has completed at least 96 credits of level 3 plus any other specialist pre-requisite required by the module lecturer.
Aim: To give students the opportunity to study in a specialty field in computer engineering that is not covered in existing modules and for which there is a demand by a number of students, but subject to availability of suitable lecturing staff.
Content: This module covers topics selected from new and current disciplines in the field of Computer Engineering. The lectures are directed towards increasing the candidates' working knowledge of the latest technologies and
analytical techniques in Computer Engineering.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Coursework and tests (25%); 2 h exam (75%).

**DP Requirement:** Pass the laboratory practical or equivalent assignment.

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**Communication Systems**

**ENEL4SY H2**

(14L-6T-12P-0S-26H-14R-4F-0G-4A-9W-8C)

**Prerequisite Modules:** ENEL3CO, ENEL4DC.

**Aim:** To see where the principles of communications are applied. To introduce the students to communications systems that they will encounter immediately they take up employment.

**Content:** Satellite communication systems: an introduction to the fundamentals of satellite communication systems; orbit types, the space segments, ground stations, link budgets, modulation schemes, multiple access types and beam switching. Direct broadcast systems (DBS), geo-stationary and low earth orbit systems and services; the Intelsat and INMARSAT systems. Cellular communication systems: principles of cellular communications systems, multiple access techniques, mobile propagation, channel modelling, analogue, digital cellular, personal communication services. Optical communication systems: optical fibre fundamentals; fibre properties, fibre link components, optical transmitters and receivers, splices connectors and couplers. Optical link design. Fibre-optic networks. Wavelength division multiplexing. Fibre fabrication and measurements.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Selected Topics in Electronic Engineering 1**

**ENEL4TA H1**

(14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

**Prerequisite Requirement:** Has completed at least 96 credits of level 3 plus any other specialist pre-requisite required by the module lecturer.

**Aim:** Students should have the ability to understand in reasonable depth the theory and practice of the particular topic, thus enabling them to proceed with post-graduate studies in this field or apply their knowledge to practical situations.

**Content:** This module covers topics selected from new and current disciplines in the field of Electronic Engineering. The lectures are directed towards increasing the candidates' working knowledge of the latest technologies and analytical techniques in Electronic Engineering.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** Pass the laboratory practical or equivalent assignment.

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**Selected Topics in Electronic Engineering 2**

**ENEL4TB H2**

(14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

**Prerequisite Requirement:** Has completed at least 96 credits of level 3 plus any other specialist pre-requisite required by the module lecturer.

**Aim:** In this self study module students should have the ability to understand in reasonable depth the theory and practice of the particular topic, thus enabling them to proceed with post graduate studies in this field or apply their knowledge to practical situations.

**Content:** This module covers topics selected from new and current disciplines in the field of Electronic Engineering. The lectures are directed towards increasing the candidates' working knowledge of the latest technologies and analytical techniques in Electronic Engineering.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (50%); 2 h exam (50%).

**DP Requirement:** Pass the laboratory practical or equivalent assignment.

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**Selected Topics in Computer Engineering 1**

**ENEL4TC H1**

(14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)
**Prerequisite Requirement:** Has completed at least 96 credits of level 3 plus any other specialist pre-requisite required by the module lecturer.

**Aim:** To give students the opportunity to study in a specialty field in computer engineering that is not covered in existing modules and for which there is a demand by a number of students, but subject to availability of suitable lecturing staff.

**Content:** This module covers topics selected from new and current disciplines in the field of computer engineering. The lectures are directed towards increasing the students’ working knowledge of the latest technologies and analytical techniques in computer engineering.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Coursework and tests (25%); 2 h exam (75%).

**DP Requirement:** Pass the laboratory practical or equivalent assignment.

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**VLSI Design**

ENEL4VL H2 (14L-6T-12P-0S-32H-10R-0F-0G-6A-13W-8C)

**Prerequisite Modules:** ENEL3TA, ENEL3DS.

**Aim:** To understand the main suite of tools that are available for VLSI design, and how they work together to support the design flow of a project. Understand the capabilities and limitations of each individual tool from their external interfaces and roles in the design process. To use modern CAD tools for VLSI design. Understand how computers can be programmed to help in the design of very-large-scale integrated (VLSI) circuits.

**Content:** Procedures for designing and implementing digital integrated systems. Design environments: system level, algorithm level, component level and layout level. Structured design technology and design tools: synthesis tools; cell contents generation and manipulation, generators of layout outside the cell, silicon compilers, post-layout generators. Static analysis tools; node extraction, geometrical design-rule checkers, electrical-rule checkers, verification. Dynamic analysis tools; circuit-level simulation, logic-level simulation, functional- and behavioural-level, simulation issues, even-driven simulation, hardware and simulation. Output of design aids; circuit boards, integrated circuits, implementation issues. Stick diagrams and graphics: display graphics, hardcopy graphics, and input devices. Scalable design rules.

**Assessment:** Coursework and tests (30%), 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

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**Vacation Work**

ENEL4VW H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-12W-0C)

**Aim:** An appreciation of a realistic working environment, enabling candidates to consider their studies in context.

**Content:** This is a Duly Performed requirement for the BScEng degree in Electrical, Electronic or Computer Engineering. Vacation work is to be arranged and undertaken by students during the course of the degree in fields relevant to their degrees. A total of 13 weeks must be accumulated. A report on the work conducted is to be submitted to the school within six weeks of the conclusion of each vacation work period, together with a certificate of progress from the firm concerned, in which the actual period is also stated.

**Assessment:** Two Reports acceptable in terms of scientific method, synthesis, computer use and presentation.

**DP Requirement:** Satisfactory completion of vacation work reports.

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**Power Systems 2**

ENEL4WA H1 (20L-2T-12P-0S-20H-20R-0F-0G-6A-13W-8C)

**Prerequisite Modules:** ENEL3PS & ENEL3MB.

**Aim:** Analyse and solve faulted power system networks for protection co-ordination of electrical equipment. Acquire a knowledge of earthing systems and practices, surge and over-voltage protection.


**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (30%); 2 h exam (70%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting ECSA ELO2 (application of scientific
and engineering knowledge. A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Power Systems 3**

ENEL4WB H2

**Prerequisite Modules:** ENEL4WA.

**Aim:** This is a self study module. Knowledge and understanding of power systems. Report writing and presentation skills. Group/team work. Interact and obtain information from industry and consultants. Time management, appointment making, interviewing and planning skills

**Content:** A variety of power system topics are provided to choose from. Students select topics and then research the area of concern and provide weekly reports, which also form the lectures to one another. A list of twenty topics relevant to the field of power systems is provided and individual or group project suggestions are welcomed.

**Practicals:** Two 6-hr laboratory practicals.

**Assessment:** Class mark (50%); 2 h exam (50%).

**DP Requirement:** None.

**Subminimum Requirements:** The module must be passed as part of meeting the requirements of ECSA ELO2 (application of scientific and engineering knowledge) and ECSA ELO9 (independent learning ability). A 50% average mark on practicals is required as part of meeting ECSA ELO4 (investigation, experimentation and data analysis).

**Dissertation - Power and Energy**

ENEL810 HY

**Aim:** The candidate to undertake research and write a dissertation showing that they (i) understand the nature and purpose of the investigation, (ii) are sufficiently acquainted with the relevant literature, (iii) have mastered the necessary techniques (iv) have acquired a thorough understanding of scientific method, (v) are capable of assessing the significance of their findings. Such dissertation must be satisfactory as to literary style and presentation.

**Content:** The module requires the candidate to undertake a research project on an approved topic under supervision.

**Assessment:** Examination of the dissertation by internal and external examiner (100%).

**DP Requirement:** Not applicable.

**This module has no supplementary exam.**

**Overview of Power & Energy Systems**

ENEL818 HC

**Aim:** To provide a comprehensive overview and introduction to the structure of the power sector, the major issues in power industry restructuring and state of the art developments in the field

**Content:** Energy resources and electric power generation- will discuss the generation technologies including conventional and non-conventional energy generation including renewable energy technologies. The students will be exposed to the techno-economic analysis of such generation technologies, the analytical models and environmental impact.

Global energy scenario- discussion on changing energy mix, future energy forecasts, policy implications. Some discussion of the South African energy policy will be touched upon and students will be required to carry out self-study.

Power industry structure- the notion of vertically integrated power systems, the deregulation of power industry, establishment of competitive market structures, auction mechanisms.

Power system structure- will discuss various components of power systems- generation, transmission and distribution with a brief introduction to operation and control of power systems both in vertically integrated systems and the changing paradigms in the context of deregulation.

New developments in power industry- introduction to smart grids, smart meters, customer participation in power systems operations and planning, demand response issues.

**Assessment:** Individual assignment or test and group assignment (50%); 2 h exam (50%).

**DP Requirement:** Students are required to complete all assignments satisfactorily

**Project Engineering & Business Strategies**

ENEL819 HC

**Aim:** To provide a comprehensive overview and introduction to the structure of the power sector, the major issues in power industry restructuring and state of the art developments in the field

**Content:** Energy resources and electric power generation- will discuss the generation technologies including conventional and non-conventional energy generation including renewable energy technologies. The students will be exposed to the techno-economic analysis of such generation technologies, the analytical models and environmental impact.

Global energy scenario- discussion on changing energy mix, future energy forecasts, policy implications. Some discussion of the South African energy policy will be touched upon and students will be required to carry out self-study.

Power industry structure- the notion of vertically integrated power systems, the deregulation of power industry, establishment of competitive market structures, auction mechanisms.

Power system structure- will discuss various components of power systems- generation, transmission and distribution with a brief introduction to operation and control of power systems both in vertically integrated systems and the changing paradigms in the context of deregulation.

New developments in power industry- introduction to smart grids, smart meters, customer participation in power systems operations and planning, demand response issues.

**Assessment:** Individual assignment or test and group assignment (50%); 2 h exam (50%).

**DP Requirement:** Students are required to complete all assignments satisfactorily
Aim: To offer advanced knowledge in Project Engineering and Business Strategy. Develop a methodology to implement the business strategy project management.

Content: The module is split into two parts. The first part covers project engineering. Areas covered will include: Project definition, project planning, planning techniques, risk assessment and analysis, project management and commissioning. Time, cost, performance and innovation will be discussed in details as well as trading off between these variables. Case studies from the electric utility industry will also form part of the coursework. The second part focuses on business strategies. The student will gain a good understanding of how to put a strategy into place. Thereafter tools will be developed to implement the strategy.

Assessment: Individual assignment or test and group assignment (30%); 2 h exam (70%).

DP Requirement: Students are required to complete all assignments satisfactorily.

Advanced Power Electronics
ENEL825 HC
(47L-8T-0P-8S-78H-15R-0F-0G-4A-13W-16C)

Aim: To offer advanced knowledge in the field of Power Electronics

Content: The module is split into seven parts. The first two parts cover: AC to DC mains frequency conversion, uncontrolled and controlled converters with characteristics and industrial applications. The third and fourth parts cover: DC to DC conversion, isolated and non-isolated converters with characteristics and industrial applications. The fifth and sixth parts cover: AC to AC and DC to AC conversion, converters with characteristics and industrial applications. The eighth part covers industrial power electronic applications, in the applications the learner will apply tools and knowledge gained from the first seven parts of the module.

Assessment: Individual assignment or test and group assignment (30%); 3 h exam (70%).

DP Requirement: Students are required to complete all assignments satisfactorily.

Advanced HVDC Systems Design and Operation
ENEL826 HC
(50L-8T-0P-8S-75H-15R-0F-0G-4A-13W-16C)

Aim: To offer advanced knowledge in the application of HVDC systems in modern transmission schemes, taking strengths and weaknesses into account. Specific design parameters and criteria important to the planning and design engineer are evaluated. Ultimately, the impact of the planning and design phases on the operation of HVDC Systems are covered.


Assessment: Individual assignment or test and group assignment (30%); 3 h exam (70%).

DP Requirement: Students are required to complete all assignments satisfactorily.

Advanced High Voltage Engineering
ENEL827 HC
(30L-10T-5P-0S-96H-15R-0F-0G-4A-13W-16C)

Aim: To offer advanced knowledge in High Voltage Engineering. This module provides advanced knowledge in the technology and testing techniques for high voltage power system components and equipment.

Content: The module covers advanced principles and practical applications in the following areas: Generation and measurement of high voltages; breakdown characteristics of insulation systems; field’s evaluation and insulation systems design; high voltage tests and specifications; insulation coordination; shielding; earthing and EMC considerations. Practical applications of the principles in the power industry.

Assessment: Individual assignment or test and group assignment (40%); 3 h exam (60%).

DP Requirement: Students are required to complete all assignments satisfactorily.

Advanced EMC and Power Quality
ENEL828 HC
(40L-8T-0P-0S-93H-15R-0F-0G-4A-13W-16C)

Aim: To offer advanced knowledge in EMC and Power Quality in Power Systems; understanding the phenomena, identifying potential problems, identifying the causes and proposing appropriate mitigation options. Simulation and analysis of the phenomena in a power system environment.

Content: Different phenomena, standards, measurement, assessment, propagation, mitigation and management methods are covered in the following two areas: EMC in power systems and Power Quality.
Syllabus

Power Systems Protection
ENEL829 HC (50L-6T-4P-0S-77H-15R-4F-0G-4A-13W-16C)

Aim: To offer advanced knowledge in power systems protection, starting from fundamentals, tools and philosophies that will enable participants to design, plan and configure safe, reliable and sustainable protection systems for generators, transporters, distributors and users of electrical power and to prepare them in the tackling of emerging protection related technologies and challenges in the power industry.

Content: Power system in the steady state, dynamic and transient behaviour of systems. Analysis of faulted networks assisted by tools such as the per-unit systems and symmetrical components. Models power systems components. Over-current protection of distribution systems. Various techniques for the protection of long lines and feeders, their limitations in operation and alternative solutions are treated. Numerical relaying and substation automation involving SCADA and accompanying communication protocols.

Assessment: Individual assignment or test and group assignment (30%); 3 h exam (70%).

DP Requirement: Students are required to complete all assignments satisfactorily

Transmission and Distribution Systems
ENEL830 HC (30L-10T-5P-0S-96H-15R-0F-0G-4A-13W-16C)

Aim: To offer advanced knowledge of the planning, design and operation of Transmission and Distribution (TD) systems.

Content: Philosophies associated with TD planning, design and operation; including the use of modern software tools. Determination of the need for expansion or strengthening of the TD network. Formulate creative and innovative alternative plans to meet this need. Analysing plans to ensure compliance with agreed technical limits and criteria. Cost plans on the basis of present-day capital costs and using appropriate net discount rates. Life cycle costing in terms of Operating and Maintenance costs and costs of losses. Investigate the economic justification. Obtain approval of recommended plans and to initiate execution.

Assessment: Individual assignment or test and group assignment (40%); 3 h exam (60%).

DP Requirement: Students are required to complete all assignments satisfactorily

Environmental Sciences
Offered in the School of Agricultural, Earth and Environmental Sciences

Environmental Systems
ENVS120 H2 P2 W2 (39L-8T-30P-0S-66H-10R-0F-0G-7A-13W-16C)

Aim: To introduce basic concepts in Physical Geography & the functioning of Environmental Systems.


Assessment: Assignment/essay (20%), Tests (10%), Practicals (20%); 3 h theory exam (50%).

DP Requirement: 80% attendance at practicals and tutorials; 40% Class mark.

Students may be required to contribute to costs of fieldwork.

Biophysical Environments of Southern Africa
ENVS210 H1 P1 W1 (39L-0T-40P-0S-54H-20R-0F-0G-7A-13W-16C)

Prerequisite Modules: ENVS120.

Aim: To introduce students to the physical processes that shape the biophysical environment in southern Africa.

Content: Weather producing systems and southern African climates and their variability; the biogeography of the...
region in terms of the distribution of biota through climatic and other environmental factors; a discussion of biomes, biodiversity and conservation; the properties of geomorphic materials as well as erosion, transport and deposition processes that shape and modify the landscape.

**Assessment:** Assignments (15%), Tests (15%), Practicals (20%); 3 h theory exam (50%).

**DP Requirement:** 80% attendance at practicals and field work; 40% Class mark.

Students may be required to contribute to costs of fieldwork.

### Geographic Information Systems

**ENVS211 H2 P2 W2**

**(29L-0T-36P-0S-77H-10R-0F-0G-8A-13W-16C)**

**Prerequisite Requirement:** 64C at Level 1.

**Aim:** To introduce students to the concepts, techniques and interdisciplinary application of GIS and remote sensing as environmental decision-making tools.

**Content:** Development, interdisciplinary nature and potential value of GIS; referencing the geographic location of data; technological environment of GIS, data sources, data models, entry and analysis; data quality, management & legal aspects; GPS, spatial representation concepts, maps as records and reflections of dominant ideologies, introduction to aerial photography.

**Assessment:** Practical reports (15%), practical test (15%), theory test (10%), assignment (10%); 3 h theory exam (50%).

**DP Requirement:** 80% attendance at practicals; 40% Class mark.

### Introduction to Remote Sensing

**ENVS250 P1 W1**

**(29L-0T-36P-0S-75H-10R-0F-0G-10A-13W-16C)**

**Prerequisite Requirement:** 64C from the College or from ISTN.

**Aim:** To introduce the theoretical and practical concepts of Remote Sensing.


**Assessment:** Test (10%), assignment (10%), practical reports (15 %), Practical test (15 %), 3 h theory exam (50%).

**DP Requirement:** 80% attendance at Practicals, 40% class mark.

### Biogeography and Climatic Change

**ENVS314 P1 W1**

**(27L-5T-30P-6S-64H-24R-0F-0G-4A-13W-16C)**

**Prerequisite Requirement:** 32C at Level 2.

**Prerequisite Modules:** ENVS210 or equivalent.

**Aim:** To provide students with a broad understanding of key biogeographical concepts.


**Assessment:** Tests (10%), Seminar, essays, presentations (15%), Practicals (including a field trip) (25%); 3 h exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

Students may be required to contribute to costs of fieldwork.

### Soil Erosion and Land Degradation

**ENVS315 P1 W1**

**(27L-0T-46P-0S-73H-10R-0F-0G-4A-13W-16C)**

**Prerequisite Modules:** ENVS210.

**Aim:** To introduce the processes, social & physical consequences of soil erosion & land degradation issues in Africa.

**Content:** Land degradation & sustainability; causes & consequences of degradation; risk assessment in relation to the sustainability of soil; food security & degradation; political & socio-economic aspects of soil erosion; physical & chemical erosion processes; human-environment processes & influences; conservation practices; magnitude-frequency considerations; desertification; land use systems in a historical context; soil conservation strategies; principles, planning & policy issues.
Practicals: Case studies & applications. Possible four day excursion.
Assessment: Field report/Assignment (30%), Practicals (10%), Test (10%); 3 h exam (50%).
DP Requirement: 80% attendance at practicals; field trip compulsory; 40% Class mark.
Students may be required to contribute to costs of fieldwork.

GIS & Remote Sensing
ENVS316 H2 P2 W2 (27L-1T-36P-0S-62H-27R-0F-0G-7A-13W-16C)
Prerequisite Modules: ENVS211 or equivalent knowledge.
Aim: This module is designed to provide further insight into GIS as a management tool for spatial data.
Content: Spatial data and modelling; Attribute data management; Analysis of remotely sensed GIS data and its classification; Data quality issues; GIS project management and design.
Assessment: Theory test (10%), assignment (10%), practical reports (15%), practical test (15%); 3h theory exam (50%).
DP Requirement: 80% attendance at practicals and tutorials; 40% Class mark.
Students may be required to contribute to costs of fieldwork.

Atmospheric Science
ENVS318 W2 (30L-0T-35P-0S-66H-25R-0F-0G-4A-13W-16C)
Prerequisite Modules: ENVS210, MATH133.
Aim: To provide an understanding of the basic concepts & theories pertaining to the behaviour of the atmosphere and to introduce the causes & consequences of air pollution, with a focus on applications in a South African context. This module provides an understanding of meteorological theory & the study of weather and climate over South Africa, and to the study of air pollution.
Content: Thermodynamics, adiabatic processes, pressure & hydrostatic equilibrium, radiative processes, divergence & vorticity, zonal and meridional airflow; local air circulations and boundary layer phenomena. Air pollution, fumigation, dispersion and its modelling.
Assessment: Practicals (10%), Practical Test (10%), Theory Test (30%); 3 h exam (50%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Students may be required to contribute to the costs of the fieldtrip.

Environmental Management
ENVS322 H2 P2 W2 (27L-0T-36P-8S-65H-20R-0F-0G-4A-13W-16C)
Prerequisite Requirement: 48C at level 2 in the environmental science disciplines.
Aim: To develop an understanding of environmental management theory and practice.
Content: Theoretical and critical examination of the issues of environmental management by examining the history of environmentalism and mainstream approaches and their alternatives. The relationship between environment and planning; examination of the different tools and methods used in environmental management.
Practicals: Use of methods and techniques related to environmental management tools.
Assessment: Essays (20%), Tests (10%), Practicals (20%); 3 h exam (50%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Students may be required to contribute to costs of fieldwork.

Geospatial Data Infrastructures
ENVS350 P1 W1 (29L-0T-36P-0S-75H-10R-0F-0G-10A-13W-16C)
Prerequisite Modules: ENVS211.
Aim: To provide an in-depth theoretical and practical understanding of Geospatial Data Infrastructures (GDI's).
Content: Justification for GDI's. GDI policy framework. Technology issues for GDI development and implementation. GDI case studies.
Assessment: Assignments and tests (30%), practical reports (20%); 3 h exam (50%).
DP Requirement: 80% attendance of lectures, seminars and practicals; 40% class mark.

Research Methods in Environmental Sciences
ENVS700 P1 W1 (30L-0T-8P-0S-99H-20R-0F-0G-3A-13W-16C)
**Prerequisite Requirement:** Entry into an appropriate Honours programme.

**Aim:** To introduce students to the history and philosophy of science and to develop techniques and skills in scientific research methods in the environmental sciences, which are relevant to solving current and past the environmental problems.

**Content:** The history and philosophy of science; the production of knowledge in the environmental sciences, techniques and skills such as basic survey and measurement in the natural sciences; statistical analysis and procedures, and other vital natural science skills. The preparation of a scientific paper and its oral and written presentation.

**Assessment:** Term paper (25%), Essays, presentations, seminars (15%), assignment (10%); 3 h exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

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**Biogeography of Invasive Species**
ENVS708 WC

**Prerequisite Requirement:** ENVS314 or a completed major in BIOL.

**Aim:** To provide a solid understanding of the biogeographical and ecological patterns and processes associated with invasive species.


**Assessment:** Seminars (30%), practicals (20%); 3h exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

**Offered in either Semester 1 or 2. Students may be required to contribute to the costs of the fieldtrip.**

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**Air Pollution**
ENVS711 WC

**Prerequisite Modules:** ENVS318.

**Aim:** To understand technical and social aspects that contribute to air pollution problems and to be able to apply this knowledge to air quality management.

**Content:** Sources and types of pollutants, air pollution chemistry, air pollution meteorology, dispersion modelling, impact and abatement strategies, air quality management, policy and legislation in South Africa, case studies of air pollution 'hotspots'.

**Assessment:** Essays (30%), Seminar presentation (20%), 3h Exam (50%); 3h theory exam (67%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

**Offered in either Semester 1 or Semester 2.**

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**Analytical GIS & Advanced Spatial Modelling**
ENVS712 P1 W1

**Prerequisite Requirement:** At least 60% in ENVS316.

**Aim:** To provide advanced insight into GIS and its applications. Emphasis is on understanding through an analytical modelling approach to spatial problems.

**Content:** Analytical modelling, techniques for spatial modelling. Statistical analysis and interpretation of geographic data. Spatial database design and manipulation. Error assessment and management. GIS project design and management. Environmental GIS applications.

**Practicals:** GIS applications for environmental management.

**Assessment:** Assignment (20%), practical reports (15%), practical test (15%); 3h theory exam (50%).

**DP Requirement:** 80% attendance at lectures, practicals; 40% Class mark.

**Students may be required to contribute to costs of fieldwork.**

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**Advanced Remote Sensing**
ENVS720 P2 W2

**Prerequisite Modules:** ENVS316 or equivalent knowledge.

**Aim:** To provide an advanced instruction in Remote Sensing, coupled with the use of Geographic Information
Systems (GIS) in environmental applications. Emphasis is on understanding through application of techniques.

**Content:** Image processing, Image restoration, Supervised and unsupervised classification, Quality assessment, including replicability, positional accuracy and thematic accuracy, Vegetation indices and their applications. Time series change and analysis using Remote Sensing with GIS. Decision making using Multiple Criteria Analysis.

**Practicals:** Application of advanced remote sensing techniques.

**Assessment:** Assignment (20%), practical reports (15%), practical test (15%); 3 h theory exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

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**Applied Geomorphology**  
ENVS722 PC  

**Prerequisite Modules:** ENVS315.

**Aim:** To impart an understanding of process geomorphology based on the analysis of case studies.

**Content:** The application of Geomorphology to solving problems in natural and urban environments. Professional ethics; social and economic considerations. Risk assessment and hazard mitigation in geomorphic systems. Case studies to investigate the application of Geomorphology in the solution of environmental problems. The field based identification and remediation of degraded systems through careful process intervention.

**Practicals:** Field excursion (students to contribute to costs), laboratory work.

**Assessment:** Major project (25%), assignment (15%), seminars (10%); 3 h Exam (50%).

**DP Requirement:** 80% attendance at lectures, practicals and field work; 40% Class mark.

Offered in either Semester 1 or 2. Students may be required to contribute to costs of fieldwork.

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**Advanced Biogeography**  
ENVS723 PC  

**Prerequisite Modules:** ENVS314.

**Aim:** To discuss, critically evaluate, synthesize and integrate the various approaches to modern biogeography.

**Content:** Vicariance biogeography; centres of origin; pan-biogeography; applied historical biogeography; techniques of historical biogeography - retrospection; experimental island biogeography; the man-land paradox and the depletion/conservation of resources; species diversity; modern environmentalism.

**Practicals:** A field excursion (students to contribute to costs), laboratory work.

**Assessment:** Practical assignments (20%); major project (20%); seminars (10%); 3 h exam (50%).

**DP Requirement:** 80% attendance at lectures, seminars and practicals, 40% Class mark.

Offered in either Semester 1 or 2. Students may be required to contribute to costs of fieldwork.

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**Environmental Science Res Project**  
ENVS730 PY WY  

**Prerequisite Requirement:** Entry into an appropriate Honours programme.

**Aim:** To introduce students to research in the environmental sciences.

**Content:** A significant research project in the environmental sciences, dealing with an appropriate environmental problem and undertaken under the supervision of an academic member of the University staff. Students are expected to present written and oral project proposals and progress reports; and to submit the research dissertation by the set date.

**Assessment:** Assessment of dissertation (80%) and oral presentations (20%).

**DP Requirement:** Not applicable.

Year-long Module. This module has no supplementary exam. Students may be required to contribute to the costs of the field trip.

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**Coastal Geomorphology**  
ENVS741 WC  

**Prerequisite Modules:** ENVS315.

**Aim:** To develop an understanding of shoreline and off-shore geomorphological history and processes; to study the geomorphological link between catchments and shorelines and to emphasize the impacts of human utilization of the coastal zone.

**Content:** Geomorphological aspects of oceanic currents; offshore and shoreline processes; tectonics and coastlines;
catchment and shoreline geomorphology; human interventions and impacts on coastal geomorphological systems.

**Practicals:** Field excursion; three afternoon practicals.

**Assessment:** Seminar presentation (20%), field report (20%), practicals (10%); 3 h exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

*Offered in either semester 1 or 2. Students may be required to contribute to the costs of the fieldtrip.*

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**Environmental Modelling**

ENVS750 PC

**Prerequisite Requirement:** Entry into an appropriate Honours programme.

**Aim:** To gain insight into the complexities of deriving process-based models pertaining to particular aspects of the natural environment.

**Content:** Models, model building and the role of models in environmental science; model sensitivity and accuracy; environmental modelling and understanding in selected natural environmental systems; modelling and simulation.

**Practicals:** The module includes a field excursion to investigate case studies involving the environmental systems considered in the course, and one major assignment.

**Assessment:** Field excursion report (15%), assignment (15 %), practical reports (20%); 3h theory exam (50%).

**DP Requirement:** 80% attendance at lectures, practicals and field trip; 40% Class mark.

*Offered in either Semester 1 or 2. Students may be required to contribute to costs of fieldwork.*

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**Contemporary Environmental Issues**

ENVS751 PC WC

**Prerequisite Modules:** ENVS322.

**Aim:** To understand the complexity of contemporary environmental issues of applied environmental science in the southern African and global context.

**Content:** Hazard assessment in an environmental context; people-environment dependencies; sustainability and biodiversity; energy, fuel and pollution; conservation strategies and policies including Agenda 21, ISO and other international treaties and conventions; environmental ethics and sustainable development; environmental consequences of population movement.

**Practicals:** Workshops, a major independent assignment and limited fieldwork.

**Assessment:** Seminars (25%), essay (10%), assignments (15%); 3 h exam (50%).

**DP Requirement:** 80% attendance at practicals, seminars and fieldwork; 40% Class mark.

*Offered in either Semester 1 or 2. Students may be required to contribute to costs of fieldwork.*

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**Coursework Masters Dissertation**

ENVS800 HY PY WY

**Aim:** To expose students to completing a major piece of supervised, independent research.

**Content:** Undertaking a major research project on an approved topic of interest to the Environmental Sciences and writing a dissertation on this research under the supervision of a member of the academic staff.

**Assessment:** The dissertation will be assessed as the sole criterion for the module, in accordance with the standard rules of the College for coursework masters degrees.

**DP Requirement:** Not applicable.

*Year-long Module. This module has no supplementary exam.*

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**Applied Geographical Information Systems**

ENVS810 PC WC

**Prerequisite Modules:** ENVS316 or equivalent.

**Aim:** To provide insight into the applications of GIS in a southern African context.

**Content:** Analysis of spatially-related problems facing the modern world, in the southern African context in particular. Advanced concepts of applied GIS. Concepts of geography as a spatial information technology. Use of case studies to illustrate different aspects of GIS theory. Use of GIS-software to acquire and apply analytical skills.

**Practicals:** Assignments, projects and a field excursion.

**Assessment:** Practical reports (25%), mini-project (25%), assignment (10%); 3 h theory exam (40%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.
Offered in either Semester 1 or 2. Students may be required to contribute to costs of fieldwork.

Internship
ENVS813 HC WC (0L-0T-0P-0S-160H-0R-0F-0G-0A-13W-16C)
Aim: To gain practical experience in a working environment.
Content: Research project on an appropriate topic during placement, under guidance of School and workplace supervisor.
Assessment: Research report (50%); Work practice report (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or 2. This module has no supplementary exam.

Sustainable Development
ENVS814 WC (0L-0T-16P-30S-91H-20R-0F-0G-3A-13W-16C)
Prerequisite Requirement: Entry into an appropriate Honours or Coursework Masters’ programme.
Aim: To explore the relationship between people and environment using sustainability as a conceptual framework.
Content: This module explores the concepts and principles of sustainability. It is divided into four main sections: theory and philosophy of environmentalism; defining sustainability; principles and management tools for sustainability: such as sustainability indicators, environmental economics, public participation, and policy processes and sustainability.
Practicals: Fieldwork project
Assessment: Theory assignment (25%), research report (25%); 3 h Exam (50%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Offered in either Semester 1 or 2. Students may be required to contribute to the costs of the fieldtrip.

Tools of Environmental Management
ENVS815 WC (0L-0T-36P-39S-72H-10R-0F-0G-3A-13W-16C)
Prerequisite Requirement: Entry into an appropriate Honours or Coursework Masters’ programme.
Aim: To expose students to a wide range of tools, over and above traditional EIA’s, that are used in environmental management and to facilitate critical engagement as to their applicability in different situations.
Content: Evaluating sustainability status of various land use categories, risk assessment, environmental management systems, strategic environmental assessment, rapid rural appraisal, ecological footprint analysis, co-management agreements, role of predictive modelling, and environmental ethics.
Assessment: Assignment (25%), research report (25%); 3 h theory exam (50%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Offered in either Semester 1 or 2. Students may be required to contribute to the costs of the fieldtrip.

Water Resource Management
ENVS817 PC WC (28L-0T-28P-28S-43H-30R-0F-0G-3A-13W-16C)
Prerequisite Requirement: Entry into an appropriate Honours or Coursework Masters’ programme.
Aim: To provide an understanding of the significance as a life-sustaining resource and techniques of managing this resource.
Practicals: 3 day field excursion and site visits.
Assessment: Article review (20%), term paper (20%), oral presentation (10%); 3 h exam (50%).
DP Requirement: 80% attendance lectures, fieldwork and seminars; 40% Class mark.
Offered in either Semester 1 or 2. Students may be required to contribute towards costs of fieldwork.

Farm Business Management

Offered in the School of Agricultural, Earth and Environmental Sciences
Production Economics and Marketing
FBMT151 P2
(39L-0T-32P-0S-40H-20R-0F-24G-5A-13W-16C)
Aim: To provide an introduction to farm business management.
Content: Production economic principles; marketing; market supply and demand.
Practicals: Bi-weekly 2 hour practical.
Assessment: Tests (20%), Assignments (20%), Practical assessments (10%); 3 h exam (50%).
DP Requirement: 40% class mark; 80% attendance at lectures and practicals.
Only for students registered at Cedara College of Agriculture.

Farm Business Management
FBMT261 P1
(20L-0T-13P-0S-20H-10R-0F-13G-4A-13W-8C)
Aim: To apply agricultural business and management principles to an agricultural production system.
Content: Agricultural business and management principles; financial and physical production records; financial statements; budgets.
Practicals: Bi-Weekly 2 hour practical.
Assessment: Tests (15%), Assignments (20%), Practical assessments (5%); 3 h exam (50%).
DP Requirement: 40% class mark; 80% attendance at lectures and practicals.
Only for students registered at Cedara College of Agriculture.

Farm Finance
FBMT371 PY
(34L-25T-40P-8S-180H-30R-0F-0G-3A-26W-32C)
Prerequisite Modules: FBMT261.
Corequisite: RMGT371.
Aim: To apply farm finance to real agricultural business system.
Content: Farm business management principles; marketing, market demand and supply; financial statements; budgets; farm finance.
Practicals: Weekly 2 hour practical.
Assessment: Assignments (40%), practical assessments (10%); 3 h exam (50%).
DP Requirement: 40% class mark; 80% attendance at lectures and practicals.
Year-long Module. Only for students registered at Cedara College of Agriculture.

Farm Engineering
Offered in the School of Agricultural, Earth and Environmental Sciences

Farm Infrastructure
FRME151 P1
(39L-0T-32P-0S-40H-20R-0F-24G-5A-13W-16C)
Aim: To provide an introduction into the different infrastructure and equipment that play a pivotal role in farming systems.
Content: Conservation structures; farm infrastructure; farm machinery and equipment.
Practicals: Weekly 2 hour practical.
Assessment: Tests (20%), assignments (20%), practical assessments (10%); 3 h exam (50%).
DP Requirement: 40% class mark; 80% attendance at lectures and practicals.
Only for students registered at Cedara College of Agriculture.

Infrastructure and Machinery Development
FRME261 P1
(20L-0T-13P-0S-20H-10R-0F-13G-4A-13W-8C)
Prerequisite Modules: FRME151.
Aim: To determine the major infrastructure and machinery requirements needed for production agriculture.
Content: Irrigation and pumping; infrastructure design and planning; machinery requirements.
Practicals: Bi-Weekly 2 hour practical.
Assessment: Tests (20%), assignments (20%), practical assessments (10%); 2 h exam (50%).
**Syllabus**

**Food Science**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Introduction to Food Science**

FSCI120 P2  
(39L-0T-36P-0S-50H-30R-0F-0G-5A-13W-16C)

**Prerequisite Requirement:** 40% in CHEM110.

**Aim:** To develop Food Science knowledge and skills, in food preparation and processing; and the experimental study of food, its composition and quality.


**Practicals:** Experimentation and basic preparation of foods as listed above.

**Assessment:** Tests (15%), essay (5%), prac reports (5%), written prac test (8%); 3 h exam (67%).

**DP Requirement:** 40% Class mark, 80% attendance at practicals.

**Further Concepts in Food Science**

FSCI210 P1  
(39L-0T-36P-0S-60H-20R-0F-0G-5A-13W-16C)

**Prerequisite Modules:** FSCI120.

**Aim:** To further develop Food Science knowledge, food preparation techniques & the experimental study of food.


**Practicals:** Advanced food preparation. Experimental study of the effect of processing on food quality.

**Assessment:** Tests (15%), essay (5%), prac reports (5%), written prac test (8%); 3 h exam (67%).

**DP Requirement:** 40% Class mark, 100% attendance at practicals.

**Food Security**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Introduction to Food Security**

FDSC360 P2  
(40L-0T-0P-4S-83H-22R-0F-6G-5A-13W-16C)

**Aim:** To introduce students to the concept of food security, the food security situation in Africa and policy responses and explore possible solutions, types of interventions and food policy options.

**Content:** Conceptual framework for food security. Access, availability, and utilization. Vulnerability of households. Food security measurements: dimensions and determinants. The right to food. Policy context. Policy making
processes. Review of food security policies, strategies, programs, projects and other intervention options. Introduction to monitoring and measuring food security.

**Assessment:** 1 test (10%), 4 assignments (40%); 3 h exam (50%).

**DP Requirement:** 40% Class mark.

**Food Security Studies**
FDSC700 (P1)  

**Aim:** The multi transdisciplinary exploration of food security issues.


**Practicals:** Field trip case studies.

**Assessment:** Summative case study assessment (100%)

**DP Requirement:** Not applicable. This module has no supplementary exam.

**Food Security Internship**
FDSC701 (PY)  

**Corequisite:** FDSC700, PODS601.

**Aim:** To give students practical experience dealing with food security issues in a community setting.

**Content:** An individual internship for which the student will prepare at several levels. The primary foci will be integration of disciplines, particularly the student's own discipline with food security, identification of food security issues and collection of data, evaluation of collected information and communication of results to others. This final step will include positive suggestions for dealing with food security issues in the community.

**Assessment:** Portfolio report (100%).

**DP Requirement:** Not applicable

Year-long module. This module has no supplementary exam.

**Food Security Dissertation for Diploma**
FDSC711 (PY)  

**Corequisite:** FDSC700, 760.

**Aim:** For students to independently investigate a food security related issue and contribute to the knowledge in any areas/aspect of food security.

**Content:** Independent investigation of any food security related problem using qualitative or quantitative methodologies. Preparation of a research paper.

**Assessment:** Research paper (100%).

**DP Requirement:** Not applicable

Year-long module. Additional requirement: Access to a computer and the Internet. This module has no supplementary exam.

**Food Storage for Food Security**
FDSC720 (P1)  

**Aim:** To explore foundational concepts of post-harvest crop storage, food preservation and food safety.

**Content:** Causes of primary crop and product losses. Micro-organisms responsible for food loss, food contamination, toxin production. Pathological effects of contaminated water and food. Testing for water and food contamination. Preservation methods for food storage: freezing, bottling, salt, sugar, acid, dehydration, pasteurisation, sterilisation, UHT, sanitation, UV radiation.

**Practicals:** Demonstrations and hands-on participation in exercises, visits to local (university and/or industry) sites.

**Assessment:** 3 class assignments (33%), externally examined poster case study assignment (67%).

**DP Requirement:** Not applicable.

Additional requirement: Access to the Internet. This module has no supplementary exam.
Syllabus

Food Access for Food Security
FDSC730 P1  (20L-0T-0P-0S-60H-0R-0F-0G-0A-10W-8C)
Aim: To explore issues related to access to food or the means to purchase food and related nutrition and food utilisation issues.
Content: Issues relating to access to food and the means to purchase food, including gender dynamics, livelihoods, intra-household allocation, HIV, and food preferences. Nutrition requirements of various population groups, food utilisation and how food access affects nutritional status.
Assessment: 4 assignments (33%), poster (67%).
DP Requirement: Not applicable.
Additional requirement: Access to the Internet. This module has no supplementary exam.

Sustainable Livelihood Options
FDSC755 P1  (25L-0T-0P-2S-38H-0R-0F-15G-0A-13W-8C)
Aim: To investigate possibilities for promoting food security though strengthening and protecting household livelihoods.
Assessment: Report on an independent field sustainable livelihood analysis and evaluation (100%).
DP Requirement: Not applicable.
Additional requirement: Access to the Internet. This module has no supplementary exam.

Introduction to Research Methods
FDSC760 PY  (25L-0T-15P-2S-38H-0R-0F-0G-0A-26W-8C)
Aim: For students to develop the necessary skills for writing a research proposal and capacity in academic writing and reporting.
Content: Scientific method of enquiry. Research question formulation, selecting appropriate methodologies, sample design and selection, qualitative and quantitative methodologies, social statistics, data analysis and writing of research projects and criteria for evaluation, writing seminars, research papers and research briefs. Requirements for publishing research findings. Development of arguments. Writing literature reviews. Citing and referencing techniques.
Assessment: 1 quiz (15%), assignment (15%), project proposal (70%).
DP Requirement: Not applicable.
Year-long module. Additional requirement: Access to the internet. This module has no supplementary exam.

Transdisciplinary Food Security
FDSC800 P1  (0L-0T-14P-66S-80H-0R-0F-0G-0A-6W-16C)
Aim: To conduct a transdisciplinary exploration of advanced food security issues.
Practicals: Field trip case studies.
Assessment: Summative critique of regional food security shocks and threats (100%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Masters Dissertation in Food Security
FDSC815 PY  (0L-0T-0P-8S-712H-0R-240F-0G-0A-26W-96C)
Prerequisite Modules: FDSC840.
Aim: To equip students with knowledge and skills to plan and implement transdisciplinary research in food security issues.
Assessment: Dissertation (100%).
Research Methods for Food Security
FDSC840 P1
Aim: To equip students with knowledge and skills to plan and implement transdisciplinary research.
Assessment: Class quiz (10%), research proposal (90%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Food Security Modelling Systems
FDSC860 P1
Aim: Exploration of modelling systems applicable to food security evaluation, assessment and projection.
Assessment: 5 class assignments (50%), externally examined simulation model (50%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Measuring and Monitoring
FDSC870 P1
Aim: Comparison of international food security measurement and monitoring systems.
Practicals: Exploration of various international monitoring systems using the Internet.
Assessment: Summative assignment (100%).
DP Requirement: Not applicable.
Additional requirement: Access to the Internet. This module has no supplementary exam.

Essays in Food Security
FDSC880 PB
Aim: Individually designed curricula based on individual student requirements to build further knowledge and experience in food security related issues.
Content: Topics and assignments and their assessment to be decided on for each specific case. Module may include seminars, literature reviews or parts of modules from various disciplines.
Assessment: 1 internally examined essay (33%), 2 externally examined essays (67%).
DP Requirement: 40% for internally examined essay.
Offered in Semester 1 and 2. This module has no supplementary exam.

Markets for Food Security
FDSC890 P1
Aim: To explore basic market concepts, assessment, monitoring and analysis for food security analyses.
Content: Basic market concepts; identification and use of market indicators; assessment tools and basic market analysis (sub national, national and regional levels with links to household level). Relevance and application of markets to vulnerability assessments, food security analysis and early warning. Examples of tools and techniques, group and individual exercises.
Practicals: Exploration of various market related websites and international monitoring systems using the Internet.
Assessment: Summative assignment (100%).
**DP Requirement:** Not applicable.
**Additional requirement:** Access to the internet. This module has no supplementary exam.

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**Food Service Management**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Food production, systems & plans**

FSMT332 P1  
(39L-0T-28P-0S-60H-24R-4F-0G-5A-13W-16C)

**Prerequisite Modules:** FSCI210, NUTR224.

**Aim:** To provide the student with knowledge and insight required of a competent foodservice manager.

**Content:** Trends in the foodservice industry; menu planning, development and implementation; production; systems approach to foodservice management; foodservice systems; sanitation and hygiene (HACCP); facility planning and design; dietary modification in FSMT.

**Practicals:** Finance practical (recipe adjustment, purchasing); managing a large-scale catering event (laboratory work); food presentation; menu modification for special diets.

**Assessment:** Practicals (6%), assignments (15%), tests (12%); 3 h exam (67%).

**DP Requirement:** 40% Class mark, 80% attendance at practicals.

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**Management Theory & Practice**

FSMT333 P2  
(49L-0T-27P-0S-60H-19R-0F-0G-5A-13W-16C)

**Prerequisite Modules:** FSMT332.

**Aim:** To provide the student with the knowledge and basic skills needed for managerial effectiveness in the Dietetics profession and in nutrition related areas.


**Practicals:** Managing a large-scale catering event (laboratory work) or management aspects of a nutrition intervention programme.

**Assessment:** Assignment (6%), management task evaluation (15%), tests (12%); 3 h exam (67%).

**DP Requirement:** 40% Class mark, 80% attendance at practicals.

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**Food Service Management Internship**

FSMT711 PY  
(6L-0T-3P-6S-17H-20R-265F-0G-3A-8W-32C)

**Prerequisite Requirement:** BSc(Diet) or BSc(Human Nutrition) degree.

**Aim:** To enable the student to expand the ability to manage a food-service unit and to develop communication skills further.

**Content:** Large scale food preparation; kitchen administration and management; menu planning; kitchen layout evaluation, kitchen safety and hygiene.

**Practicals:** Students work in a food-service unit for the duration of the module.

**Assessment:** Professional evaluation (7%, submin 50%), FSMT prac assignments in the FSMT facility (7%), FSMT assignments (15%), business plan (2%), oral exam (2%); 3 h exam (67%, submin 40%).

**DP Requirement:** 40% Class mark.

8 week module offered during the course of the year.

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**Genetics**

*Offered in the School of Life Sciences*

**Introductory Genetics**

GENE240 P1 W1  
(39L-20T-9P-0S-57H-28R-0F-0G-7A-13W-16C)
Prerequisite Modules: BIOL101 or BIMI120, MATH133.

Aim: To attain an understanding of basic inheritance patterns, cell division and the structure & function of chromosomes.

Content: In depth study of prokaryotic & eukaryotic cellular division & reproduction, revision of inheritance principles. Extensions of Mendelism in allelic variation, gene function & types of gene action, chromosomal basis of Mendelism, sex-determination & linkage. Cytogenetics: variation in chromosome number & structural rearrangements, linkage, crossing-over & mapping; evolutionary processes that modify genomes.

Practicals: Analysis of chromosome behaviour & karyotypes. Tutorial based exercises based on theory content.

Assessment: 2h theory & 2h tutorial test (50%); 3h exam (50%), 40% sub-minimum in exam.

DP Requirement: 40% Class mark. 80% attendance at tutorials and 100% at tests. Completion and submission of all assignments on time.

Population and Quantitative Genetics
GENE310 P1 W1 (30L-12T-24P-6S-68H-16R-0F-0G-4A-13W-16C)

Prerequisite Modules: GENE240; BMET210 or BIOL200.

Aim: To attain insight into populations and quantitative genetics in the context of animal & plant breeding, conservation biology and evolution.

Content: Genetic basis of variation in natural populations: random mating, multiple alleles, sex-linked genes, linkage & linkage disequilibrium. Analysis of quantitative traits: genetic variation, heritability, natural selection, assortative mating, migration, drift, inbreeding, genotype/environment interactions & artificial selection. Application to problems such as animal & plant breeding and conservation biology.

Practicals: Selected from the above. Tutorials. Problem solving exercises.

Assessment: Theory tests (25%), seminars (5%), tutorials & assignments (15%), practicals (5%); 3 h exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials & practicals. Completion & submission of all assignments on time.

Bioinformatics
GENE320 P1 W1 (27L-10T-20P-0S-73H-25R-0F-0G-5A-13W-16C)

Prerequisite Modules: GENE240 or RDNA202 or BIOL205.

Aim: To attain an understanding of the basic theory of bioinformatics and gain practical experience of DNA and protein sequence analysis.

Content: DNA and protein sequence alignment, sequence alignment algorithms, structure function prediction, the organization and use of public domain sequence databases and public domain software, genome annotation and systems biology.

Practicals: Hands-on experience with the retrieval and manipulation of data from online databases.

Assessment: 2 h theory tests (35%), practical reports and assignments (15%),; 3 h exam (50%).

DP Requirement: 40% Class mark. 80% attendance at tutorials and practicals, 100% attendance at tests.

Genomics and Molecular Diagnostics
GENE330 P2 W2 (27L-6T-27P-0S-74H-21R-0F-0G-5A-13W-16C)

Prerequisite Modules: GENE240, RDNA202.

Aim: To attain an understanding of the organization and analysis of eukaryotic genomes. Insight, skills and experience in recombinant molecular technologies.

Content: Eukaryotic genome organization, gene expression and gene control. The theory of cloning, manipulation and analysis of eukaryotic DNA, RNA and proteins. This includes providing a working knowledge of modern molecular and diagnostic technologies.

Practicals: Analysis of eukaryotic molecular and cellular systems.

Assessment: 2 h theory tests (20%), tutorial reports (10%), and practical reports (20 50%); 3 h exam (50%).

DP Requirement: 40% Class mark. 80% attendance at tutorials, practicals and 100% at tests. Completion and submission of all assignments on time.

Integrated Human Genetics
GENE340 W2 (36L-36T-0P-0S-53H-28R-0F-0G-7A-13W-16C)
Prerequisite Modules: GENE240.

**Aim:** To attain an understanding of the diverse nature of human genetics, and develop competency-based skills to allow future biomedical researchers to successfully integrate genetics, epidemiology & ethics into their practices.

**Content:** The organisation of the human genome & mapping; somatic cell genetics, identifying the genetics basis of disease; genetic screening & pre-natal diagnosis, treatment of genetic disease; genetic basis of cancer & the immune system; mitochondrial pathology; application of novel scientific discoveries to patient care; breakthroughs in the organisation of the human genome & mapping; contemporary ethical, social & moral issues pertaining to genetics.

**Assessment:** 2 h theory tests (30%), tutorial reports (20%); 3 h exam (50%).

**DP Requirement:** 40% in coursework. 100% attendance at practicals and tests. Completion and submission of all assignments on time.

### Animal Genetics

**GENE350 P2**

**Prerequisite Modules:** GENE240.

**Aim:** To attain insight into how genetic principles may be used to assess and predict, and thereby improve the genetic merit of animal populations.

**Content:** Aspects of cytogenetics, molecular genetics, population genetics, conservation genetics, quantitative genetics and biotechnology, with special reference to their application and use in animal populations.

**Practicals:** Tutorials. Problem solving exercises and field trips.

**Assessment:** Seminar (5%), term paper (5%), Class tests (20%), tutorials and assignments (15%), practicals & field visits (5%); 3 h exam (50%).

**DP Requirement:** 40% Class mark. 80% attendance at tutorials and practicals, 100% attendance at tests. Completion and submission of all assignments on time.

### Mini Research Project in Genetics

**GENE701 PY**

**Aim:** To provide insight to the principles of conducting research through laboratory based and/or computer based research and to develop the skills to analyze, interpret and present results.

**Content:** Research project which falls within the thrust of the school’s research area. This includes a relevant literature survey and the execution of research.

**Practicals:** Design and execution of a research project.

**Assessment:** Report (70%) & 1h oral presentations (30%).

**DP Requirement:** 50% Class mark. 80% attendance at lectures, tutorials, and practicals, 100% attendance at tests. Completion and submission of all assignments on time.

*Year-long Module. This module has no supplementary exam.*

### Advanced Genomics and Bioinformatics

**GENE703 P1**

**Aim:** To provide insight to the principles of conducting research through laboratory based and/or computer based research and to develop the skills to analyze, interpret and present results.

**Content:** Topics chosen from, but not limited to: Comparative Genomics, genome annotation, genomic sequencing, data management and mining, genetic study design and analysis.

**Practicals:** Computational exercises and DNA isolation and analysis techniques.

**Assessment:** Practical reports (100%) (50% externally examined).

**DP Requirement:** Not applicable.

*This module has no supplementary exam.*

### Genetics Research Skills

**GENE714 P1**

**Aim:** To provide strategies to find, organise, & critically evaluate scientific literature in molecular and/or quantitative genetics with an emphasis on the manipulation & interpretation of in silico data. To train students how to present scientific results orally % in essay and poster format.

**Content:** Scientific presentation skills, literature database searches, scientific standards and plagiarism, analyzing
and evaluating scientific literature, planning and organising a essay and poster on a selected topic.

**Assessment:** Oral presentations (20%), tutorial exercises (10%), class test (20%), scientific essay and/or poster (50%) (50% externally examined).

**DP Requirement:** Completion and submission of all assignments on time. Attendance at 80% of all scheduled activities.

**This module has no supplementary exam.**

**Advanced Population & Quantitative Genetics**

**GENE715 P1**

**Aim:** To advance and integrate knowledge of quantitative & population genetics with concepts of statistics and biology in their application within populations and genomes. To familiarise students with the concepts, theories and methodology involved in the application of genetic principles to populations and genomes.

**Content:** A selection of topics in Population & Quantitative Genetics including but not limited to: Measures of genetic diversity, allele frequencies & Hardy-Weinberg, inbreeding & kinship, selection, drift, mutation, migration, neutral theory, population structure, QTL mapping, estimation of genetic parameters, selection index & multivariate selection.

**Assessment:** Assignments (15%), practicals (10%), 2 h test (15%), seminar (10%); 3 h exam (50%).

**DP Requirement:** Class mark of 40% and attendance of 80% of practicals.

**This module has no supplementary exam.**

**Advanced Seminar Topics in Genetics**

**GENE716 P1**

**Aim:** To conduct advanced and comprehensive reviews of selected topics in genetics and to present these in a written and oral format.

**Content:** Relevant highly contemporary topics from the sub-disciplines of Genetics, such as bacterial, plant, animal, human and medical Genetics, as well as genomics and bioinformatics.

**Assessment:** Oral presentations (50%) and written assignments (50%).

**DP Requirement:** Not applicable.

**This module has no supplementary exam.**

**Advanced Animal Breeding & Genetics**

**GENE718 P2**

**Aim:** To increase understanding of genetic principles and their applications on genetic improvement of livestock and wild life populations.


**Assessment:** Assignments (30%), Seminar (10%), Term Paper (10%), 3 h exam (50%).

**DP Requirement:** Class mark of 40%, including at least 80% attendance at practicals.

**This module has no supplementary exam.**

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**Geography**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Human Environments**

**GEOG110 H1 P1 W1**

**Aim:** To introduce students to basic concepts in human geography.

**Content:** The central themes in this module are society-space and nature-society linkages. These are grounded in the African social, economic and political context and further explored in relation to processes of globalisation and uneven development. Fundamental concepts are: global/local interactions at different scales; spatial variation and spatial interaction; individual agency in the face of larger economic and social structures; human-environment interactions at
different scales. Practicals form an integral part of the theory and utilise map skills.

**Assessment:** Class essay (15%), theory test (15%), practical test (20%); 3 h theory exam (50%).

**DP Requirement:** 80% attendance at practicals and tutorials; 40% Class mark.

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**Geographies of Urban and Rural Change**

**GEOG220 H2 P2 W2**

**Prerequisite Modules:** GEOG110.

**Aim:** To introduce students to spatial transformations in urban and rural contexts in southern Africa.

**Content:** Spatial transformations in urban and rural contexts are explored in light of appropriate theory drawn from urban, economic, cultural and political geography. Regional change is interpreted in the context of post-apartheid planning and development practice, as well as in the global economy. Particular attention is paid to contested urban landscapes and new urban forms; the impact of land reform initiatives & the spatial impacts of development theory and planning.

**Assessment:** Tests (20%), assignments (20%), practicals (10%); 3 h exam (50%).

**DP Requirement:** 80% attendance at practicals and tutorials; 40% Class mark.

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**Tourism Studies**

**GEOG301 H1**

**Prerequisite Requirement:** GEOG220 or at least 64C at level 2.

**Aim:** To introduce students to conceptual and theoretical aspects of leisure, recreation and tourism in the context of planning for sustainable tourism development.

**Content:** Conceptual and theoretical issues in leisure. Recreation and tourism. Historical development of tourism. The economics of tourism development. Principles of sustainable tourism development, forms of tourism development. The sustainability of ecotourism. Environmental policies and impact control measures. Policy management and planning for tourism development in South Africa.

**Practicals:** Collection and analysis of data, report presentation and field excursion.

**Assessment:** Tests (25%), assignments (5%), practicals (20%); 3 h exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

**Students may be required to contribute to the costs of field trips.**

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**Land Issues and Rural Development in SA**

**GEOG314 H2**

**Prerequisite Requirement:** 32C at Level 2.

**Aim:** To deepen understanding of land issues in the African context.

**Content:** Explanations of rural poverty (including globalization and HIV/AIDS). Historical background to the land question in Southern Africa. Land demand and use in Southern Africa. Natural resources and rural development, rural livelihoods and food security. Women/gender and rural development, and enhancing conditions for the promotion of rural development.

**Assessment:** Assignments (15%), tests (15%), project (20%); 3 h theory exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

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**Geography of Development**

**GEOG325 P1**

**Prerequisite Modules:** GEOG220.

**Aim:** To highlight the shortcomings of mainstream models and theories of development, especially the inability to address problems of poverty and environmental sustainability.

**Content:** The module will cover development debates. Agrarian change and rural development. Survival strategies of the poor. Globalization and development. Gender and development. Alternative approaches to development for the future.

**Assessment:** Assignments (30%), practicals (20%); 3 h exam (50%).

**DP Requirement:** 80% attendance at practicals; 40% Class mark.

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**Sustainable Cities and Development**
GEOG330 H2 P2

Prerequisite Modules: GEOG220.
Aim: To develop an understanding of sustainable urban processes in Sub-Saharan Africa, and to appraise these in the context of development theory and practice.
Content: Contemporary transformation and urban change within cities; strategies for urban sustainability and growth. Urban policies, democratization, decentralization and social movements. People-land relationships and urban land use in Africa.
Assessment: Assignments (25%), practicals (25%); 3 h exam (50%).
DP Requirement: 80% attendance at practicals and tutorials; 40% Class mark.

Concepts and Methods in Geography
GEOG700 H1 P1

Prerequisite Requirement: Entry into an appropriate Honours programme.
Aim: To consolidate the principles, philosophy and methods of Geography as a holistic, applied environmental science, within a spatial and temporal context.
Content: Debates on philosophical and methodological theories, concepts and paradigms informing and contextualizing methods with an emphasis on a variety of quantitative and qualitative methods available to conduct geographical research.
Practicals: Workshops, presentations and assignments.
Assessment: Assignments (20%), essay (15%), term paper (15%); 3 h exam (50%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Students may be required to contribute to the costs of the fieldtrip.

Urban governance: managing sustainable cities
GEOG726 PC

Prerequisite Requirement: Entry into an appropriate Honours programme.
Aim: To examine the experience of urban planning and management in developing countries.
Content: Democratisation, neo-liberal growth strategies and globalisation in the context of cities. The reorientation of policies and instruments of city management in order to improve efficiency, social equity and sustainability. Urban policies; decentralisation and democratisation; public-private partnerships; community participation; social movements; sustainable environments; poverty alleviation; case studies. Critical appraisal of urban reconstruction strategies in South Africa.
Practicals: Workshops/Projects
Assessment: Presentations (20%), assignments (30%); 3 h exam (50%).
DP Requirement: 80% attendance at lectures, practicals and seminars; 40% Class mark.
Offered in either Semester 1 or 2.

Urban Studies
GEOG727 H2

Prerequisite Requirement: Entry into an appropriate Honours programme.
Aim: To develop a critical understanding of the nature of contemporary cities and the key theories used to examine urban processes.
Content: The key processes & types of development through which contemporary cities are evolving, reviewing issues in urban geographical literature from the developed and developing worlds. Urban competition, social upliftment, gentrification, the formation of spaces of the hyper-real and mechanisms for strengthening the position of cities in the global economy. The module interrogates the impacts on cities with special consideration of the nature of African and South African cities.
Practicals: Application of urban theory.
Assessment: Presentations (20%), assignments (30%); 3 h Exam (50%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.

Geographical Sciences Research Project
GEOG730 PY WY
Corequisite: GEOG700.

Aim: To gain experience in the formulation, planning and execution of a research project in the Geographical Sciences. To identify & execute a significant research project in one of the sub-disciplines of Geography within the natural sciences, requiring the student to collect, analyse and interpret data; integrate practical & theoretical knowledge; develop independent critical thought and communicate the results effectively in both written & oral reports.

Content: The projects will be decided in discussion between the supervising staff & the individual student. The project must be submitted in the format as required by one of the journals of the discipline appropriate to the selected project.

Assessment: Oral presentations (20%), Dissertation (80%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam. Students may be required to contribute to the costs of the fieldtrip. For students in the College of Agriculture, Engineering and Science only.

Natural Resources & Sustainable Land Use
GEOG733 HC PC WC

Prerequisite Requirement: Entry into an appropriate Honours programme.

Aim: To examine NRM and SLU issues utilising problem-based, interdisciplinary and field-orientated approaches.

Content: Resource management theories and debates, ecosystem management, field-based methodologies, sustainable land use, natural resource management strategies, institutional dynamics, conflict resolution, policy aspects, constraints and capacities.

Practicals: Workshops, projects and fieldwork.

Assessment: Essays (30%); seminars (20%), presentations (10%); 3 h exam (40%).

DP Requirement: 80% attendance at all academic contact activities; 40% class mark.

Offered in either Semester 1 or 2. Students may be required to contribute to costs of fieldwork.

Rural Development & Land Reform
GEOG735 PC WC

Prerequisite Requirement: Entry into an appropriate Honours programme.

Aim: To examine rural change and challenges in developing contexts.

Content: Social differentiation in rural areas; rural governance and political dynamics; knowledge systems and social capital; rural-urban linkages; food security and agricultural issues; off-farm income generating/livelihood sustaining activities; rural service provision, appropriate technologies; review of relevant rural development policies; monitoring/management and research issues in rural development.

Practicals: Workshops, projects and a field excursion.

Assessment: Assignments (25%), research report (25%); 3 h exam (50%).

DP Requirement: 80% attendance at all academic contact activities; 40% class mark.

Offered in either Semester 1 or Semester 2. Students may be required to contribute to costs of fieldwork.

Geography Sciences Research Project
GEOG740 HY PY

Corequisite: GEOG700.

Aim: To gain experience in the formulation, planning and execution of a research project in Geography within the social and human sciences. To identify & execute a significant research project in one of the sub-disciplines of Geography, requiring the student to collect, analyse, & interpret data; integrate practical & theoretical knowledge within the appropriate framework in the human sciences or at the interface between the natural & social sciences; to develop independent critical thought, and communicate the research results effectively in both written and oral reports.

Content: The research projects will be decided in discussion between the supervising staff and the individual student.

Assessment: Dissertation (80%) and oral presentations (20%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam. Students may be required to contribute to the costs of the fieldtrip. For students in the College of Humanities only.

Advanced Tourism Studies
GEOG744 HC PC
**Prerequisite Requirement:** Entry into an appropriate Honours programme.

**Aim:** To develop critical expertise in the analysis of tourism issues in the developing world.

**Content:** Concepts and theoretical aspects of tourism, the production of tourism spaces, places and forms, globalization and tourism, trends in tourism development, tourism impacts, tourism and sustainable development and tourism in Southern Africa.

**Practicals:** Workshops, projects, and field excursions.

**Assessment:** Term paper (20%), assignments (20%), seminar presentations (10%); 3 h exam (50%).

**DP Requirement:** 80% attendance at all academic contact activities; 40% class mark.

Offered in either Semester 1 or 2. Students may be required to contribute to costs of field trips.

**Geological Sciences**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Earth and its Materials**

GEOL101 W1

(39L-0T-39P-0S-45H-32R-0F-0G-5A-13W-16C)

**Aim:** To introduce students to the Earth as a dynamic planet and to those processes which operate within and on the Earth’s surface.

**Content:** Introduction to geology; origin of the earth; agents which shaped the Earth’s surface; uniformitarianism; geological time and its measurement; introduction to mineralogy and the rock forming minerals; the major rock groups and their characteristics; internal structure of the earth; deformation of rocks; introduction to Plate Tectonics.

**Practicals:** Exercises related to the earth’s tectonic domains; recognition and description of rocks and minerals. 2 days of field excursions may be included as part of practical work.

**Assessment:** Practical exercises (20%), tests (30%); 3 h exam (50%).

**DP Requirement:** 40% Class mark. 80% attendance at both lectures and practicals. Field excursions are compulsory. Students may be required to contribute to the cost of accommodation and transport related to field work.

**Earth’s Surface Processes**

GEOL102 W2

(39L-0T-39P-0S-45H-32R-0F-0G-5A-13W-16C)

**Aim:** To introduce the processes which shape the surface of the earth.

**Content:** Introduction to chemical & mechanical weathering, regolith development; transportation of sedimentary particles by various agents & the resultant landscapes; lithification processes, geologic time, relative & absolute age; stratigraphic correlation; faunal succession; formation & use of fossils; the geological column.

**Practicals:** Topographic & geological maps: contours & scale; relationship between topography & geology; basic outcrop patterns on geological maps; topographic & geological cross sections. 2 days of field excursions may be included as part of practical work.

**Assessment:** Practical exercises (20%), tests (30%); 3 h exam (50%).

**DP Requirement:** 40% class mark, including a minimum of 40% in practical work; 80% attendance at both lectures and practicals. Field excursions are compulsory. Students may be required to contribute to the cost of accommodation and transport related to field work.

**Geology Field Module**

GEOL200 WV

(0L-0T-97P-10S-50H-0R-0F-0G-3A-6W-16C)

**Prerequisite Modules:** GEOL101, 102.

**Prerequisite Requirement:** DP in GEOL201 and GEOL220.

**Corequisite:** GEOL202, 205.

**Aim:** To learn the basic skills and field techniques required in compiling a geological map and accompanying geological report on a field area.

**Content:** 7 to 10-day field trip in the University vacation. Recognition and description of different rock types and rock associations in the field; measuring structures in outcrop; field techniques and geological mapping; interpretation of field observations; geological synthesis of field area based on geological map and outcrop evidence; verbal presentation of findings.
Assessment: Field exercises, field map and cross section (40%), verbal presentations (10%), written report and final map (50%). No formal examination.

DP Requirement: Attendance on field trip and all pre-trip exercises.

Restricted to students registered for the Programme in Geological Sciences. In addition to tuition fees, each student will be required to purchase a field kit and to contribute to the cost of subsistence, accommodation and transport. Students who do not satisfy the prerequisite requirements will have to de-register from the module. This module has no supplementary exam.

Mineralogy
GEOL201 W1
Prerequisite Modules: GEOL101, 102; CHEM110.

Aim: To understand the structural and chemical properties of minerals as well as their distribution and significance in solid earth and surface environments.

Content: Principles of crystallography and crystal chemistry; physical properties of minerals; classification of minerals, their composition, structure, occurrence, technical and economic significance; mineral stability; introduction to X-ray diffraction analysis.

Practicals: Crystallographic exercises; mineralogical calculations and plots, X-ray diffraction exercises.

Assessment: Practical exercises (20%), tests (30%); 2 h exam (50%).

DP Requirement: 40% Class mark; 80% attendance at both lectures and practicals.
Students may be required to attend a field excursion and contribute to the cost thereof.

Mineral Microscopy
GEOL202 W1
Prerequisite Modules: GEOL101, 102.
Corequisite: GEOL201.

Aim: To acquire the essential skills for optical identification and analysis of minerals. To introduce thin section microscopy as a basic tool for understanding the petrography of sedimentary, igneous and metamorphic rocks.

Content: Principles of mineral optics; identification and description of non-opaque minerals using the polarized-light microscope.

Practicals: Examination of common rock-forming minerals under the microscope.

Assessment: Tests (50%); 2 h exam (50%).

DP Requirement: 40% minimum mark in the coursework; 80% attendance at both lectures and practicals.
Admission to this module is restricted to students registered for the Programmes in Geological Sciences.

Sedimentary Petrology
GEOL205 W1
Corequisite: GEOL201, 202.

Aim: To gain an understanding of the concepts of grain size distribution, textures and structures of sedimentary rocks, and the characteristics of terrigenous, chemical and biochemical sedimentary rocks.

Content: Particles and grain size analysis; textures of sedimentary rocks, rudaceous rocks, arenaceous rocks, argillaceous rocks, limestone, dolomite, siliceous rocks, evaporites, iron-rich rocks and phosphorites, and their formation processes.

Practicals: Particles and grain-size analysis, identification of sediment and rock specimens, sedimentary structures, microscopic analysis of thin sections from sedimentary rocks.

Assessment: Practical exercises (20%), tests (30%); 2 h exam (50%).

DP Requirement: 40% Class mark; 80% attendance at both lectures and practicals.
Students may be required to participate in fieldwork and contribute to the cost thereof.

Principles of Igneous & Metamorphic Petrology
GEOL206 W2
Prerequisite Modules: GEOL201, 202, CHEM120.

Aim: To introduce petrological concepts & tools required for the description, analysis & interpretation of igneous & metamorphic rocks.
Content: Systematic classification of igneous rocks; phase diagrams igneous textures structures & field relationships major trace element & isotope geochemistry; composition of the mantle & the origin of basalts; compositional & structural characteristics of metamorphic rocks physio-chemical controls on metamorphic rock formation; metamorphic phase equilibria.
Practicals: Advanced mineral microscopy; petrography of igneous & metamorphic rocks.
Assessment: Practical exercises (20%), tests (20%); 2 h theory exam (30%), 2 h practical exam (30%).
DP Requirement: 40% Class mark; 80% attendance at both lectures & practicals.

Geochemistry
GEOL211 W2
Prerequisite Modules: GEOL101, 102, CHEM110, 120.
Aim: To Introduce the principles of geochemistry, the geochemical structure of the Earth and marine geochemistry.
Content: Distribution of elements in the Solar System; the solid Earth and the oceans; the Periodic Table; analytical methods; geochemical characterization of rocks, sediments and water; introduction to environmental and biogeochemistry; geochemical exploration.
Practicals: Familiarization with the Periodic Table; analytical methods; how to use and interpret geochemical data; geochemical characterization of rocks, sediments and water.
Assessment: Practical exercises (20%), tests (30%); 2 h exam (50%).
DP Requirement: 40% Class mark; 80% attendance at both lectures and practicals.

Palaeontology
GEOL214 W2
Prerequisite Modules: GEOL101, 102.
Aim: To introduce students to the broad concepts of Palaeontology with the focus on Invertebrate Palaeontology.
Content: Fossils and fossilization; palaeoecology; evidence in the fossil record for evolution and extinction; invertebrate palaeontology; microfossils; biostratigraphy.
Practicals: Recognition and description of fossilised: Bivalves, Gastropods, Cephalopods, Brachiopods, Trilobites, Corals, Echinoderms and selected microfossils.
Assessment: Practical exercises (20%), tests (30%); 2 h exam (50%).
DP Requirement: 40% Class mark; 80% attendance at both lectures and practicals.
Module may not be offered in 2012.

Elements of Geology for Civil Engineers
GEOL215 H2
Prerequisite Modules: GEOL101, 102.
Aim: To provide an introduction to geology for Civil Engineers.
Content: Elements of petrography, geomorphology and structural geology. Aspects of engineering geology including soil types, open and subsurface excavations, foundations, dams and reservoirs, building materials. Construction and interpretation of geological maps and profiles.
Practicals: Solving engineering geological problems, map interpretation, mineral and rock identification, discontinuity analysis.
Assessment: Practical exercises (15%), tests (25%); 3 h exam (60%).
DP Requirement: 40% Class mark; 80% attendance at both lectures and practicals.
For Engineering students only.

Brittle Deformation of Rocks
GEOL220 W1
Prerequisite Modules: GEOL101, 102.
Aim: To introduce students to the structures produced by the deformation of rock material and the factors that influence the formation of these structures.
Content: Definition of deformation; recognition of deformation in rock material; brittle and ductile deformation; fault geometry and nomenclature; linked fault systems; fault rocks, joints, fold geometry and nomenclature; mechanisms of igneous intrusion.
Practicals: Geological map exercises, stereographic projection problems, Mohr diagrams.
**Assessment:** Practical exercises (20%), tests (30%); 2 h exam (50%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals. Attendance on and completion of field trips.

Students may be required to participate in fieldwork and contribute to the cost thereof.

### Igneous and Metamorphic Processes

**GEOL301 W1**

**Prerequisite Modules:** GEOL206.

**Aim:** Using mineralogical, chemical and textural information from igneous and metamorphic rocks to understand the processes and conditions of rock formation.

**Content:** Quantitative assessment and modelling of major, trace and isotope geochemical data; melt petrogenesis and differentiation processes within classical petro-tectonic settings. Analysis and interpretation of metamorphic rocks and terrains; phase equilibria in simple and complex systems: metamorphism of ultramafic, mafic and pelitic rocks; prograde and retrograde processes.

**Practicals:** Appropriate to the above.

**Assessment:** Practical exercises (25%), tests (25%); 3 h exam (50%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals.

### Ductile Deformation of Rocks

**GEOL303 W1**

**Prerequisite Modules:** GEOL220.

**Aim:** To build on the knowledge contained within GEOL220 with emphasis on structures produced by ductile deformation of rocks & the factors that influence their formation.

**Content:** Strain in a geological context; principles of analysing ductile deformation in complexly deformed terrains; factors controlling ductile deformation; structures developed during ductile deformation (e.g. folds, shear zones, boudins, cusps); deformation fabrics; introduction to strain analysis.

**Practicals:** Geological map exercises, stereographic projection problems, fold analysis, analysis of ductile shears.

**Fieldwork:** A 3-day excursion.

**Assessment:** Practical exercises (20%), tests (30%); 2 h exam (50%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals. Attendance on and completion of field trip.

Students will be required to participate in fieldwork and to contribute to the cost thereof.

### Advanced Field Mapping Skills

**GEOL304 WV**

**Prerequisite Requirement:** GEOL200, 205, 206.

**Aim:** To build on the knowledge & skills acquired in GEOL200 by introducing established & new mapping techniques as applied to complex geological terrains.

**Content:** 7-10 day field trip in the winter vacation. Literature, map & aerial photograph search. Field & map skills, including GPS & related GIS skills. Identification, measurement & interpretation of rocks, their relationships & structures. Interpolation of geological data in areas of incomplete outcrop to produce reliable geological maps & cross-sections. Report writing & verbal presentations.

**Practicals:** Incorporated within content.

**Assessment:** Field assessment (10%), field map & cross section (30%), verbal presentations (10%), written report and final map, externally examined (50%).

**DP Requirement:** Attendance on and completion of field trip and all pre-trip exercises.

In addition to tuition fees, each student will be required to contribute towards the cost of subsistence, accommodation and transport. This module has no formal examination and no supplementary exam.

### Geological Evolution of Southern Africa

**GEOL306 W2**

**Prerequisite Modules:** GEOL200.

**Aim:** To provide an insight into the geological evolution of the southern African sub-continent by studying the entire
geological record of the region.

**Content:** The crustal evolution in Southern Africa; 3.5 billion years of earth history.

**Practicals:** Description and interpretation of geological maps from the aspects of processes and geological evolution.

**Assessment:** Practical exercises (25%), tests (35%); 2 h exam (50%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals.

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**Geology of Ore Deposits**

**GEOL308 W2**

**Prerequisite Modules:** GEOL205, 206.

**Aim:** To build on the knowledge introduced in GEOL217 by providing an understanding of the processes and conditions of ore deposit formation.

**Content:** Ore deposits formed by igneous, sedimentary/surficial and hydrothermal processes; mineral paragenesis, role of stable isotope and fluid inclusion studies in understanding ore deposits. Plate tectonics and ore deposits.

**Practicals:** Ore mineralogy and ore petrography.

**Assessment:** Practical exercises (20%), tests (20%); 3 h theory exam (30%), 3 h practical exam (30%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals.

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**Sedimentary Facies and Environments**

**GEOL310 W2**

**Prerequisite Modules:** GEOL205.

**Aim:** To gain an understanding of the concepts of sedimentary facies and depositional environments.

**Content:** Concept of sedimentary facies and depositional environments, facies controlling factors, facies change in space and time, facies sequences and cyclicity. Depositional models for fluvialitic, aeolian, littoral and deltaic sedimentary sequences.

**Practicals:** Facies columns and Facies maps. Palaeocurrent analysis, reconstruction of palaeographic maps. Field excursion to study sedimentary facies and palaeodepositional environments.

**Assessment:** Practical exercises (20%), field report (10%), tests (20%); 2 h exam (50%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals. Attendance on and completion of all field trips.

**Students will be required to participate in fieldwork and contribute to the cost thereof.**

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**Environmental Geology**

**GEOL313 W1**

**Prerequisite Modules:** 16C from Level 2 GEOL including GEOL211.

**Aim:** To provide insight into man's interaction with the geological environment.

**Content:** Water resources: Hydrological cycle, groundwater, water quality and pollution. Waste management: Landfill site selection, design, siting and operations, disposal of nuclear waste. Environmental pollution: Impact of man, mining & mineral processing. Geomaterials and geohazards.

**Practicals:** Evaluation of Earth hazards to man, his environment and planning processes

**Assessment:** Practical exercises (16%), assignments (8%), tests (16%); 3 h exam (60%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals.

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**Rock Mechanics**

**GEOL314 W1**

**Prerequisite Modules:** GEOL220, MATH133.

**Aim:** To provide an introduction to rock mechanics.

**Content:** Rock behaviour, properties and testing. Deformation and failure of rocks. Assessment of rock strength, hardness and elasticity. Weathering and its influence on rock behaviour. Discontinuities. Rock mass classification.

**Practicals:** Laboratory testing of rocks and discontinuities.

**Assessment:** Practical exercises (14%), assignments (10%), tests (16%); 3 h exam (60%).

**DP Requirement:** 40% Class mark; 80% attendance at both lectures and practicals.

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**Hydrogeology**
GEOL321 W2

Prerequisite Modules: GEOL313.

Aim: To provide a qualitative & quantitative understanding of groundwater, its occurrence, composition, exploration & development.


Practicals: Darcy’s experiment, Estimation of aquifer parameters, pumping test data analysis, analysis of Hydrochemical & water isotope data, hydrogeological mapping, development of a conceptual hydrogeological & groundwater flow model.

Assessment: Practical exercises (20%), assignments (5%), tests (15%); 3 h exam (60%).

DP Requirement: 40% class mark; 80% attendance at both lectures and practicals.

Introduction to Mine Geology
GEOL323 W1

Prerequisite Modules: GEOL220.

Aim: To introduce the principal concepts of mine geology, plan reading, mineral resource management, production and overall operational processes in the mining industry.

Content: Introduction to mine and mining terminology. Mining methods, mine mapping and sampling, reading mine plans, mineral reporting codes, mineral resource estimation and evaluation.


Assessment: Practical exercises and presentations (30%), tests (20%); 2 h exam (50%).

DP Requirement: 40% class mark; 80% attendance at both lectures and practicals.

Igneous Petrology & Geochemistry
GEOL701 W1

Aim: To acquire a high level of knowledge and practical experience in the processes that gave rise to magmas and the crystallized products of those magmas in different tectonic and regional settings.

Content: Advanced aspects of igneous petrology and geochemistry relating to specific areas in southern Africa. These may relate to some or all of the following: continental flood basalts, granite, komatiite, and layered intrusions. Case studies will relate to crustal evolution, magma genesis and mineralization processes. Field studies and sampling, data acquisition and handling, and interpretation are integral parts of the course.

Practicals: Practical applications as applied to the above.

Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Students may be required to participate in fieldwork and to contribute to the cost.

Sedimentology and Basin Analysis
GEOL702 W1

Aim: To provide in-depth knowledge of the processes that produce sediments and sedimentary rocks and the analysis of these rocks as sedimentary basin fill.

Content: Subsidence, denudation, flux rates and sediment budget. Classification of sedimentary basins, depositional style of the basin-fill, evolution of the basin-fill, sequence stratigraphy, sedimentary basins in South and southern Africa.

Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Students may be required to participate in fieldwork and to contribute to the cost thereof.

Metamorphic Petrology
GEOL703 W1

Aim: To understand the processes of metamorphic rock formation in the framework of lithosphere dynamics, and to be able to recognise and utilise the geological record of metamorphic rocks and terrains in order to reconstruct their
geological histories.

Content: Advanced aspects of metamorphic petrology, such as geothermobarometry, pressure-temperature histories of metamorphic rocks, tectonic settings and heat sources of metamorphism, thermal modelling, metamorphic fluids, reaction- and deformation-related microstructures, geochronology.

Practicals: Practical applications as applied to the above

Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Students may be required to participate in fieldwork and to contribute to the cost thereof.

Ore Deposits
GEOL705 W2

Aim: To provide an understanding of the modern techniques of ore genesis studies and an introduction to ore processing techniques.

Content: Advanced ore deposit genesis studies, hydrothermal deposits, volcanic-hosted sulphide deposits, sediment-hosted sulphide deposits, carbonate-hosted deposits and structural controls on mineralisation. The fundamentals of mineral processing technology and the application of mineralogy to ore processing techniques.

Practicals: Ore petrography, fluid inclusion and cathodoluminescence studies

Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Mines Field Class
GEOL706 W2

Aim: To provide an insight into geological and engineering aspects of the South African mining industry.

Content: Site visits to study geological, environmental and engineering aspects of the mining industry. No formal lectures.

Assessment: Written report (67%); field assessment (33%).

DP Requirement: Not applicable.

Offered in the Winter vacation. In addition to tuition fees, each student will be required to contribute towards the cost of subsistence, accommodation and transport. This module has no supplementary exam.

Research Project
GEOL707 WY

Aim: To demonstrate the ability, knowledge background and skills to carry out an independent research project which involves a literature survey and the possibility of generating and assessing new data.

Content: No formal instruction.

Practicals: No formal practicals.

Assessment: Project presentations (20%), Final report (80%).

DP Requirement: Submission of project report by set date.

This module has no supplementary exam.

Precambrian Tectonics
GEOL708 W2

Aim: To investigate the evidence for tectonic processes operating in the early and mid Precambrian. The principle of Uniformitarianism will be applied to the Precambrian through a study of the tectonic framework of southern Africa.

Content: Techniques of analysing Precambrian terrains. General characteristics of the Archaean era and Archaean terrains worldwide; Archaean terrains of southern Africa; the evidence for plate tectonics in the Archaean; Proterozoic crustal evolution in southern Africa.

Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Students may be required to participate in fieldwork and contribute to the cost thereof.

Structural Geology
GEOL710 W2
Aim: To analyse complexly deformed rocks and relate the deformation history to appropriate tectonic processes and regimes.


Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Students may be required to participate in fieldwork and to contribute to the cost thereof.

Engineering Geology
GEOL711 W2

Aim: To provide insights into specialist aspects of engineering geology.


Practicals: Geotechnical core logging and soil profiling, physical properties of problem soils. Site visits.

Assessment: Class mark (33%); 3 h exam (67%).

DP Requirement: 40% Class mark.

Pollution Studies
GEOL712 W2

Aim: To provide a qualitative and quantitative understanding of the type, behaviour and movement of pollutants in the soil and water environment.


Practicals: Modelling exercises using the software package PHREEQC. Case studies of water quality problems in South Africa.

Assessment: Class mark (50%); 3 h exam (50%).

DP Requirement: 40% Class mark.

Special Topics
GEOL713 WC

Aim: To provide an insight into specialized topics within the sub-disciplines of geology.

Content: Special topics in Environmental geology, Engineering geology, Sedimentary, igneous and metamorphic petrology, Structural geology and tectonics, Geochemistry, Mineralogy, Ore deposit geology and Marine geosciences.

Practicals: Appropriate practicals will be offered for the topic.

Assessment: Continuous (100%); tests and assignments comprising at least 50% of the final mark externally examined.

DP Requirement: 40% Class mark.

Offered in either Semester 1 or 2. This module has no formal examination and no supplementary examination.

Rock Engineering
GEOL714 W1

Aim: To give an understanding of the way rock behaves on the surface and underground and to provide tools for quantifying its properties and variability.


Practicals: Analysis of rock engineering problems. Familiarisation with specialised rock engineering packages.

Assessment: Class mark (33%); 3 h exam (67%).

DP Requirement: 40% Class mark.

Analytical Techniques in Earth Science
GEOL715 W1

Aim: To provide a detailed understanding of the theory, practice & application of analytical techniques relevant to
Earth Sciences.

**Content:** An overview of analytical instruments & techniques commonly used to characterize the composition, structure & texture of Earth materials, including, but not limited to, X-ray analysis, electron beam imaging & analysis, and mass spectrometry. Underlying physico-chemical principles, instrumentation, sample preparation & applications in geosciences are covered for each technique. Topics also include sampling techniques, precision & accuracy, contamination, calibration techniques, presentation & interpretation of analytical results.

**Practicals:** Practical applications as applied to the above

**Assessment:** Class mark (50%); 3 h exam (50%).

**DP Requirement:** 40% Class mark.

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**Geotechnical Engineering**  
GEOL716 W1

**Prerequisite Requirement:** Entrance to the Honours programme in Geological Sciences.

**Aim:** To provide students with the basic information and skills required to undertake geotechnical investigations, the analysis of physical and geotechnical properties of soils in relation to the stability of slopes and the estimation of settlement of structures on sands and clays.

**Content:** Geotechnical investigation techniques. Sampling techniques including trial pits and boreholes. Description of the soil profile. In situ testing including SPT and CPT tests, laboratory testing and analysis of settlement. Slope stability analysis.

**Practicals:** Practical applications as applied to the above.

**Assessment:** Class mark (33%); 3 h exam (67%).

**DP Requirement:** 40% Class mark.

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**Advanced Coastal and Marine Geology**  
GEOL717 W1

**Aim:** To assess selected models of coastal and marine environments and apply these to examples found within southern African waters.

**Content:** Distribution, characteristics and development of Cretaceous and Tertiary ocean basins in southern Africa; sedimentological, statistical and geomorphological models of continental shelf, slope and deep water environments.

**Assessment:** Class mark (50%); 3 h exam (50%).

**DP Requirement:** 40% Class mark.

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**Horticultural Science**

*FOR UNDERGRADUATE PROGRAMME IN HORTICULTURAL SCIENCE – See Rule AES-BScAg2 and Agricultural Plant Sciences.*

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**Human Physiology**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Advanced Human Physiology**  
HPHY200 P2

**Prerequisite Modules:** BIOL101, CHEM110, CHEM120, MPHY200.

**Aim:** To give the student an overview of human anatomy and a thorough knowledge of the physiology of the various systems covered, in order to provide a background to therapeutic nutrition modules.

**Content:** Bone, muscle, the heart, circulation, blood, immune and lymphatic system, digestive, reproductive physiology.

**Assessment:** 2 tests (18%), assignment, practicals (15%); 3 h exam (67%).

**DP Requirement:** 40% Class mark, 80% attendance at practicals.

*Only for students registered in the College of Agriculture, Engineering and Science.*
Hydrology

Offered in the School of Agricultural, Earth and Environmental Sciences

Introduction to Physical Hydrology
HYDR210 P1
(26L-7T-40P-0S-64H-15R-0F-0G-8A-13W-16C)

Prerequisite Requirement: 64C at Level 1.

Aim: To develop an understanding of the fundamentals of major components making up the hydrological cycle and human interaction with it.

Content: The key concepts underlying the science of hydrology including studies of rainfall, interception, evaporation, runoff, soil water, systems and anthropogenic impacts on the hydrological cycle.

Practicals: 12 - covering various basic hydrological concepts.

Assessment: 3 tests (22%), tutorials, practical and other assessments (8%), 3 h practical exam (10%), 3 h theory exam (60%).

DP Requirement: 40% Class mark, Attendance at 80% of practicals.

Environmental Aspects of Hydrology
HYDR220 P2
(26L-7T-40P-0S-65H-15R-0F-0G-7A-13W-16C)

Prerequisite Modules: HYDR210.

Aim: To provide students taking agriculture and environmental science options with an understanding of current topics in environmental hydrology and anthropogenic impacts on the hydrological cycle.

Content: Natural and anthropogenic impacts on the hydrological cycle, including climate change impacts and the impacts of forestry; networks and instrumentation; morphometry; and an introduction to soil loss.

Practicals: 12 - covering the subjects above. 1 field trip to a research catchment.

Assessment: 3 class tests (24%), class tutorials & pracs (8%), 1 prac exam (8%), 3 h exam (60%).

DP Requirement: 40% Class mark, Attendance at 80% of practicals.

Modelling for Hydrological Design
HYDR310 P1
(24L-8T-40P-0S-51H-20R-8F-0G-9A-13W-16C)

Prerequisite Modules: HYDR210.

Aim: To understand hydrological simulation models commonly used in South Africa and their application to design and water conflict problems.

Content: Application of hydrological models to sustainable integrated water resources management and planning, under varying environmental conditions. Understanding theoretical concepts of hydrological simulation; ability to select appropriate models for particular problems; application of hydrological models to obtain water resources design and planning information; ability to set up and run hydrological models.

Practicals: 12 Practicals. Compulsory 3 day field trip.

Assessment: 3 tests (20%), tutorials, practicals and other assessments (10%), 3h practical exam (10%), 3 h theory exam (60%).

DP Requirement: 40% Class mark, Attendance at 80% of practicals.

Students must contribute to costs of field trip. Credit may not be obtained for both HYDR310 and HYDR311.

Agrohydrological Simulation Modelling
HYDR311 P1
(16L-6T-20P-0S-24H-8R-0F-0G-6A-13W-8C)

Prerequisite Requirement: At least 32C from level 1 courses in Mathematics, Physics, Statistics or Computer Science.

Aim: To provide students not majoring in Hydrology with an understanding and appreciation of the role of simulation models in hydrological science.

Content: Development philosophies of hydrological modelling systems and ability to operate selected models. Specific outcomes: an understanding of theoretical concepts of hydrological simulation; ability to select appropriate models for particular problems; ability to configure and run hydrological models.
Practicals: 6 - covering the subjects above. 1 field trip to a nearby research catchment.
Assessment: Class work (15%), 1 class test (15%), 1 prac exam (10%), 2 h exam (60%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.
Credit may not be obtained for both HYDR310 and HYDR311.

Irrigation Design & Management for Hydrology
HYDR313 P1
(18L-3T-18P-0S-24.5H-12R-0F-0G-4.5A-4W-8C)
Corequisite: HYDR310.
Aim: To understand the principles of irrigation design and management to students majoring in Hydrology.
Content: Design of irrigation systems including; the link to crop water requirements, sprinkler, micro and flood irrigation, centre pivot and moving systems, pumps scheduling and maintenance and the flow of water in pipes and channels.
Assessment: 1 class test (10%), class tutorials, pracs and assignments (30%); 2 h exam (60%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.
Students will be required to contribute to costs of field trips. Credit may not be obtained for both HYDR313 and AGPS301.

Hydrology Project
HYDR321 P1
(2L-1T-3P-9S-65H-0R-0F-0G-0A-13W-8C)
Prerequisite Modules: HYDR210, HYDR220.
Corequisite: HYDR310.
Aim: To provide the ability to study in some detail a particular topic of contemporary hydrological concern, by way of literature review and practical application of hydrological knowledge learned in preceding modules and to present this as a formal document to laid down specifications.
Content: Detailed self-study by way of literature review, interview, etc regarding a particular topic of contemporary hydrological concern.
Practicals: Application of a document to formal scientific specifications.
Assessment: Completed document in terms of content, adherence to specifications (70%). Oral presentation of topic as well as participation in peer presentations (30%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Environmental Water Quality
HYDR322 P2
(15L-4T-18P-0S-30H-8R-0F-0G-5A-13W-8C)
Prerequisite Modules: HYDR210.
Aim: To provide an intermediate level of understanding and appreciation of water quality issues in hydrology especially those relevant to southern African conditions, such as eutrophication and E.coli problems.
Content: The causes and effects of water quality problems and the potential for simulation modelling thereof, with particular reference to South African conditions.
Practicals: Exercises covering the subjects above, as well as monitoring of a local river.
Assessment: Class tutorials & pracs (20%), 2 class tests (20%), 2 h exam (60%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.

Applied Hydrology
HYDR324 P2
(24L-8T-54P-6S-50H-10R-0F-0G-8A-13W-16C)
Prerequisite Modules: HYDR310.
Aim: To provide an understanding of applied aspects of hydrology and the ability to solve applied problems.
Content: Interrelationships between principles & theories; applied issues & problem solving, including: Planning for water resources, water resources yield & planning model, legal aspects of dam design, safety evaluation, basic hydraulic principles, techniques for design flood estimation including probability plotting & distribution fitting, unit hydrographs. Rational method, application of SCS techniques, flood routing, the Muskingum & storage indication methods; grassed spillway design; reservoir yield analyses to optimize dam & irrigable area capacity.
Assessment: Tests (20%), Practicals or Assignments (5%), Dam Design Report (25%), 3 h exam (50%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.
Water Resources Policy, Laws and Institutions  
HYDR330 P2  
Prerequisite Modules: HYDR210.  
Aim: To equip students with knowledge regarding the evolution of SA water law and the scientific underpinnings of key aspects thereof.  
Content: Principles of Integrated Water Resources Management with specific focus on integrated land and water management and climate change in a South African context. Other foci include South African Water Law, organizational arrangements, institutions, rules and policies for water resources management and contemporary topics based on current case studies.  
Assessment: Tests (20%), assignments (20%); 2 h Theory Exam (60%).  
DP Requirement: 40% Class mark, Attendance at 80% of practicals.

Current Issues in Hydrology  
HYDR710 P1  
Aim: To provide honours level students with an understanding of current and topical issues of importance in hydrological sciences. Specific outcomes include: the ability to understand and synthesis particular topics from scientific literature; an understanding of the philosophy of hydrological science; and understanding of the dynamic nature of the science of hydrology; an awareness of the external forces driving the science.  
Content: The study of topical and relevant issues pertaining to the science of hydrology.  
Practicals: Exercises covering the subjects above, as well as monitoring of a local river.  
Assessment: Class assignments (40%), 3 h exam (60%).  
DP Requirement: Attendance at all class meetings. Completion of all assignments

Integrated Water Resources Management  
HYDR720 P2  
Aim: To provide an integrated understanding of hydrological sciences and an ability to solve applied hydrological problems in an interdisciplinary environment.  
Content: The interrelationships between principles and theories learned in preceding courses and the processes they represent. In particular, students should be aware of the integrating nature of the hydrological catchment. Topics include: environmental impact assessment; integrated catchment management; environmental water requirements; water quality issues.  
Practicals: Practicals covering the subjects above as well as visits to sites of relevance.  
Assessment: Class assignments (40%), 3 h exam (60%).  
DP Requirement: Attendance at all class meetings. Completion of all assignments

Advanced Hydrological Processes  
HYDR725 P2  
Aim: To provide honours level students with an in depth understanding of fundamental hydrological processes. Students should acquire an in-depth understanding of specific hydrological processes.  
Content: Design flood estimation; soil water and hillslope processes; groundwater modelling; forest hydrology.  
Practicals: Practicals covering the subjects above as well as visits to sites of relevance.  
Assessment: Class assignments (40%), 3 h exam (60%).  
DP Requirement: Attendance at all class meetings. Completion of all assignments

Hydrology Honours Project  
HYDR790 PY  
Aim: To train hydrology honours level students to conduct an approved research project and prepare and present a scientific report on the results.  
Content: Access and review scientific documentation. Conduct a small research project, analyse results. Presentation by way of written report to specified scientific format as well as orally to a group of academic staff and peers.  
Practicals: All work is conducted under supervision and will be assessed by internal and external reviewers.  
Assessment: Written report (80%), oral presentation (20%).
DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

**Advanced Hydrological Modelling Skills**

HYDR795 PY

(30L-12T-40P-0S-203H-30R-0F-0G-5A-26W-32C)

**Aim:** To apply advanced hydrological skills to water resources problems by simulation modelling.

**Content:** Collection of data, configuration and application of a model to a specific water resources problem providing skills in: GIS applications; catchment delineation; rainfall surfaces; landuse and soils information; irrigation; crop yield; results analysis; planning scenarios. Progress reports handed in during the year; also, full final project report on the project in full, as if to a client.

**Practicals:** Site visits, analysis of field data; use of GIS.

**Assessment:** Work is supervised. Progress & final reports assessed by 3 reviewers (50%), 3 h exam (50%).

**DP Requirement:** Attendance at all class meetings. Completion of all assignments

**Spatial Analysis for Water Resources Mngt**

HYDR820 PC

(20L-6T-20P-12S-62H-15R-0F-20G-5A-13W-16C)

**Prerequisite Modules:** ENVS810, 817

**Aim:** To enable students to apply advanced spatial modelling skills used in water resources assessment, planning and management

**Content:** The application of spatial decision support systems in water resources management, with foci on linkages between GIS and decision support systems and spatial analysis for water resources management including both surface and groundwater. The use of multicriteria decision analysis techniques rounds off the module.

**Assessment:** Class mark (30%), Project (30%); 3 h Theory Exam (40%).

**DP Requirement:** 80% attendance at all academic contact activities, 50% Class mark.

Offered in either Semester 1 or 2.

**Earth Observation for Water Resources Mngt.**

HYDR825 PC

(20L-6T-20P-12S-62H-15R-0F-20G-5A-13W-16C)

**Prerequisite Modules:** ENVS810.

**Aim:** To enable students to identify and utilise sources of earth observation data and information available for hydrological analyses.

**Content:** The use of satellite-based Earth Observation techniques for the Identification of sources of rainfall, soil moisture, evaporation, surface and groundwater fluxes and other water resources related data and information. The application of these in hydrological analyses and water resources management.

**Assessment:** Class mark (30%), Project (30%); 3 h Theory Exam (40%).

**DP Requirement:** 80% attendance at all academic contact activities, 50% Class mark.

Offered in either Semester 1 or 2.

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**Land Surveying**

*Offered in the School of Engineering*

**Geomatics I**

ENSV1G1 H1

(28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)

**Aim:** To introduce the scope and uses of spatially referenced information and methods of acquiring it, at local and global scales. To introduce the concept of data quality and ways of assessing it. To introduce ways of representing spatial data in different reference systems of the 3-dimensional Earth and on various map projections, and transformation of information between reference systems.

**Content:** An overview of the concepts of geomatics; the nature of spatial data; representation of spatial data; coordinate systems and the standard map projection systems used in South Africa (Gauss, Conformal, Lambert’s, Conical, Conformal and Alber’s Equal Area); overview of the methods of acquisition of spatial data; processing,
analysing, representation and display of spatial data; introduction to statistical description and analysis of spatial data; introduction to the concepts of geographical information systems (GIS); interpretation and analysis of maps, aerial photographs and remote sensing imagery.

**Practicals:** Field and office work on data acquisition, processing and presentation.

**Assessment:** Class mark (30%); 3 h exam (70%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

### Geomatics 2

ENSV1G2 H2

**Prerequisite Requirement:** 40% in ENSV1G1

**Aim:** To provide students with an ability to plan and carry out a survey of any mapping and/or engineering project, and to select the right methodology, equipment and software to facilitate processing and presentation of the survey results in an appropriate and easy to understand format.

**Content:** Levelling; angle measurement; distance measurement; methods for fixing ground control and observation points; site and field surveying; similarity and affine co-ordinate transformations; GPS for use in Geographic Information Systems (GIS); theory and application of a gyrotheodolite.

**Practicals:** Field and office work on data acquisition, processing and presentation.

**Assessment:** Class mark (30%); 3 h exam (70%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

### Introduction to Geomorphology

ENSV1GM H1

**Aim:** To enable students to understand land surface evolution and the natural environment and to have a background on the associated natural environmental hazards and how these affect the geodetic reference frames.

**Content:** Introduction to land surface formation, geological time, the major rock groups and their characteristics. Introduction to plate tectonics, crustal deformation and its effect on Geodetic Reference Frames. Surface faults, stresses and strain. Introduction to natural environmental hazards including earthquakes, tsunamis, landslides, floods and fires and their impact on spatial referencing networks. Introduction to natural hazard and risk zonation maps and their characterization.

**Assessment:** Assignments/Practicals and Tests (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

### Cadastral Surveying 1

ENSV2CS H1

**Aim:** To enable students to carry out the surveying, computational and presentation phases of a minor subdivision, to advise a client on the requirements and submission process, to understand the relevant legislation.

**Content:** The need for cadastral survey and registration; the South African cadastral system; conveyancing; ownership; rights in land; subdivisional application; details of the Land Survey Act and regulations; Professional Land Surveyors and Technical Surveyors Act and Rules; software packages for fieldwork and computations; cadastral survey task.

**Practicals:** Field work on relocation of boundaries, subdivision.

**Assessment:** Practical assignments and one test (30%); 3 h exam (70%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

### Hydrographic Surveying

ENSV2HY H1

**Aim:** To provide students with an ability to plan and carry out a near shore bathymetric survey using total stations, real time differential GPS and digital echo sounder, reduce the results and produce a contoured chart of the area.

**Content:** Maritime baselines, boundaries, limits and coastal rights; Control for inshore and offshore position fixing;
Acoustic ranging systems; Depth determination, depth datums, underwater acoustics; Tidal regime, wave heights, mean sea level and chart datum transfer; Harmonic components, tidal constituents; Wave refraction, reflection and diffraction; CSP principles. Satellite altimetry and its application to ocean bathymetry; Secular variations in MSL and their relevance to climate. Positional control of robotic hydrographic exploration; Geophysical exploration of the oceanic subsurface.

Practicals: Methods used in hydrographic surveying.

Assessment: Practical/tutorial assignment (15%); 3 h exam (85%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Survey Camp 2
ENSV2SC H2 (OL-0T-0P-0S-0H-0R-80F-0G-0A-2W-8C)

Prerequisite Modules: ENSV1G1 or ENSV2SE.

Aim: To introduce students to the establishment of low order control. To advise students on techniques, data management and graphics.

Content: The module consists of completing assigned tasks that vary from year to year. These generally do not take the candidate beyond what was learned formally in Second Year modules but consolidate understanding and skill in the various stages involved in spatial information gathering and presentation.

Practicals: This module is carried out as a practical exercise off-campus, often in a nature reserve.

Assessment: Daily assessment of performance in the field and compilation of a portfolio of daily activities (100%)

DP Requirement: 100% attendance.

This module has no supplementary exam.

Surveying Engineering
ENSV2SE H1 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)

Aim: To introduce students to the concepts of observing, recording, reduction and presentation of survey measurements and their applications in engineering projects and to highlight the importance of recognising landownership when executing engineering projects.

Content: The nature and representation of spatial data; co-ordinate systems and map projection systems used in South Africa; overview of modern surveying instruments for spatial data acquisition; levelling; angle measurement; distance measurement; methods for fixing ground control and observation points; site surveying and terrain modelling; photo interpretation; introduction to Geographical Introduction Systems (GIS); Introduction to Global Position System (GPS); engineering applications of survey measurements; introduction to cadastral surveys and landownership.

Practicals: Field and office work involving various survey techniques, processing and presentation of survey measurements.

Assessment: Class mark (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Theory of Adjustments 1
ENSV2T1 H1 (40L-10T-0P-0S-70H-35R-0F-0G-5A-13W-16C)

Prerequisite Modules: MATH131

Aim: To show students difference statistical techniques required for analysis of quantitative data and how to measure and control data quality, to form simple linear functional models, how to form linear functional models of simple problems and solve them using the least-squares method.


Assessment: Class mark (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.
Theory of Adjustments 2
ENSV2T2 H2  
Prerequisite Modules: ENSV2T1.
Aim: To provide students with an understanding and skills in formulating and solving advanced adjustment problems and quality assessments.
Content: Least squares adjustments with constraints; general case of least squares; partitioning of least squares problems and Helmert blocking; sequential least squares and Kalman filtering; concepts of reliability; detection of outliers; analysis of surveying networks; the datum problem; free networks.
Assessment: Tests (15%), tutorials (15%); 3 h exam (70%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Co-ordinate Systems & Geodetic Projections
ENSV3CG H1  
Aim: To enable students to transform positions on a plane or three-dimensional system, to solve problems on the unit sphere, to understand common 3-dimensional systems, to transform onto and from the ellipsoid to the Gauss conformal projection.
Content: Rotations in three dimensions; spherical trigonometry; co-ordinate transformations; Local and global natural and conventional co-ordinate systems for the Earth; the Laplace condition; geometry of the ellipsoid; calculation of co-ordinates in three dimensions and on the reference ellipsoid; Gauss conformal projection; astronomical co-ordinate systems and time systems.
Practicals: Hands-on experience in solving problems and geodetic projections.
Assessment: Tutorial Assignments and one test (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.

Cadastral Surveying 2
ENSV3CS H2  
Aim: To enable the student to carry out the geometrical design and create a general plan of a township layout, to survey a sectional title scheme, to plan a development route for a township scheme.
Content: Cadastral systems; rectilinear boundaries; acquisition of land; registration and certificates of titles; servitudes; leases; curvilinear boundaries; township development; town survey marks; sectional titles; application of computer aided drafting; cadastral surveying task.
Practicals: Hands-on experience in cadastral surveying.
Assessment: Practical assignments, one test (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.

Photogrammetry
ENSV3PO H1  
Aim: To enable the student to design a photogrammetric project, determine if photogrammetric methods will solve a problem, analyse the results of a photogrammetric project.
Content: Introduction to photogrammetry, basic mathematics of photogrammetry, photogrammetric optics, aerial cameras and photography, aerotriangulation, control surveys, analogue, analytical and digital plotting instruments, orthophotographs, planning and executing a photogrammetric project, non-topographic photogrammetry. Application areas.
Practicals: Design and implementation of a photogrammetric project.
Assessment: Tutorial/Practical Assignments and one test (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Survey Camp 3
ENSV3SC H2  
(0L-0T-0P-0S-0H-0R-80F-0G-0A-2W-8C)
Prerequisite Modules: ENSV2SC.

Aim: To enable students to establish first-order control, to organise data storage, integrity and long-term accessibility, to prepare final graphic output of field data.

Content: The module consists of completing assigned tasks that vary from year to year. These generally do not take the student beyond what was learned formally in second and third year modules but consolidate understanding and skill in the various stages involved in spatial information gathering and presentation.

Practicals: This module is carried out as a practical exercise off-campus, often in a nature reserve.

Assessment: Daily assessment of performance in the field and compilation of a portfolio of daily activities (100%)

DP Requirement: 100% attendance.

This module has no supplementary exam. Daily assessment of performance in the field, alternatively a portfolio presentation.

Engineering Surveying 2
ENSV3SE H1 (28L-10T-19P-0S-78H-20R-0F-0G-5A-13W-16C)

Prerequisite Modules: ENSV2T2 and ENSV2SE.

Aim: To enable students to design an appropriate measuring, execution and analysis scheme for an engineering surveying problem, and analyse the results.


Practicals: Practicals are done on campus. Students may be taken to the sites off campus if need arises.

Assessment: Assignments/Practicals and Tests (30%); 3 h exam (70%).

DP Requirement: DP Requirement: Students are required to attend tutorials/lectures and complete practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Satellite Surveying
ENSV3SS H2 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)

Aim: To enable students to perform GPS surveys efficiently, assess their quality, assess hidden errors, specify equipment needs. To introduce students to the instrumentation and techniques used in realisation of global reference, enabling the student to integrate these systems into national and regional projects.

Content: Satellite co-ordinate systems and satellite orbits, principles of position location using satellites. The Global Position System; navigation and surveying using GPS. Design a control system for a specific geodetic task.

Practicals: Perform GPS surveys.

Assessment: Tutorial/Practical assignments and one test (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Geodesy
ENSV4GY H1 (30L-20T-0P-0S-75H-30R-0F-0G-5A-13W-16C)

Aim: To give students an understanding of the Earth's gravity field as it affects measurements on it, the various models for height and gravity reductions and representational frameworks.

Content: Potential theory, gravity observations, reductions and instruments, isostacy, height systems, 3-dimensional triangulation; geodetic co-ordinate systems. Geodetic surveying in one dimension (geodetic levelling and gravimetry), in two dimensions (geodetic astronomy and two-dimensional geodetic networks) and in three dimensions: three-dimensional geodetic networks, inertial surveying systems, geodetic use of the Global Position System, very long baseline interferometry, lunar and satellite laser ranging, satellite and airborne gravity gradiometry, satellite altimetry.

Assessment: Tutorial assignments and one test (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

Precise Engineering Surveying
ENSV4PE H2 (28L-10T-19P-0S-78H-20R-0F-0G-5A-13W-16C)
Prerequisite Modules: ENSV2SE and ENSV2T2
Aim: To enable students to: calibrate precise measuring instruments, design an appropriate measuring scheme for a specific problem, to subject real observations to appropriate analysis.
Content: Precise Geodetic surveys; Instrumentation used in precise engineering surveying; testing and laboratory calibration of instruments; precision surveying methods; including methods of precision alignment, deformation surveys, analytical methods associated with precision engineering surveys, pre-and post-analyses of accuracy. Unified adjustment techniques, sequential processing, interpolation, filtering, collocation and real-time data analysis.
Assessment: Assignments/Practicals (15%), test (15%); 3 h exam (70%).
DP Requirement: Students are required to attend tutorials/lectures and complete practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Photogrammetry 2
ENSV4PO H2
Prerequisite Modules: ENSV2T2 and ENSV3PO.
Aim: To enable students to: undertake close range photogrammetry and LIDAR mapping, design an appropriate measuring scheme for close range photogrammetry, to subject real observations to appropriate analysis.
Practicals: Practicals are done on campus. Students may be taken to the sites off campus if need arises.
Assessment: Assignments/Practicals and Tests (30%); 3 h exam (70%).
DP Requirement: Students are required to attend tutorials/lectures and complete practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Research Methodology
ENSV4RM H1
Aim: To enable the student to produce quality hard-copy and presentation material, to make a professional presentation, to write a project proposal, use library and source reference material and to use approved referencing.
Content: Primary factors of research activity in support of ENSV4SP. Topics include: What is research? Selecting and justifying a research topic. Planning research project. Literature search, data analysis and gathering. Presentation of findings.
Assessment: A written mini-project proposal (30%), written full project proposal and an oral presentation (70%).
DP Requirement: 40% for mini-project proposal.
This module has no supplementary exam.

Surveying & Mapping Project
ENSV4SP H2
Prerequisite Requirement: 40% for ENSV4RM.
Aim: To enable the student to carry out a substantial self-leaning exercise involving data collection, analysis, presentation of a mini-dissertation and an oral presentation.
Content: The candidate is invited to choose his/her own topic for investigation. The topic should be relevant to the broad field of geomatics and preferably it should develop knowledge and skill in some aspect that the candidate wishes to develop further after graduating.
Assessment: Mini-dissertation, oral presentation and participation in a seminar (100%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Land Tenure
ENSV4TN H1
Aim: To enable the student to understand the role of security of tenure and land ownership in the land survey profession in order to be informed of the right approach to solving cadastral and land management problems.
Content: Introductory land tenure concepts; world land tenure systems; historical development of land tenure patterns.
in South Africa; Land policies of the South African Government; South African Land Tenure Systems; Cadastral systems and Cadastral reform.

Assessment: Class mark (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

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**Mammalian Physiology**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Introduction to Mammalian Physiology**

MPHY200 P1

(39L-10T-16P-0S-55H-30R-0F-5G-5A-13W-16C)

**Prerequisite Modules:** BIOL101, CHEM110, 120.

**Aim:** To provide students with an overview of general human and animal anatomy and a thorough knowledge of basic physiological processes of various systems of the mammalian body.

**Content:** Introduction to the mammalian body. Levels of organisation in the body. Anatomical regions and positions. Homeostasis and feedback mechanisms. Sensory receptors. The nervous system; neurons and impulses; central; peripheral and autonomic nervous system. Endocrine, respiratory, renal systems and fluid balance. Integumentary system. Temperature regulation. Integration of physiological processes.

**Assessment:** Formal tests (20%), practicals (13%), 3 h exam (67%).

**DP Requirement:** 40% Class mark, 80% attendance of practicals. Only for students registered in the College of Agriculture, Engineering and Science.

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**Mathematics**

*Offered in the School of Mathematics, Statistics and Computer Science*

**Augmented Quantitative Methods 1**

MATH105 P1 W1

(78L-78T-0P-0S-99H-54R-0F-0G-11A-13W-16FC-16DC)

**Prerequisite Requirement:** HG E or SG D Matric Maths or Level 3 NSC Maths; acceptance into the BCom-4 programme.

**Aim:** To introduce mathematical techniques for business mathematics and to develop problem solving skills.

**Content:** This module covers the syllabus of MATH134 and, in addition, supplementary material designed for students who are under-prepared for University-level Mathematics. Students are expected to attend additional lectures, tutorials & undergo additional assessment to a maximum of 160 hours (39L-39T-0P-0S-49.5H-27R-0F-0G-5.5A-13W).

**Assessment:** Class tests and/or assignments (33%); 3 h exam (67%).

**DP Requirement:** 35% Class mark, 80% attendance at lectures and tutorials.

Credits may not be obtained for MATH105 and any of MATH130, 131, 134, 150 or 195. This module is worth 16 degree credits and 16 foundation credits.

**Introduction to Calculus**

MATH130 PB WB

(49L-39T-0P-0S-51H-15R-0F-0G-6A-13W-16C)

**Prerequisite Requirement:** Higher Grade D or Standard Grade A for Matric Mathematics, or NSC Level 5 Maths, or 60% for MATH199.

**Aim:** To introduce and develop the Differential Calculus as well as the fundamentals of proof technique and rudimentary logic.

**Content:** Fundamental Concepts - elementary logic, proof techniques. Differential Calculus - Functions, graphs and inverse functions, limits and continuity, the derivative, techniques of differentiation, applications of derivatives, antiderivatives.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

Credit may not be obtained for MATH130 and any of MATH105, 131, 134, 150, 195 or 197.

Mathematics 1A Eng
MATH131 H1 P1

Prerequisite Requirement: Higher Grade C or Standard Grade A for Matric Mathematics or NSC Level 6 Maths.

Aim: To introduce basic mathematical concepts of differential and integral calculus.


Assessment: Class tests and/or assignments (20%); 3 h exam (80%).

For Engineering students only. Credit may not be obtained for MATH131 and any of MATH105, 130, 134, 150, 195 or 197.

Applied Mathematics 1A (Eng)
MATH132 H1 P1

Prerequisite Requirement: Higher Grade C or Standard Grade A for Matric Mathematics or NSC Level 6 Maths.

Aim: To introduce basic methods of vector and matrix algebra, statics and kinematics.


Assessment: Class tests and/or assignments (20%); 3 h exam (80%).

For Engineering students only.

Quantitative Methods 1
MATH134 P1 W1 H1

Prerequisite Requirement: Higher Grade E or Standard Grade B for Matric Mathematics or NSC Level 4 Maths.

Aim: To introduce mathematical techniques for business mathematics and to develop problem solving skills.


Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

Credit may not be obtained for MATH134 and any of MATH105, 130, 131, 150, 195 or 197.

Calculus and Linear Algebra
MATH140 PB WB

Prerequisite Requirement: 40% in MATH130.

Aim: To develop the Integral Calculus and to introduce elementary Linear Algebra.

Content: Integral Calculus - the definite integral, techniques of integration, applications of integrals, Taylor series, polar coordinates, complex numbers. Introduction to Linear Algebra - vectors, lines and planes in space, matrices, systems of linear equations, determinants.

Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

Credit may not be obtained for MATH140 and any of MATH141, 143, 145 or 196.

Mathematics 1B (Eng)
MATH141 H2 P2

Prerequisite Requirement: 40% in MATH131.
Aim: To develop concepts of differential and integral calculus and introduce elements of differential equations and complex numbers theory.


Assessment: Class tests and/or assignments (20%); 3 h exam (80%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Credit may not be obtained for MATH141 and any of MATH140, 143, 145 or 196. For Engineering students only.

Applied Mathematics 1B (Eng)
MATH142 H2 P2 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite Requirement: 40% in (MATH131 and MATH132).

Aim: To provide knowledge about the fundamentals of engineering dynamics.


Assessment: Class tests and/or assignments (20%); 3h exam (80%).

For Engineering students only.

Further Mathematics for Natural Sciences
MATH143 P2 (19L-19T-0P-0S-26H-12R-0F-0G-4A-13W-8C)

Prerequisite Requirement: 40% in MATH150.

Aim: To equip students with mathematical tools needed in the life and physical sciences, and to study practical applications of mathematics to these fields.


Assessment: Class tests and/or assignments (33%); 2 h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Credit may not be obtained for MATH143 and any of MATH140, 141, 145 or 196.

Operations Research
MATH144 W2 (39L-39T-0P-0S-50H-26R-0F-0G-6A-13W-16C)

Prerequisite Requirement: 40% in MATH130.

Corequisite: MATH140.

Aim: To introduce and develop the fundamentals of operations research.

Content: Linear programming, game theory, difference equations, elementary graph theory.

Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Further Topics in Mathematics
MATH145 W2 (39L-39T-0P-0S-50H-26R-0F-0G-6A-13W-16C)

Prerequisite Requirement: 40% in MATH150.

Aim: To equip students with mathematical tools needed in the life and physical sciences, and to study practical applications of mathematics to these fields.

Content: Antiderivatives and indefinite integrals. Definite integrals and areas. Techniques of integration (including exponential and trigonometric functions, partial fractions, Taylor Series) and Simpson’s rule; applications. Improper integrals; applications. Differential equations and applications to discrete growth processes and exponential growth. Functions of several variables; partial derivatives, maxima and minima; applications. Lagrange multipliers, least squares approximations and applications.

Assessment: Class tests & assignments (33%); 3 h exam (67%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Credit may not be obtained for MATH145 and any of MATH140, 141, 143 or 196.

Mathematics for Natural Sciences
MATH150 P1 W1 (49L-39T-0S-51H-15R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Higher Grade E or Standard Grade B for Matric or NSC Level 4 Maths.
Aim: To equip students with mathematical tools needed in the life and physical sciences, and to study practical applications of mathematics to these fields.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Credit may not be obtained for MATH150 and any of MATH105, 130, 131, 134 or 197.

Introduction to Calculus (Augmented)
MATH195 P1 W1 (78L-78T-0S-99H-54R-0F-0G-11A-13W-16FC-16DC)
Prerequisite Requirement: Higher Grade E or Standard Grade B for Matric Mathematics or NSC Level 3 Maths; acceptance into BSc4(Augmented).
Aim: To introduce and develop the Differential Calculus as well as the fundamentals of proof technique and rudimentary logic.
Content: This module covers the syllabus of MATH130 and, in addition, supplementary material designed for students who are under-prepared for university-level Mathematics. Students are expected to attend additional lectures, tutorials and undergo additional assessment to a maximum of 160 hours.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Credit may not be obtained for MATH195 and any of MATH105, 130, 131, 134, 150 or 197. This module is worth 16 degree credits and 16 foundational credits.

Calculus and Linear Algebra (Augmented)
MATH196 P2 W2 (78L-78T-0S-99H-54R-0F-0G-11A-13W-16FC-16DC)
Prerequisite Requirement: 40% in MATH195.
Aim: To develop the Integral Calculus and to introduce elementary Linear Algebra.
Content: This module covers the syllabus of MATH140 and, in addition, supplementary material designed for students who are under-prepared for university-level Mathematics. Students are expected to attend additional lectures, tutorials and undergo additional assessment to a maximum of 160 hours.
Assessment: Class tests and assignments (33%); 3 h exam (67%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Credit may not be obtained for MATH196 and any of MATH140, 141, 143 or 145. This module is worth 16 degree credits and 16 foundational credits.

Maths & Stats for Natural Sciences (Aug)
MATH197 P1 W1 (78L-78T-0S-99H-54R-0F-0G-11A-13W-16FC-16DC)
Prerequisite Requirement: Higher Grade E or Standard Grade B for Matric Mathematics or NSC Level 3 Maths; acceptance into BSc4(Augmented).
Aim: To introduce students to the fundamental principles, methods, procedures and techniques of mathematics and statistics as the language of Science.
Content: This module covers the syllabus of MATH150 and, in addition, supplementary material designed for students who are under-prepared for university-level Mathematics. Students are expected to attend additional lectures, tutorials and undergo additional assessment to a maximum of 160 hours.
Assessment: Class tests and assignments (33%); 3 h exam (67%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Credit may not be obtained for MATH197 and any of MATH105, 130, 131, 134 or 150. This module is worth 16 degree credits and 16 foundation credits.

Foundation Mathematics
MATH199 PY WY

Prerequisite Requirement: Any pass symbol on Standard or Higher Grade Matric Maths or NSC Maths.

Corequisite: BIOL199, CHEM199, PHYS199, (SCOM103 or 113).

Aim: To provide a foundation for all first year mathematics modules.


Assessment: Class mark (Assignments, Class tests, 3 h June test, and tutorial tests), (50%); 3 h November exam.

DP Requirement: 40% Class mark, plus 80% attendance at all lectures and tutorials.

Year-long Module. This module is only for students in the Foundation Stream of the BSc4. It carries 36 Foundational credits and 4 degree credits.

Advanced Calculus & Linear Algebra
MATH212 P1 W1

Prerequisite Modules: MATH130, 140.

Aim: To give a coherent treatment of basic theories & problem solving techniques from Advanced Calculus and Linear Algebra and their applications.


Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: Class record 35%. 80% attendance at lectures and tutorials.

Credit may not be obtained for MATH212 and MATH238.

Mechanics
MATH235 W1

Prerequisite Modules: MATH130, 140.

Aim: To provide the student with a systematic development of advanced applications in mechanics.

Content: Newton’s laws of motion and conservation laws. Kepler’s laws, central forces and planetary motion. Moving frames and Coriolis forces. Motion of a rigid body and Euler’s equations. Lagrange’s equations. Introduction to mechanics of continuous media.

Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Discrete Mathematics with Applications
MATH236 P1 W1

Prerequisite Modules: MATH130, 140.

Aim: To study basic concepts of discrete mathematics & applications to cryptology and graph theory.


Assessment: Class mark (33%); 3h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Mathematics 2A (Eng)
MATH238 H1 (39L-39T-0P-0S-52H-24R-0F-0G-6A-13W-16C)
**Prerequisite Requirement:** 40% in MATH141.
**Prerequisite Modules:** MATH131.
**Aim:** To exhaustively cover the methods & applications of multivariable calculus.
**Assessment:** Class tests and/or assignments (20%); 3 h exam (80%).
**DP Requirement:** 35% Class mark, 80% attendance at lectures & tutorials.
**For Engineering students only. Credit may not be obtained for MATH212 and MATH238.**

Applied Finite Mathematics
MATH239 H1 (20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)
**Prerequisite Requirement:** 40% in MATH131, 141.
**Aim:** To introduce the student to the theory and methods of finite mathematics.
**Content:** Logic, Boolean algebra. Set Theory. Difference Equations. Graph Theory. Linear Programming.
**Assessment:** Class tests and/or assignments (20%); 2 h exam (80%).
**DP Requirement:** 35% Class mark, 80% attendance at lectures & tutorials.
**For Engineering students only.**

Intro to Numerical Mathematics
MATH243 PC W2 (39L-39T-0P-0S-52H-24R-0F-0G-6A-13W-16C)
**Prerequisite Modules:** MATH130, 140.
**Aim:** To provide the student with a knowledge and understanding of fundamental material in numerical methods.
**Content:** Error analysis, interpolation and polynomial approximation, numerical differentiation and integration, numerical linear algebra. Basic numerical methods in differential equations.
**Assessment:** Class tests and/or assignments (33%); 3 h exam (67%).
**Recommended co-requisite:** MATH 251.

Mathematical Modelling
MATH246 P2 W2 (39L-39T-0P-0S-52H-24R-0F-0G-6A-13W-16C)
**Prerequisite Modules:** MATH130, 140.
**Aim:** To develop skills to construct and analyse mathematical models of real world situations.
**Content:** Formulation and construction of mathematical models for real world problems in terms of difference and differential equations. Case studies from finance, population theory, mathematical biology, epidemiology, geometry and mechanics. Relevant properties of difference and differential equations and systems. Basic methods of analysing these models.
**Assessment:** Class tests and/or assignments (33%); 3 h exam (67%).
**Recommended co-requisite:** MATH 251.

Mathematics 2B (Eng)
MATH248 H2 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)
**Prerequisite Requirement:** 40% in MATH238.
**Prerequisite Modules:** MATH141.
**Aim:** To exhaustively cover linear differential equations, eigenvalue theory, and to prepare students for more advanced methods.

Assessment: Class tests and/or assignments (20%); 3 h exam (80%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

For Engineering students only. Credit may not be obtained for MATH248 and MATH251.

Further Calculus and Introductory Analysis

MATH251 P2 W2

Prerequisite Modules: MATH212.

Aim: To provide a foundation for advanced study in mathematics and applied mathematics.


Assessment: Class tests (33%); 3h exam (67%).

DP Requirement: 35% Class mark; 80% attendance at both lectures and tutorials.

Introduction to Astronomy

MATH265 W1

Prerequisite Modules: PHYS110, 131 or 195; (MATH130 & 140) or MATH133 or (MATH195 & 196) or MATH197.

Aim: To provide a broad range of students with an introduction to astronomy, with an emphasis on extra-solar planetary systems, stars and cosmology.

Content: History of astronomy, basic astronomical concepts and observational astronomy. Properties, origin, and evolution of the solar system, the formation and detection of extra-solar planets, formation and evolution of the universe.

Practicals: Computer practicals will be carried out in a subset of the tutorial periods.

Assessment: Class mark (33%); 3h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Optimisation & Optimal Control Theory

MATH301 P2 W2

Prerequisite Modules: MATH 212 and 251.

Aim: To provide the student with a knowledge and understanding of the theory and tools of optimisation and their applications to optimal control.


Assessment: Class Tests (33%); 3 h exam (67%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Real Analysis

MATH310 P1 W1

Prerequisite Modules: MATH212, 251.

Aim: To introduce and develop in a mathematically rigorous manner, the Riemann integral, sequences and series of functions, and metric spaces.

Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Networks & Graph Theory

MATH322 PC

Prerequisite Requirement: 16 credits of Mathematics at Level 2.
Aim: To explore proof techniques and algorithms and to acquire problem solving skills in discrete mathematics.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Offered in either Semester 1 or 2.

Complex Analysis

MATH323 PC

Prerequisite Modules: MATH212.
Aim: This module discusses basic theories and techniques from Complex Analysis, including methods of solving classical problems relevant to Applied Sciences.
Content: Complex plane and Riemann sphere; elementary complex functions; complex differentiation; Cauchy-Riemann equations; contour integral and Cauchy Theorem for analytic functions; Cauchy Integral Formula; harmonic functions; Taylor's Theorem; Laurent Series; isolated singularities and residues; conformal mappings; linear fractional transformation; either Riemann surfaces of elementary functions or application to Laplace equations.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Offered in either Semester 1 or 2.

Numerical Methods

MATH324 P2

Prerequisite Modules: MATH212.
Aim: To give students a solid foundation in the theory and techniques of numerical methods and skills in solving mathematical problems numerically.
Assessment: Class Tests (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Numerical Analysis

MATH327 W2

Prerequisite Requirement: 32C of MATH at Level 2 including MATH212.
Aim: To provide students with a solid foundation in the theory and techniques of Numerical Analysis.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Offered in either Semester 1 or 2.

Operations Research Methods

MATH331 P1

Prerequisite Modules: MATH212.
Aim: To acquire knowledge of the theory behind optimisation algorithms and to acquire skills in solving optimisation problems.

Assessment: Tutorial & project work (10%), Class tests (30%); 3 h exam (60%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Advanced Differential Equations
MATH334 P1 W1
Prerequisite Modules: MATH212, 251.
Aim: To acquire knowledge of the underlying mathematical theory to solve advanced problems in differential equations.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Linear Algebra & Coding Theory
MATH338 W1
Prerequisite Modules: MATH212, 251.
Aim: To develop advanced techniques in linear algebra and introduce the student to the fundamentals of coding.
Content: Topics from Advanced Linear Algebra and an introduction to Coding Theory.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Algebraic Structures
MATH340 P2 W2
Prerequisite Modules: MATH212, 251.
Aim: To investigate properties of groups, rings, polynomial rings and fields which are fundamental to Modern Algebra.
Content: Binary operations, equivalence relations, elementary number theory, groups, subgroups, cyclic groups, normal subgroups, quotient groups, isomorphism theorems for groups, permutation groups, groups of small order. Rings, polynomial rings, ideals, prime and maximal ideals. Fields, field of fractions, finite fields, extension fields.
Assessment: Class Tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Graph Theory
MATH342 W2
Prerequisite Requirement: 32C of MATH at Level 2 including MATH212.
Aim: To explore techniques and algorithms in graph theory.
Content: Aspects of Graph Theory and its applications: Distance, connectivity, matchings, hamiltonicity, eulerian graphs, vertex and edge colourings, network flows.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Advanced Mechanics
MATH343 W2
Prerequisite Modules: MATH212, 251.
Aim: To consider the mathematical formulation of problems arising in mechanics.
Assessment: Class tests and/or assignments (33%); 3 h exam (67%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Tensor Analysis
MATH344 W2
(29L-20T-0P-0S-80H-26R-0F-0G-5A-13W-16C)

Prerequisite Modules: MATH212, 251.

Aim: To develop the basic theory of tensors and to study applications in physical theories.

Content: Basic tensor theory with applications to a selection of topics from special relativity, electromagnetic theory, mechanics and thermodynamics.

Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Introduction to Financial Mathematics
MATH346 W2
(29L-20T-0P-0S-80H-26R-0F-0G-5A-13W-16C)

Prerequisite Requirement: 32C of MATH at Level 2 including MATH212.

Aim: To develop the mathematics and techniques relevant to finance.


Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Topics in Analysis
MATH347 W2
(29L-20T-0P-0S-80H-26R-0F-0G-5A-13W-16C)

Prerequisite Requirement: 40% in MATH310.

Aim: To introduce the student to the theory of Hilbert spaces and basic Lebesgue integration.


Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Discrete Mathematics
MATH349 H2
(20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite Requirement: 40 % in MATH239.

Prerequisite Modules: MATH248.

Aim: To provide the students with a knowledge and understanding of discrete mathematics.

Content: Groups, semigroups, finite fields. Finite state machines, linear codes. Further graph theory, Boolean algebra with applications.

Assessment: Class tests and/or assignments (20%); 2 h exam (80%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

For Engineering students only.

Mathematics 3A (Eng)
MATH354 H1
(20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite Requirement: MATH238, 40% in MATH248.

Aim: To provide the student with essential tools of advanced applied mathematics.


Assessment: Class tests and/or assignments (20%); 2 h exam (80%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

For Engineering students only.

Methods of Applied Mathematics
MATH356 W1
(29L-20T-0P-0S-80H-26R-0F-0G-5A-13W-16C)
Prerequisite Modules: MATH212, 251.

Aim: This module discusses techniques and methods necessary for problem solving.


Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Numerical Methods
MATH360 H2

Prerequisite Requirement: 40% in MATH248.

Aim: To provide the student with a knowledge and understanding of basic approximate methods for solving mathematical problems in engineering.

Content: Interpolation, approximate integration, numerical solution to algebraic, ordinary and partial differential equations.

Assessment: Class tests and/or assignments (20%); 2 h exam (80%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Mathematical Methods in Astronomy
MATH365 W2

Prerequisite Modules: MATH334, 356. PHYS130, 140

Aim: To introduce students to mathematical methods used in astronomy, both theoretical and observational, that will allow students to solve modern problems in astronomy.


Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.

Classical Algebra
MATH701 WC

Aim: To develop basic aspects of the theory of classical algebra.

Content: Further group theory; Galois theory; ring theory.

Assessment: 3 h exam (100%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Cosmology
MATH703 WC

Aim: To acquire knowledge of the theory and techniques used in Cosmology.

Content: Robertson-Walker solution and Friedman models; inflation; gravitational waves.

Assessment: 3 h exam (100%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Differential Geometry
MATH704 WC

Aim: To develop basic aspects of the modern theory of Differential Geometry.

Content: Structure of manifolds; Lie algebras; symmetries and application to physics.

Assessment: 3 h exam (100%).
Syllabus

**DP Requirement:** 80% attendance. Offered in either Semester 1 or 2.

**Graph Theory 1**
MATH707 W1

Aim: To develop basic aspects of the modern Graph Theory.
Content: Digraphs, tournaments, Ramsey theory, graph matchings.
Assessment: 3 h exam (100%).

**Graph Theory 2**
MATH708 W2

Prerequisite Modules: MATH707.
Aim: To further develop Graph Theory.
Content: Distances, vulnerability, colouring and domination in graphs.
Assessment: 3 h exam (100%).

**Industrial Mathematics**
MATH709 WC

Aim: To study mathematical models applied to industry.
Content: Selected case studies from industrial practice involving precipitation of crystals, electron beam lithography, pollution spreading, photocopier machine and others. Modelling from first principles, theoretical analysis of models, basic numerical procedures.
Assessment: 3 h exam (100%).

**Set Theory & Logic**
MATH710 PC

Prerequisite Requirement: Any Level 3 Mathematics module.
Prerequisite Modules: MATH212.
Aim: This module provides mathematical treatment of the basic ideas and results from set theory and logic. It places emphasis on the axiomatic approach to set theory, the semantic and syntactic interaction in mathematical languages. It is suitable for students registered in Mathematics Honours programmes and those from Computer Sciences.
Assessment: Assignments (33%); 3 h exam (67%).

**Classical Mechanics**
MATH712 WC

Aim: To acquire knowledge of the theory and techniques used in Classical Mechanics.
Content: Calculus of variations; Lagrangian and Hamiltonian mechanics; canonical transformations and Hamilton-Jacobi theory; conservation laws; Lie algebras; Liouville's theorem and integrable systems; configurational invariants and almost complete integrability.
Assessment: 3 h exam (100%).

DP Requirement: 80% attendance. Offered in either Semester 1 or 2.
Number Theory
MATH713 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To develop basic aspects of Number Theory.
Content: Introduction to algebraic number theory, quadratic residues, quadratic and cyclotomic fields, factorization, geometric methods, applications.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Ordinary Differential Equations
MATH714 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To develop basic aspects of the modern theory of Ordinary Differential Equations.
Content: Historical introduction; symmetry; Lie symmetries; differential equations and symmetry; classification of equations; solution of equations; algebras of integrals; partial differential equations; systems of equations; generalized symmetries; Noether's theorem.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Partial Differential Equations
MATH716 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To acquire knowledge of the theory and techniques used in Partial Differential Equations.
Content: First order equations, classification and solutions of second order equations, Cauchy-Kovalevskaya theorem, systems of equations, shocks.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

General Relativity
MATH718 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To acquire knowledge of the theory and techniques used in General Relativity.
Content: Curvature and Einstein field equations; Schwarzschild solution and black holes.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Set Theory & Ordered Sets
MATH719 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To develop basic aspects of the Axiomatic Set Theory and related topics.
Content: Axiomatic set theory, ordinal and cardinal arithmetic, axiom of choice. Order, lattices, closure systems.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Topology
MATH721 PC WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To develop basic aspects of the theory of topology.
Content: An introduction to general topology: separation, countability, metrizability. A selection of topics from general and algebraic topology.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.
Foundations
MATH722 WC

Aim: To provide and develop the foundations of mathematics.
Content: Propositional and first order logic; completeness, compactness.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Universal Algebra
MATH723 WC

Aim: To provide and develop basic theory of Universal Algebra.
Content: Algebras, congruences, varieties and quasivarieties, congruence modularity and distributivity, axiomatization.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Cryptography
MATH724 WC

Aim: To develop basic aspects of the modern theory of Cryptography.
Content: Entropy, block ciphers, stream ciphers, public key systems, signature schemes, key management.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Coding Theory
MATH726 WC

Aim: To develop basic aspects of modern Coding Theory.
Content: Introduction to field theory and design theory. Linear, cyclic, Hamming, Hadamard, Golay and BCH codes.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Special Topics A
MATH727 PC WC

Aim: To acquire knowledge of and skills in a recent topic in Pure or Applied Mathematics.
Content: Topics in mathematics or applied mathematics, not included in the list of specified modules or additional aspects of the listed modules may be offered.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Applied Analysis
MATH728 WC

Aim: To introduce an up-to-date mathematical theory of the applications of abstract analysis.
Content: Basic topological and metric notions. Uniform convergence and interchangeability of limiting processes. Banach fixed point theorem with applications. Implicit and inverse function theorems.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Special Topics B
MATH729 PC WC
Aim: To acquire further knowledge of and skills in a recent topic in Pure or Applied Mathematics.

Content: Further topics in mathematics or applied mathematics, not included in the list of specified modules or additional aspects of the listed modules may be offered.

Assessment: 3 h exam (100%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Computability Theory
MATH730 PC
(27L-0T-0P-0S-103H-25R-0F-0G-5A-13W-16C)

Prerequisite Requirement: Any Level 3 Mathematics module. MATH710 is recommended.

Prerequisite Modules: MATH212.

Aim: To introduce an up-to-date mathematical theory of Computable Functions and Computability.


Assessment: Assignments (33%); 3 h exam (67%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Mathematical Biology
MATH731 PC WC
(29L-10T-0P-0S-97H-18R-0F-0G-6A-13W-16C)

Prerequisite Modules: MATH334.

Aim: To provide students with a first introduction to theoretical fluid mechanics and its applications.

Content: The continuum approach. Modelling of fluids; Eulerian and Lagrangian approaches. The material derivative and equations of motion of inviscid fluids Vorticity, circulation and irrotational flows. The complex potential, Kutta condition, lift and drag. Introduction to viscous fluid flows; Navier-Stokes equations.

Assessment: Tests and assignments (30%); 3 h exam (70%).

DP Requirement: 80% attendance, 40% coursework.

Offered in either Semester 1 or 2.

Fluid Dynamics
MATH732 PC WC
(29L-10T-0P-0S-97H-18R-0F-0G-6A-13W-16C)

Prerequisite Modules: MATH334.

Aim: To provide students with a first introduction to theoretical fluid mechanics and its applications.

Content: The continuum approach. Modelling of fluids; Eulerian and Lagrangian approaches. The material derivative and equations of motion of inviscid fluids Vorticity, circulation and irrotational flows. The complex potential, Kutta condition, lift and drag. Introduction to viscous fluid flows; Navier-Stokes equations.

Assessment: Tests and assignments (30%); 3 h exam (70%).

DP Requirement: 80% attendance, 40% coursework.

Offered in either Semester 1 or 2.

Applied Numerical Analysis
MATH733 PC
(29L-10T-0P-0S-97H-18R-0F-0G-6A-13W-16C)

Prerequisite Modules: MATH324.

Aim: To provide numerical techniques and analysis for methods applied in some practical problems.


Assessment: Tests and assignments (30%); 3 h exam (70%).

DP Requirement: 80% attendance, 40% coursework.

Offered in either Semester 1 or 2.
Analytic Methods in Partial Differential Eqns
MATH734 PC
Prerequisite Modules: MATH334.
Aim: To acquire knowledge of techniques used in partial differential equations and their applications.
Assessment: Tests and assignments (30%); 3 h exam (70%).
DP Requirement: 80% attendance, 40% Class mark.
Offered in either Semester 1 or Semester 2.

Further Graph Theory
MATH740 PC WC
Prerequisite Modules: MATH322 or 342.
Aim: To further develop Graph Theory.
Assessment: Assignments (33%); 3 h exam (67%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Financial Mathematics
MATH741 PC WC
Prerequisite Requirement: A degree in a mathematical science.
Prerequisite Modules: MATH212, 251.
Aim: To acquire knowledge of Markowitz mean variance portfolio theory and its implementation.
Assessment: 2 projects (50%); 3 h exam (50%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Algorithms & Complexity
MATH745 PC WC
Prerequisite Requirement: A degree in a mathematical science.
Prerequisite Modules: MATH212, 251.
Aim: Advanced understanding of and facility in the correctness and complexity of algorithms.
Assessment: Test & assignments (30%); 3 h exam (70%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Further Group Theory
MATH751 PC WC
Prerequisite Modules: MATH340.
Aim: To develop further the Theory of Groups.
Content: Permutation groups, simplicity of $A_n$, groups of small order, permutation representations, p-groups, Sylow theorems, normal series, solvable and nilpotent groups, finite direct products, basis theorem, fundamental theorem of finite abelian groups, general linear group, some simple groups.
Assessment: Assignments (33%); 3 h exam (67%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.
Recent Topics in Mathematics I
MATH753 PC WC  (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To acquire knowledge of and skills in a recent topic in Mathematics.
Content: Will vary according to the most recent developments in Mathematics.
Assessment: Project (30%); 3 h exam (70%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Applied Optimal Control Theory
MATH755 PC WC  (29L-10T-0P-0S-97H-18R-0F-0G-6A-13W-16C)
Aim: To provide an introduction to optimal control with an emphasis on applications.
Assessment: Tests and assignments (30%); 3 h exam (70%).
DP Requirement: 80% attendance, 40% Class mark.
Offered in either Semester 1 or 2.

Recent Topics in Mathematics II
MATH761 P2  (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To acquire knowledge of and skills in a recent topic in Mathematics.
Content: Will vary according to the most recent developments in Mathematics.
Assessment: Project (30%); 3 h exam (70%).
DP Requirement: 80% attendance.

Representation Theory
MATH762 PC WC  (27L-0T-0P-0S-108H-22R-0F-0G-3A-13W-16C)
Prerequisite Modules: MATH340.
Corequisite: MATH751.
Aim: To introduce and develop the theory of Group Representations.
Assessment: Assignments (33%); 3 h exam (67%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Further Ring Theory
MATH763 PC WC  (27L-0T-0P-0S-108H-22R-0F-0G-3A-13W-16C)
Prerequisite Modules: MATH340.
Corequisite: MATH771.
Aim: To develop further the theory of Rings and Modules.
Content: Ordered structures, one-sided and two-sided ideals, modules and submodules, Isomorphism Theorems, composition series and chain conditions, simple primitive and prime rings, the prime and Jacobson radicals, semisimple modules and the Wedderburn-Artin Theorem, artinian and noetherian rings, injective and projective modules, localization and rings of quotients.
Assessment: Assignments (33%); 3 h exam (67%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Advanced Optimisation
MATH765 PC WC  (29L-10T-0P-0S-97H-18R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Programming skills.
Prerequisite Modules: MATH331.
Corequisite: MATH324.
Aim: To acquire knowledge of advanced techniques in Optimisation.
Content: Advanced topics in linear programming, mixed integer programming and nonlinear programming.
Assessment: Tests and assignments (30%); 3 h exam (70%).
DP Requirement: 80% attendance, 40% Class mark.
Offered in either Semester 1 or 2.

Rings & Fields
MATH771 PC WC (27L-0T-0P-0S-108H-22R-0F-0G-3A-13W-16C)
Prerequisite Modules: MATH340.
Aim: To develop basic aspects of the theory of rings, fields and other algebraic structures.
Content: Topics will be chosen from: Ideals, localization, polynomial rings, basic module theory, field extensions and Galois theory.
Assessment: Assignments (33%); 3 h exam (67%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Topics in Topology
MATH777 W2 (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Prerequisite Modules: MATH721.
Aim: To develop further topics in Topology.
Content: Depending on interest, topics will be chosen from advanced general topology, theory of locales or algebraic topology.
Assessment: Tests (33%); 3 h exam (67%).
DP Requirement: 80% attendance.

Numerical Analysis I
MATH778 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To acquire knowledge of the theory and techniques used in basic Numerical Analysis.
Content: Review of functional analysis, the matrix eigenvalue problem, the linear inverse problem, advanced methods on numerical solutions of differential equations.
Assessment: Tests (33%); 3 h exam (67%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Measure and Integration I
MATH783 PC WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Aim: To develop basic aspects of the modern theory of Measure and Integration.
Content: Lebesgue measure, Lebesgue integral, convergence theorems, Lebesgue's differentiation theorem.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Measure and Integration II
MATH784 P2 W2 (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Prerequisite Modules: MATH783.
Aim: To further develop the modern theory of Measure and Integration.
Content: Abstract measure spaces, Lp spaces, convergence, the Radon-Nikodym theorem, Fubini's theorem, other special topics.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in Semester 2 provided MATH783 has been offered in Semester 1.
Functional Analysis I
MATH785 PC WC  
Aim: To develop basic aspects of the modern theory of Functional Analysis.
Content: Normed spaces and Banach spaces, linear operators, Hilbert spaces, fundamental theorems for normed and Banach spaces.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Functional Analysis II
MATH786 W2  
Prerequisite Modules: MATH785.
Aim: To further develop the concepts of Functional Analysis.
Content: Compact linear operators, Banach algebras, spectral theory for bounded self-adjoint operators, other special topics.
Assessment: 3 h exam (100%)
DP Requirement: 80% attendance.
Offered in Semester 2 provided MATH785 has been offered in Semester 1.

Numerical Analysis II
MATH792 W2  
Prerequisite Modules: MATH778.
Aim: To develop further topics in Numerical Analysis.
Content: The non-linear inverse problem, approximation theory, other topics.
Assessment: 3 h exam (100%)
DP Requirement: 80% attendance.
Offered in Semester 2 provided MATH778 has been offered in Semester 1.

Optimisation I
MATH793 WC  
Aim: To acquire knowledge of the theory and techniques used in basic Optimization.
Content: A selection of topics in linear and non-linear optimisation.
Assessment: 3 h exam (100%)
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Optimisation II
MATH794 W2  
Prerequisite Modules: MATH793.
Aim: To develop further topics in Optimization.
Content: A selection of advanced topics in linear and non-linear optimisation.
Assessment: 3 h exam (100%)
DP Requirement: 80% attendance.

Financial Mathematics I
MATH795 WC  
Aim: To acquire basic knowledge of the theory and techniques used in Financial Mathematics.
Content: Introduction to forward, futures, and options. Modelling of stock prices, Ito's lemma, the Black-Scholes equation and pricing derivatives.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.
Financial Mathematics II
MATH796 W2  
(29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)
Preliminary Modules: MATH795.
Aim: To acquire further knowledge of the theory and techniques used in Financial Mathematics.
Content: Review of stochastic calculus, further option theory, Interest rates derivatives.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in Semester 2 provided MATH795 has been offered in Semester 1.

Honours Project in Applied Mathematics
MATH798 P2 W2  
(0L-20T-0P-4S-296H-0R-0F-0G-0A-13W-32C)
Aim: To acquire experience and skills in the problem-solving process from problem formulation through to policy formulation.
Content: Some aspect of applied mathematics is considered under the guidance of a "supervisor", a report is written and an oral presentation given, both of which are graded. It could be a survey, a synthesis or an application of a known method to a new problem. Original research is not expected but the appropriate research methodology is demanded.
Assessment: Report (80%), Oral presentation (20%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Honours Project in Mathematics
MATH799 P2 W2  
(0L-20T-0P-4S-296H-0R-0F-0G-0A-13W-32C)
Aim: To gain an ability to read and understand modern mathematical texts; to study in depth a topic in Mathematics.
Content: Some aspect of mathematics is considered under the guidance of a "supervisor", a report is written and an oral presentation given, both of which are graded. It could be a survey, a synthesis or an application of a known method to a new problem. Original research is not expected but the appropriate research methodology is demanded.
Assessment: Report (80%), Oral presentation (20%).
DP Requirement: Not applicable.
This module has no supplementary exam.

Combinatorics
MATH811 WC  
(26L-26T-0P-26S-60H-16R-0F-0G-6A-13W-16C)
Aim: To provide students with knowledge of modern combinatorics at a level allowing them to read advanced research papers and undertake their own research.
Assessment: Continuous assessment (100%), including up to two tests (50%) and assignments (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.

Topology
MATH812 WC  
(26L-26T-0P-26S-60H-16R-0F-0G-6A-13W-16C)
Aim: To provide students with knowledge of modern topology at a level allowing them to read advanced research papers and undertake their own research.
Assessment: Continuous assessment (100%), including up to two tests (50%) and assignments (50%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.
Group Theory  
MATH813 WC  
Aim: To provide students with knowledge of modern group theory at a level allowing them to read advanced research papers and undertake their own research.  
Content: Revision. Group actions: orbits, stabilisers, permutation groups, permutation representation. Applications of group actions. Group products. Further topics including free groups, composition series and composition factors, commutators, soluble groups, Hall's Theorem, Nilpotent groups, Frattini subgroups.  
Assessment: Continuous assessment (100%), including up to two tests (50%) and assignments (50%).  
DP Requirement: Not applicable.  
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.

Advanced Analysis  
MATH814 WC  
Aim: To provide students with knowledge of modern analysis at a level allowing them to read advanced research papers and undertake their own research.  
Content: Review, interchangeability of limits. A choice of Banach and Hilbert space techniques. (e.g. Baire’s category arguments, Ascoli-Arzela theorem, etc). Calculus in Banach spaces. Topics from complex analysis: harmonic functions, maximum modulus principle, analytic continuation.  
Assessment: Continuous assessment (100%), including up to two tests (50%) and assignments (50%).  
DP Requirement: Not applicable.  
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.

Recent Topics in Discrete Mathematics  
MATH815 WC  
Prerequisite Modules: MATH811, MATH812, MATH813, MATH814.  
Aim: To develop basic research skills in Discrete Mathematics by offering students opportunities to formulate research questions, perform critical literature search, obtain own research results and present them at a critical discussion forum.  
Content: Selected topics in discrete mathematics.  
Assessment: Continuous assessment of the presentation of the research topic (100%).  
DP Requirement: Not applicable.  
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.

Recent Topics in Analysis  
MATH816 WC  
Prerequisite Modules: MATH811, MATH812, MATH813, MATH814.  
Aim: To develop basic research skills in Analysis by offering students opportunities to formulate research questions, perform critical literature search, obtain own research results and present them at a critical discussion forum.  
Content: Selected topics in analysis.  
Assessment: Continuous assessment of the presentation of the research topic (100%).  
DP Requirement: Not applicable.  
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.

Recent Topics in Algebra & Foundations  
MATH817 WC  
Prerequisite Modules: MATH811, MATH812, MATH813, MATH814.  
Aim: To develop basic research skills in Algebra and the foundations of mathematics by offering students opportunities to formulate research questions, perform critical literature search, obtain own research results and present them at a critical discussion forum.  
Content: Selected topics in algebra.  
Assessment: Continuous assessment of the presentation of the research topic (100%).  
DP Requirement: Not applicable.  
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.
Recent Topics in Topology
MATH818 WC
(13L-0T-0P-52S-79H-16R-0F-0G-0A-13W-16C)
Prerequisite Modules: MATH811, MATH812, MATH813, MATH814.
Aim: To develop basic research skills in Topology by offering students opportunities to formulate research questions, perform critical literature search, obtain own research results and present them at a critical discussion forum.
Content: Selected topics in topology.
Assessment: Continuous assessment of the presentation of the research topic (100%).
DP Requirement: Not applicable.
Offered in either Semester 1 or Semester 2. This module has no supplementary examination.

Mathematics Dissertation
MATH819 WY
(0L-0T-0P-36S-900H-20R-0F-0G-4A-48W-96C)
Prerequisite Modules: MATH811, MATH812, MATH813, MATH814, and two of (MATH815, MATH816, MATH817, MATH818).
Aim: To give students experience in developing and executing an independent research project in mathematics.
Content: Selection of broad research topic. Literature search. Specifying detailed research questions. Independent research work and presentation of partial results at research work groups, writing dissertation.
Assessment: External examination and oral presentation of the dissertation (100%).
DP Requirement: Not applicable.
Year-long module. This module has no supplementary examination.

Mechanical Engineering
Offered in the School of Engineering

Engineering Drawing
ENME1DR H1 P1
(9L-30T-0P-0S-20H-12R-0F-0G-9A-13W-8C)
Aim: To provide basic information and skills to be able to read and understand drawings as a language for engineering communication and explain the fundamental principles of projection and drawing practice.
Assessment: Drawings: tutorials and tests (12.5%); CAD: tutorials and test (37.5%); 2 h exam (50%).
DP Requirement: Attendance at all tests, 50% for the CAD component.

Mechanical Engineering Design
ENME1ED H2
(20L-35T-3P-0S-1H-12R-0F-0G-8A-13W-8C)
Aim: To be able to configure an appropriate design process and select appropriate materials and manufacturing processes.
Practicals: Construction of a working micro steam car. Industrial visits.
Assessment: Assignment, tutorials and steam car competition (12%), tests (18%); 2 h exam (70%).
DP Requirement: Attendance at all tests, a minimum of 50% for the CAD component, a working model of a steam car, attendance at four industrial visits

Introduction to Engineering Materials
ENME1EM H2
(20L-10T-0P-0S-25H-21R-0F-0G-4A-13W-8C)
Aim: The candidates will acquire a basic understanding of materials, their structure and its influence on the physical and mechanical properties.
Content: Introduction to materials, structure of materials, crystal imperfections, mechanical behaviour of materials, alloys and properties of alloys, equilibrium phase diagrams.
Assessment: Tests, assignments/tutorials (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

Computer Fundamentals
ENME2CF H1  (20L-30T-0P-0S-15H-12R-0F-0G-3A-13W-8C)
Aim: To provide students with an understanding of computer architecture and hardware. To acquire fluency with a variety of software packages. To gain expertise in computer programming and computational methods and the skill to apply these to specific engineering examples, as well as an ability to operate communication software packages.
Content: Introduction to computers, introduction to computer arithmetic, computer languages, programming, debugging, computational methods, specific professional software packages and communication software packages.
Assessment: Tutorials, test (30%); 2 h exam (70%). The exam consists of a theoretical and programming section. A sub minimum of 40% is required for each section.
DP Requirement: Students are required to attend all tests and to complete all tutorials satisfactorily, as specified in the module outline.

Design Methods
ENME2DM H2  (30L-30T-0P-0S-56H-36R-0F-0G-8A-13W-16C)
Prerequisite Modules: ENME1DR, ENME1ED.
Aim: To design components commonly found in Mechanical Engineering applications such as permanent and detachable fasteners, power screws, springs, flexible power transmission components, gears, and shafts.
Assessment: Tests and assignments (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

Dynamics
ENME2DY H1  (20L-20T-6P-0S-15H-14R-0F-0G-5A-13W-8C)
Prerequisite Modules: MATH142
Aim: To develop in the student the ability to analyze problems in the area of engineering dynamics in a logical and deductive manner.
Practicals: Problem solving using MATLAB
Assessment: Tests, assignments/tutorials (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all tests and to complete all assignments/tutorials satisfactorily, as specified in the module outline.

Fluid Mechanics I
ENME2FM H1  (20L-10T-6P-22H-18R-0F-0G-4A-13W-8C)
Prerequisite Modules: MATH142.
Aim: An introductory course designed to establish an understanding of basic fluid dynamics concepts, an ability to apply the basic laws in analysing simple engineering fluid flow problems and to provide a foundation for studying advanced fluid dynamics topics.
Content: Fluid as a continuum, fluid properties, dimensions and units. Fluid statics, buoyancy and flotation. Continuity, the momentum equation: impact of a jet, reaction at a nozzle, forces at pipe bends, momentum theory of a propeller, the angular momentum equation. The energy equation, Bernoulli's equation with and without friction. Flow
measurement, flow visualisation. Dimensional analysis and similarity.

Assessment: Tests; practicals (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all class tests and to complete all practicals satisfactorily, as specified in the module outline.

Measurements & Experimental Methods
ENME2MM H2
Aim: To provide students with an understanding of the concepts of measurements of engineering parameters, dimensional analysis, error calculations, SI units, accuracy, devices and to give them the skill to apply this to resolve instrumentation problems.
Content: Measurement of experimental parameters, measurement techniques and devices, accuracy and uncertainty, SI units, error calculations and dimensional analysis.
Practicals: 8 practicals related to measurement systems.
Assessment: Practical, test (45%); 2 h exam (55%).
DP Requirement: Students are required to attend the class test and to complete all practicals satisfactorily, as specified in the module outline.

Materials Strength
ENME2MS H1
Prerequisite Modules: MATH142.
Aim: To provide students with an understanding of the mechanics of materials and tools to solve simple design problems in the behaviour of structural components.
Content: Basic concepts of elasticity, stress and strain. Compound bars, thin pressure vessels, compound tubes. Shear force diagrams, bending moment diagrams and bending stresses in beams. Torsion of shafts. Close-coiled helical springs.
Assessment: Tests (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all tests.

Fundamentals of Physical Metallurgy
ENME2PM H1
Prerequisite Modules: ENME1EM.
Aim: To provide students with basic information and understanding of the kinetics of phase changes in metals, and heat treatments of ferrous and non-ferrous alloys and their influence on the properties of the material.
Content: Nucleation, solidification & growth, diffusion, iron-carbon phase diagram, hardening and tempering, surface treatment, dispersion and precipitation hardening, recovery and recrystallization.
Assessment: Tests, assignment/tutorial (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all tests.

Strength of Materials 1
ENME2SM H2
Prerequisite Modules: ENME1ED & MATH142.
Aim: To provide students with basic know-how regarding the behaviour of selected structure groups under various types of loading.
Content: Techniques for solving for stresses and deflections of torsional shafts, bending and buckling in beams, trusses, frames, and machines. Shear stresses and strains, temperature effects on components, complex loading, as well as tools for dealing with statically determinate structures, also form part of the syllabus.
Assessment: Tests, assignment with formal report (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all tests and to complete the assignment satisfactorily, as specified in the module outline.

Thermofluids
ENME2TF H1
Prerequisite Modules: ENME1ED & MATH142.
Aim: To provide students with basic information and understanding of the kinetics of phase changes in metals, and heat treatments of ferrous and non-ferrous alloys and their influence on the properties of the material.
Content: Nucleation, solidification & growth, diffusion, iron-carbon phase diagram, hardening and tempering, surface treatment, dispersion and precipitation hardening, recovery and recrystallization.
Assessment: Tests, assignment/tutorial (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all tests.

Thermofluids
ENME2TF H1
Prerequisite Modules: ENME1ED & MATH142.
Aim: To provide students with basic information and understanding of the kinetics of phase changes in metals, and heat treatments of ferrous and non-ferrous alloys and their influence on the properties of the material.
Content: Nucleation, solidification & growth, diffusion, iron-carbon phase diagram, hardening and tempering, surface treatment, dispersion and precipitation hardening, recovery and recrystallization.
Assessment: Tests, assignment/tutorial (30%); 2 h exam (70%).
DP Requirement: Students are required to attend all tests.
Aim: To provide students with foundational principles in thermodynamics and fluid mechanics.


Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests.

Thermodynamics 1
ENME2TH H1
(20L-10T-0P-0S-25H-20R-0F-0G-5A-13W-8C)

Aim: An understanding of the fundamental properties of gases and condensable vapours needed for thermodynamic analysis. To be able to apply the conservation of energy and mass in closed and open systems which involve work transfer, expansion, compression processes, heating, cooling and velocity changes.

Content: Fundamental concepts such as the system, thermodynamic properties, work and heat transfer. The 1st law of thermodynamics (conservation of energy) for closed and open systems. Gas laws, adiabatic processes for gases. The 2nd law of Thermodynamics, basic heat engine performance, entropy. Thermodynamic processes: isochoric, isobaric, isothermal. Steam tables and charts.

Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests.

Workshop Training
ENME2WS H2
(0L-0T-0P-0S-0H-0R-0F-0G-0A-2W-0C)

Aim: Candidates to acquire an appreciation and basic skills in common fabrication techniques, and familiarize themselves with the structure and function of common mechanical engineering and machine shop equipment items.

Content: Practical workshop instruction and experience includes methods of measurement, jointing & welding, material forming, heat treatment, precision drilling, shaping, turning, etc., with fitting (assembly/disassembly). The use of common hand tools, lathes, and drilling & milling equipment will be covered.

Assessment: Students must earn a duly performed certificate.

DP Requirement: Satisfactory completion of training.

Design of Machine Elements
ENME3DM H1
(30L-30T-0P-0S-58H-34R-0F-0G-8A-13W-16C)

Prerequisite Modules: ENME2DM, ENME2SM

Aim: To acquire expertise in safety and reliability for the design of engineering components and systems as well as knowledge of impact forces and effects as well as fracture and fatigue.


Assessment: Tests, design project assignment and report (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tests and to complete the assignment satisfactorily, as specified in the module outline.

Fluid Mechanics II
ENME3FM H2
(40L-10T-9P-0S-60H-36R-0F-0G-5A-13W-16C)

Prerequisite Modules: ENME2FM.

Aim: To learn fluid mechanics concepts for flows that the engineer will encounter in industry and the ability to apply these concepts to engineering type flow problems and fluid flow design problems.

problems.

Assessment: Tests, practicals (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tests and to complete the laboratory practicals satisfactorily, as specified in the module outline.

Heat & Mass Transfer 1
ENME3HM H2

Aim: To assess the magnitude of heat transfer by conduction, convection and radiation and in mixed environments. To determine the performance of devices that rely on heat and mass transfer.


Assessment: Tests (30%); 3 h exam (70%).

DP Requirement: Students are required to attend all tests and to complete the laboratory practicals satisfactorily, as specified in the module outline.

Manufacturing Technology
ENME3MT H2

Aim: To learn engineering principles of manufacturing processes and machine tools: manufacturing, economics and optimisation problems.


Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all class tests.

Selection of Engineering Materials
ENME3SM H2

Prerequisite Modules: ENME2PM.

Aim: To learn about engineering materials & applications in order to correctly select materials for a given design.

Content: Introduction to corrosion, non-destructive testing, fracture mechanics, carbon and alloy steels, cast irons, stainless steels, tool steels, aluminium alloys, copper alloys, nickel and cobalt alloys, magnesium and zinc alloys, ceramics, composites, engineering plastics, wear, advanced surface treatments, metallurgy of welding. Selection methodologies.

Practicals: Metallography - preparation of samples and observation of microstructures of metals, mechanical properties of materials, heat treatments of ferrous and non ferrous alloys, and the metallurgy of welding.

Assessment: Tests, assignment/tutorial, practical reports (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all class tests.

Strength of Materials 2
ENME3ST H1

Prerequisite Modules: ENME2SM.

Aim: To perform analysis for continuous beams, plates, shells, thick cylinders and disks, including the use of numerical and energy methods for stress-strain problems.

Content: Stresses and strains of inclined planes. Principal stresses and strains, Mohr’s circle, constitutive equations, plane stress and plain strain. Energy methods, theories of failure. Analysis of thick disks, and pressure vessels.
Elementary plasticity, including methods of plastic analysis of beams, cylinders, rotating disks, and limit design. Method of forces and method of displacements applied to statically indeterminate frames.

**Assessment:** Tests (30%); 3 h exam: (70%).

**DP Requirement:** Students are required to attend all laboratory practicals and tests, and to complete the laboratory reports satisfactorily, as specified in the module outline.

**Thermodynamics 2**
ENME3TH H2 (20L-10T-9P-0S-20H-16R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENME2TH.

**Aim:** To apply basic thermodynamics to the operation and behaviour of real machinery such as gas compressors, piston engines, gas turbines, jet engines, refrigeration plant and steam power plant.

**Content:** Vapour power cycles. Piston engine cycles, Otto & diesel cycles. Gas turbines, jet engines, refrigeration cycles and steam plant.

**Assessment:** Test (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests and to complete the practicals satisfactorily, as specified in the module outline.

**Theory of Machines**
ENME3TM H2 (20L-10T-3P-0S-26H-16R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENME2DY.

**Aim:** To provide the student with an insight into the theory of multibody mechanical systems and into the modern computer-aided techniques applied in the analysis and synthesis of moving assemblies.


**Assessment:** Tests, assignments (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

**Advanced Manufacturing Systems**
ENME4AM H1 (20L-5T-8P-0S-28H-15R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENME3MT.

**Aim:** To equip students to function effectively as manufacturing engineers in the context of the modern manufacturing environment.

**Content:** Fundamental concepts and models for manufacturing, basic manufacturing engineering, process engineering, numerically controlled (NC) systems and NC part programming, CNC and adaptive control techniques, group technology, automation concepts and strategies, CAD/CAM and computer integrated manufacturing (CIM), flexible manufacturing systems (FMS), modern trends in advanced manufacturing systems, factories of the future.

**Assessment:** Tests, practical reports (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests and to complete all practicals satisfactorily, as specified in the module outline.

**Subminimum Requirements:** The exam must be passed as part of meeting ECSA ELO2 (application of scientific engineering knowledge). The practicals must be passed as part of meeting ECSA ELO4 (investigations, experiments and data analysis).

**Engineering Computational Methods**
ENME4CM H1 (10L-20T-0P-0S-22H-15R-0F-0G-13A-13W-8C)

**Prerequisite Modules:** ENME3ST, ENME3FM.

**Aim:** To provide the students with an ability to analyse, design and synthesize complex engineering systems using computational techniques.

**Content:** An introduction to finite element method, including analysis of plane trusses and frames and the solution of continuum mechanics problems. Analysis of fluid mechanics and heat transfer problems with finite elements. An
introduction to commercial FEM software. The application of these packages for the analysis and solution of problems in solid mechanics, fluid mechanics and heat transfer.

**Assessment:** Assignments (50%), tests (20%); 2 h exam (30%).

**DP Requirement:** Students are required to attend all tests and pass all assignments.

**Subminimum Requirements:** The exam must be passed as part of meeting ECSA ELO5 (engineering methods, skills and tools, including information technology). The assignment must be passed as part of meeting ECSA ELO9 (independent learning ability).

### Design & Analysis of Manufacturing Processes

ENME4DM H1

(20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

**Corequisite:** ENME4AM.

**Aim:** The design and analysis of manufacturing processes and design problems related to the manufacturing processes, structures and systems.


**Assessment:** Tests (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests.

### Design & Research Project 2

ENME4DP H2

(9L-0T-0P-26S-198H-0R-0F-0G-7A-13W-24C)

**Prerequisite Modules:** ENME4PD.

**Aim:** To understand the design process and apply this in real engineering situations. Experience in: teamwork, specification development, concept generation and selection, analysis and synthesis, data collection and interpretation, written and verbal communication.

**Content:** Each team is presented with a general project definition and is required to perform the following tasks: Customer Specifications and Quality Function Deployment charts (QFD) Concept Generation and Selection techniques. Design and prototype manufacture. Design validation and testing. Formal oral presentations. Poster presentations. Technical report writing. Peer and self review techniques. Project management. Professional practice.

**Assessment:** Multidisciplinary assignment, oral presentation; Open Day presentation; professional practice assignment: final report. Classmark: oral/Open Day presentations (20%). Professional practice assignment (10%), supervisor's mark (10%); Final report (60%).

**DP Requirement:** The student must pass the professional practice assignment and the oral presentation.

**Subminimum Requirements:** Students must pass all ECSA Exit Level Outcome subsections in the final report to meet ECSA ELO3 (engineering design), ECSA ELO4 (investigations, experiments and data analysis), ECSA ELO6 (professional and technical communication), ECSA ELO8 (individual, team & multidisciplinary working) and, ECSA ELO9 (independent learning). The assignment on engineering professionalism must be passed as part of meeting ECSA ELO10 (engineering professionalism). The oral presentation must be passed as part of meeting ECSA ELO6 (professional and technical communication). The multidisciplinary task must be passed to meet ECSA ELO8 (individual, team & multidisciplinary working).

### Mechanical Engineering Design

ENME4ED H2

(20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENME3ST.

**Aim:** To enable the students to undertake advanced design work and to perform design optimization involving materials and geometry of common engineering structures.

**Content:** Techniques of optimisation, optimal design formulation, application to mechanical component design, material selection charts, performance indices, optimum material design, case studies.

**Assessment:** Tests, assignment (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests.
Energy Management
ENME4EM H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

**Aim:** To enable students to manage large scale energy systems.

**Content:** Energy resources. Energy production distribution. Renewable and non-renewable energy. New processes, process change, new methods. Energy conservation approaches, energy conservation through process integration. Case studies in the food, petrochemical, power, and metallurgical industries.

**Assessment:** Tests (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests.

Alternative Energy Systems
ENME4ES H1 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENME3FM.

**Aim:** To enable students to choose among different energy systems and design energy producing systems.

**Content:** Introduction. Types of conventional and alternative energy sources - renewable and non-renewable sources. Fundamentals of energy conversion processes (energy conversion laws and principles, energy conversion equations, conservation of energy, mechanical, electrical, chemical and thermal energy). Principles of application. Conversion systems: solar thermal energy, solar photovoltaic, geothermal energy, wind energy, biomass/biogas, ocean thermal energy, tidal energy, nuclear energy, magneto-hydrodynamics (MHD), fuel cells, hydro energy, fuel energy (coal, petroleum, natural gas, etc.). Conventional and alternative energy systems design, analysis and performance.

**Assessment:** Tests (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests.

Fracture & Fatigue of Engineering Materials
ENME4FF H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

**Prerequisite Modules:** ENME3DM.

**Aim:** To provide the students with an understanding of fracture and fatigue design techniques, to enable them to analyse fracture and fatigue failures.

**Content:** The role of failure prevention analysis in design. Modes of mechanical failure. Concept of cumulative damage, life prediction and fracture control. Use of statistics in fatigue analysis. High and low-cycle fatigue. Fretting fatigue and fretting wear. Laboratory demonstration of fracture and fatigue failures.

**Assessment:** Tests, tutorials, assignment (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests, tutorials, lab demonstrations and to complete all assignments satisfactorily, as specified in the module outline.

Design of Fluid Power Systems
ENME4FP H1 (20L-10T-0P-0S-30H-15R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** ENME3FM.

**Aim:** To an understanding of the operation of equipment used in fluid power systems and to develop the ability to design such systems.

**Content:** Design and operation of centrifugal and axial flow pumps: Impeller blade and guide vane geometry, velocity triangles, dynamic and Euler heads. Efficiencies and net positive suction head. Pumps in systems: Series and parallel operation, application of commercial pump curves, similarity of rotodynamic machines. Design and operation of impulse and reaction turbines: Pelton, Kaplan and Francis turbines, velocity triangles, power losses and efficiencies. Design and operation of double- and single-acting positive displacement pumps, pressure indicator diagrams, separation and air vessels.

**Assessment:** Two tests, an assignment (30%); 2h exam (70%).

**DP Requirement:** Students are required to attend all class tests and to complete the assignment satisfactorily, as specified in the module outline.

**Subminimum Requirements:** The exam must be passed as part of meeting ECSA ELO1 (problem solving). The assignment must be passed as part of meeting ECSA ELO3 (engineering design).

Mechanics of Composite Materials
ENME4MC H1 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)
Prerequisite Modules: ENME3ST.

Aim: To enable the students to undertake design and analysis work involving composite components.

Content: Micromechanics of fibre reinforced composites, stress/strain analysis of orthotropic materials and laminated composites, failure analysis of laminated composites, design with composites.

Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests.

Selected Topics in Mechanical Engineering 1
ENME4ME H1 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Aim: Candidates will demonstrate: an ability to understand a topic of engineering importance and to be able to apply it in theory or in practice; a broader perspective of engineering activities which may facilitate progression into postgraduate studies in this field.

Content: Lectures and seminars involving elements of experimentation, computing, analysis and design in traditional areas of Mechanical Engineering such as thermodynamics, fluid mechanics, manufacturing and solid mechanics.

Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests.

Selected Topics in Mechanical Engineering 2
ENME4MN H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Aim: Candidates will demonstrate: An ability to understand a topic of engineering importance and to be able to apply it in theory or in practice; a broader perspective of engineering activities which may facilitate progression into postgraduate studies in this field.

Content: Lectures and seminars involving elements of experimentation, computing, analysis and design in traditional areas of Mechanical Engineering such as thermodynamics, fluid mechanics, manufacturing and solid mechanics.

Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests.

Mechatronic Engineering
ENME4MT H2 (20L-10T-0P-0S-27H-20R-0F-0G-3A-13W-8C)

Prerequisite Modules: ENME3MT.

Corequisite: ENEL3CS.

Aim: To provide students with an understanding of the ability to apply and integrate mechanical and electrical components or devices to control processes or machines to achieve control engineering objectives.


Assessment: Tests, assignment (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests and pass the assignment.

Subminimum Requirements: The exam must be passed as part of meeting ECSA ELO2 (application of scientific and engineering knowledge). The assignment must be passed as part of meeting ECSA ELO5 (engineering methods, skills and tools, including information technology).

Mechanical Vibrations
ENME4MV H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Prerequisite Modules: ENME2DY.

Aim: To provide the student with the ability to analyze and to solve a broad spectrum of vibration problems found in mechanical engineering practice.

Content: Vibrations of undamped and damped systems, response under rotating unbalance, response under moving support, vibration isolation, vibration measurements and signal analysis. The Eigenvalue problem and the eigenvectors. Modal analysis of conservative systems.

Assessment: Tests, assignment (30%); 2 h exam (70%).

DP Requirement: Students are required to attend all tests and pass the assignment.

Subminimum Requirements: The exam must be passed as part of meeting ECSA ELO1 (problem solving).
### Design & Research Project 1
ENME4PD H1

**Prerequisite Requirement:** Student must be in a position to complete the degree within 3 semesters.

**Prerequisite Modules:** ENME2WS, ENME3DM

**Aim:** To develop the ability of students to work in a team which can take a broad statement of a problem, convert it into engineering terms, and produce an acceptable product which solves the problem. Skills in writing complex technical reports and oral presentations, as well as the ability to produce working prototypes will be developed.

**Content:** Teams and their dynamics, project management and planning, quality function deployment, concept selection, failure mode analysis, design validation.

**Assessment:** Multidisciplinary assignment, mid-term and final report. Mid-term report (10%), supervisor's mark (20%), final report (70%).

**DP Requirement:** The student must pass the multidisciplinary assignment and the mid-term report.

**Subminimum Requirements:** Students must pass all ECSA Exit Level Outcome subsections in the final report assessment to meet ECSA ELO3 (engineering design), ECSA ELO6 (professional and technical communication), ECSA ELO8 (individual, team and multidisciplinary working) and, ECSA ELO9 (independent learning). The multidisciplinary task must be passed to meet ECSA ELO8 (individual, team and multidisciplinary working).

### Thermodynamics 3
ENME4TD H1

**Prerequisite Modules:** ENME3TH.

**Aim:** To introduce students to the methods of analysis of mixtures of gases and condensable vapours, combustion processes, the high speed flow through nozzles and diffusers and their application to the thermodynamics of turbines and compressors.

**Content:** Mixtures of perfect gases and condensable vapours, specific and relative humidity, the psychrometric chart, evaporative cooling towers. High speed flows, total temperature and enthalpy, Mach number, convergent/divergent ducts, normal shock waves. Energy exchanges and pressure changes in axial impulse and reaction turbines, axial compressor blading and the boundary layer limitation on stage pressure rise.

**Assessment:** Tests, assignments (30%); 2 h exam (70%).

**DP Requirement:** Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

### Vacation Work
ENME4VW H2

**Aim:** An appreciation of a realistic working environment, enabling candidates to consider their studies in context.

**Content:** This is a Duly Performed requirement for the BScEng (Mechanical) degree. Vacation work is to be arranged and undertaken by students during the course of the degree in fields relevant to mechanical engineering. A total of 12 weeks must be accumulated. A report on the work conducted is to be submitted to the department within six weeks of the conclusion of each vacation work period, together with a certificate of progress from the firm concerned, in which the actual period is also stated.

**Assessment:** Reports acceptable in terms of scientific method, synthesis, computer use and presentation.

**DP Requirement:** Satisfactory completion of vacation work reports.

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**Microbiology**

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Microbiology**
MICR182 W2

**Prerequisite Modules:** CHEM110, BIOL101.

**Corequisite:** CHEM120.

**Aim:** To provide an overview of the basic concepts of microbiology and the role of microbes in ocular disease.


Assessment: Theory test (50%); 2 h exam (50%).

DP Requirement: 40% Class mark, 80% attendance at practicals.

Bacteriology
MICR213 P1 W1
(36L-6T-36P-0S-53H-24R-0F-0G-5A-13W-16C)

Prerequisite Modules: CHEM110; BIMI120 or BIOL101.

Aim: To provide a strong foundation in the field of bacteriology.


Practicals: Handling bacteria; aseptic technique; cultural practices; staining procedures; microscopy.

Assessment: Theory tests (10%), assignments and practical tests (10%), laboratory and practical reports (20%); 3 h exam (60%).

DP Requirement: 40% Class mark, 80% attendance at practicals.

Introductory Food Microbiology
MICR214 P2
(18L-6T-18P-0S-22H-12R-0F-0G-4A-13W-8C)

Prerequisite Modules: BIOL101 or BIMI120, CHEM110.

Aim: To provide concepts and applications in food microbiology.

Content: The morphology, physiology and classification of microorganisms. Aspects of food, dairy and water microbiology including food safety and preservation as well as aspects of production hygiene and disinfection. Use of microorganisms in the production of selected fermented food and dairy products and their nutritional enhancement. Methods of preventing food spoilage and food poisoning as well as principles of food safety. Selected topics in food orientated industrial microbiology applications.

Practicals: Laboratory exercises in selected topics.

Assessment: Tests and assignments (20%), prac reports (20%); 2h exam (60%).

DP Requirement: 40% Class mark, 80% attendance at practicals.

Introduction to Fungi and Viruses
MICR215 W2
(36L-6T-36P-0S-53H-24R-0F-0G-5A-13W-16C)

Prerequisite Modules: MICR213.

Aim: To introduce the fundamental aspects of fungi and viruses (classification, structure, defining characteristics, lifecycles).


Practicals: Microscopy. Isolation, purification and identification of fungal cultures. An introduction to the techniques used to detect and cultivate viruses.

Assessment: Theory tests and assignments (20%), practical tests, laboratory and practical reports (20%); 3 h exam (60%).

DP Requirement: 40% Class mark, 80% attendance at practicals.

Introductory Microbial Ecology
MICR220 P2
(18L-6T-18P-0S-22H-12R-0F-4G-0A-6W-8C)

Prerequisite Modules: BIOL101 or BIMI120, CHEM110.

Aim: To provide key concepts and application in the area of microbial ecology.

Content: Introduction to basic microbial ecology principles: microorganisms in their natural habitats; the microhabitat
concept; microbe-microbe and microbe-host interactions; parasitism and symbiosis. Selected topics in applied
environmental microbiology including: biogeochemical cycling of elements, bioremediation of polluted soils,
eutrophication and microbiological treatment of polluted water, microbiological aspects of composting and silage
making, mycorrhizal associations, rumen microbiology.
Practicals: Laboratory exercises in selected topics from the above.
Assessment: Tests and assignments (20%), prac reports (20%); 2 h exam (60%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Micr$\text{©} 304$ P2 W2

Prerequisite Modules: MICR213.
Aim: To introduce the key concepts & applications in microbial bioprocessing.
Content: Range and scope of microbial bioprocessing. Growth of microbes in a controlled environment, including
nutrient requirements, kinetics, environmental parameters, and monitoring. Batch & continuous bioprocesses. Aspects
of upstream and downstream processing. Examples of major fermentation processes. Current trends and applications
in industrial biotechnology. Regulatory, safety (Hazard Analysis Critical Control Point) and socio-economic
consideration of biotechnology.
Practicals: Related laboratory work. Field trips to facilities employing microbiological processes.
Assessment: Theory tests and assignments (20%), practical tests and laboratory reports (20%); 3 h exam (60%).
DP Requirement: 40% in Class mark, 80% attendance at practicals.

Advanced Applications of Fungi and Viruses
MICR306 W2

Aim: To introduce advanced aspects and applications of fungi and viruses relevant to microbial biotechnology.
Fungal and viral genetics: mechanisms of variability, gene-for-gene hypothesis. Applied mycology and virology, fungal
and viral diseases and their biological control strategies.
Practicals: Colonisation of buried cellophane, environmental factors in fungal growth. Mycostasis. Isolation,
identification of fungal cultures from seeds. Identification and characterization of viruses.
Assessment: Theory tests, assignments (20%), practical tests, laboratory and practical reports (20%); 3 h exam
(60%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Environmental Microbial Biotechnology
MICR307 P1 W1

Prerequisite Modules: MICR213.
Aim: To provide essential knowledge relevant to industry in the area of biotechnological processes involving
microorganisms.
Content: Pollution microbiology. Sources & consequences of pollution. Methods for pollutant detection. Strategies for
evaluation & biochemical processes. Assessment of microbial diversity in biotechnological processes. Microbial
biotechnology for mineral & energy production.
Practicals: Mini-research projects in selected topics from the above. Field trips to facilities using environmental
microbial biotechnology.
Assessment: Theory tests and assignments (20%), assessment of practical and project reports (20%), 3 h exam
(60%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Advanced Bacteriology
MICR311 W1

Prerequisite Modules: MICR213.
Aim: To introduce students to advanced topics in bacteriology.


Assessment: Theory tests (20%), essay assignment, practical assessments, learning portfolio, poster presentation (20%); 3 h exam (60%).

DP Requirement: 40% Class mark, 80% attendance at practicals.

Advanced Microbial Metabolism & Ecophysiology

MICR320 P1

Prerequisite Modules: MICR213; BIOC201 or CHEM220.

Aim: To study microbial physiology and metabolism in natural ecosystems and industrial environments.

Content: Review of microbial metabolism and energy generation under aerobic and anaerobic conditions. Ecophysiological versatility of eu- and archaebacteria and environmental impact of microbial activity. Thermodynamic aspects and regulation of microbial catabolism and biotechnological applications thereof.

Practicals: Experiments on microbial metabolism (e-donors, e-acceptors, regulation, secondary metabolites) and ecophysiology. Laboratory-scale industrial microbiology processes. Excursions.

Assessment: Tests and assignments (20%), prac reports (20%); 3h exam (60%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Death & Control of Micro-organisms

MICR360 P2

Prerequisite Modules: MICR213.

Aim: To study the procedures available to kill or control undesirable microbes.


Practicals: Assessing various physical and chemical antimicrobial agents, the effect of environmental factors on the killing/inhibitory activity of selected antimicrobials.

Assessment: 2 Tests (20%), prac reports and performance in tutorials (20%); 3 h exam (60%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Specialised Microbial Molecular Techniques

MICR701 W1

Aim: To familiarize students with selected advanced practical techniques in Microbiology and Microbial Molecular Biology.


Assessment: Practical and theory tests (60%), oral exam (40%).

DP Requirement: Class mark of 40%, 80% attendance of tutorials and practicals.

Research Project

MICR710 PY WY

Prerequisite Modules: MICR701.

Aim: To provide a grounding in research techniques & procedures in Microbiology.

Content: Students have an opportunity to obtain some degree of specialization in: Agricultural Biotechnology, Medical Biotechnology or Industrial and Environmental Microbiology & Biotechnology. In addition to the above, seminars and a
Agriculture, Engineering & Science

research proposal, relevant to the research project are presented to the staff and students. The findings of the research project are submitted in the form of a bound mini-dissertation and also presented at a scientific forum.

Assessment: Project Report (70%), literature review, proposal presentation and research paper (20%), conference presentation (10%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

Bacteriology
MICR711 W1 (24L-24T-0P-10S-66H-30R-0F-0G-6A-13W-16C)
Aim: To train students to critically evaluate recent peer-reviewed publications in Bacteriology.

Content: Topics pertinent to the ever expanding field of Bacteriology.

Assessment: Test (25%), performance in tutorials (15%), seminars (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Mycology
MICR712 W1 (24L-24T-0P-10S-66H-30R-0F-0G-6A-13W-16C)
Aim: To train students to critically evaluate recent peer-reviewed publications in Mycology.

Content: Topics pertinent to latest developments in Mycology.

Assessment: Test (25%), performance in tutorials (15%), seminars (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Molecular Genetics
MICR713 W2 (24L-24T-0P-10S-66H-30R-0F-0G-6A-13W-16C)
Aim: To train students to critically evaluate recent peer-reviewed publications in Molecular Genetics.

Content: Coverage of current publications in molecular genetics.

Assessment: Test (25%), performance in tutorials (15%), seminars (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Biotechnology
MICR719 W2 (24L-24T-0P-10S-68H-30R-0F-0G-4A-13W-16C)
Aim: To train students to critically evaluate recent peer-reviewed publications in Biotechnology.

Content: Advances in biotechnology principles and biotechnological applications.

Assessment: Test (25%), performance in tutorials (15%), seminars (10%); 3 h exam (50%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Microbiology Research Skills
MICR721 P1 (5L-5T-80P-0S-50H-0R-0F-10G-10A-13W-16C)
Aim: To introduce students to a laboratory research environment and to provide skills for planning, implementing, analysing and interpreting research in Microbiology.

Content: Good laboratory practice. Experimental design. Selection and evaluation of research methods. Hands-on exposure to a range of standard and sophisticated techniques pertinent to the discipline of Microbiology. Qualitative and quantitative analysis. Interpretation of experimental data.

Practicals: Mini-projects, workshops.

Assessment: Assignments and (1h) oral presentation (100%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Fermentation Microbiology
MICR722 P2 (29L-10T-24P-2S-65H-15R-0F-10G-5A-13W-16C)
Aim: To provide the skills required in establishing and maintaining an industrial microbiological process.

Content: Screening and selection procedures for strain improvement. Scale-up; maintenance of sterility and foam control. Bioreactor design - production methods; batch, fed-batch and continuous culture processes. Immobilisation of whole cells. Selection, preparation and pre-treatment of feedstocks. Product recovery, downstream processing and
Environmental Biotechnology
MICR723 P2 (0L-36T-0P-2S-84H-20R-0F-15G-3A-13W-16C)

Aim: To introduce advanced aspects of environmental biotechnology. To expose students to the application of microbial processes in addressing environmental issues such as pollution, waste-treatment and energy generation.

Content: Selected topics highlighting current advances, analytical techniques and applications in the field of environmental biotechnology. These may change from year to year. Examples include: type sources of pollutants; microbial responses to anthropogenic stress; anaerobic digestion; biofuels; biosorption; biofiltration; bioleaching; bioremediation (in situ and ex situ); composting; phytoremediation; solid waste treatment; and, wastewater treatment.

Assessment: Assignments and presentations (40%); 1 h oral exam (60%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Advanced Environmental Microbiology
MICR724 P2 (0L-36T-0P-2S-84H-20R-0F-15G-3A-13W-16C)

Aim: To introduce advanced aspects of environmental microbiology and microbial ecology.

Content: Selected topics highlighting current advances and the latest developments in environmental microbiology and microbial ecology. These may change from year to year. Examples include: phylogenetically based methods in microbial ecology, biodiversity mining and metagenomics, biogeochemical cycling and microbial role in biodeterioration and biodegradation processes, microbial biocatalysis, microbial biofilms, microbial interactions with plants, animals and other microbes.

Assessment: Assignments and presentations (40%); 3 h exam (60%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Nutrition
Offered in the School of Agricultural, Earth and Environmental Sciences

Introductory Nutrition & Community Resources
NUTR114 P1 (39L-10T-18P-0S-62H-25R-0F-0G-6A-13W-16C)

Aim: To enable students to develop an understanding of: the link between health and nutrition, various factors affecting eating behaviour, what causes malnutrition, the guidelines for healthy eating, and food purchasing & food safety issues.

Content: Introduction to nutrition; nutrients (overview); factors affecting eating behaviour; public health nutrition; planning a healthy diet; procuring and using food.

Practicals: Referencing, plagiarism and nutrition topics related to the module content.

Assessment: Assignment/practical and test for each section of the module (33%); 3 h exam (67%).

DP Requirement: 40% Class mark, 80% attendance at practicals.

Human Nutrition 1: Lifecycle & Macronutrients
NUTR124 P2 (39L-10T-24P-0S-62H-20R-0F-0G-5A-13W-16C)

Prerequisite Requirement: At least 40% in BIOL101, CHEM110 and NUTR114.

Corequisite: CHEM120.

Aim: To give an understanding of nutrition in the lifecycle, energy and macronutrients and the roles of Dieticians & Nutritionists.

Content: Energy; protein; carbohydrate; fibre; fats; alcohol; pregnancy & lactation; nutrition during infancy, childhood, adolescence & aging; human development; skills, capabilities & job opportunities for the Dietician and Nutritionist.

Assessment: 2 tests (20%), prac/assignments (13%); 3 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Micronutrients, Nutritional Assessment, SA
NUTR224 P1
Prerequisite Modules: NUTR114, NUTR124.
Corequisite: BIQC201, MPHY200.
Aim: To provide an understanding of micronutrients, assessment of nutritional status, the nutrition situation in South Africa and a brief introduction to research.
Practicals: Introduction to academic writing, critical evaluation of micronutrient supplement, case studies, assessment of micronutrient intake, seminar writing, oral presentations, taking anthropometric measurements.
Assessment: 2 tests (20%), pracs/assignments (13%); 3 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Epidemics and Nutrition
NUTR260 P2
Prerequisite Modules: NUTR224.
Aim: To provide an in depth practical approach to the nutritional impact of malnutrition, HIV and Aids, and Tuberculosis, within the South African context.
Content: Prevalence, diagnosis, nutritional treatment, and current government nutrition intervention policies for severe malnutrition, HIV/AIDS and tuberculosis in the context of the SA situation.
Practicals: Anthropometry, growth chart interpretation, case studies, interpreting literature.
Assessment: Practical evaluation (17%), 2 tests (16%); 2 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Nutrition & Communication
NUTR342 P2
Prerequisite Modules: NUTR224.
Aim: To equip students to plan, conduct and evaluate effective nutrition education programmes.
Practicals: Visual and hands-on participation in exercises and preparation for a nutrition education episode.
Assessment: Assignments (23%), Tests (10%); 3 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.

Community Nutrition Level 3
NUTR343 P1
Prerequisite Modules: NUTR224.
Aim: To gain an understanding of nutrition security in South Africa & internationally, and initiatives to improve nutrition security.
Content: World & SA nutrition situation; Epidemiological concepts, methods & applications to nutrition; Policies & programmes to improve nutrition; Making policy; Nutrition & Human Rights; Advocacy; The INP; Assessment of communities; Principles of & establishing successful nutrition programmes; Health services in SA; Child survival programmes; Social grants.
Practicals: Causes of malnutrition in SA; KZN profile; nutrition strategy for SA; community assessment; community project visit; human rights; nutrition advocacy; Local NGOs; infant feeding (HIV).
Assessment: Test, essay, workbook (33%); 3 h exam (67%).
DP Requirement: 40% Class mark, 80% attendance at practicals.
Applied Nutrition Science  
NUTR350 P2 (39L-0T-9P-0S-85H-14R-10F-0G-3A-13W-16C)  
Prerequisite Modules: NUTR224.  
Aim: To introduce the principles of nutrition research, with special emphasis on epidemiology and its importance in public health.  
Practicals: Case studies and field trips.  
Assessment: Tests (10%), assignments (23%); 3 h exam (67%).  
DP Requirement: 40% Class mark, 80% attendance at practicals.

Nutrition in Humanitarian Crises  
NUTR370 P2 (30L-0T-40P-0S-60H-5R-0F-20G-5A-13W-16C)  
Aim: To provide an understanding of the role of nutrition during humanitarian emergency situations.  
Content: Famine, its causes, geography, consequences and societal response. Approaches to famine relief, with possible counter-famine operations. Income-generating projects, emergency response tactics and food relief programs. Ethical issues in humanitarian crises.  
Practicals: The student must submit a case-study at the end of the semester, in which an example of any existing organization that delivers food aid in Africa is discussed and analysed. Weekly visits by local non-governmental relief agencies, international case-studies and other examples of humanitarian crises.  
Assessment: 2 theory tests (20%), assignments (20%); 3 h exam (60%).  
DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.

Community Nutrition Internship  
NUTR711 PY (70L-0T-6P-7S-59H-319F-0G-4A-26W-48C)  
Prerequisite Requirement: BScDiet or BScHuman Nutrition Degree.  
Aim: To provide practical experience of community nutrition interventions.  
Practicals: Students work in antenatal clinic, postnatal/maternity ward, well baby clinic, paediatric outpatients, medical outpatients & HIV clinic.  
Assessment: Minimum of 75% for MC questionnaire prior to practice placement (0%). Professional evaluation & task assessment (14%, submin 50%), written reports (15%), literature review (2%), oral exam (2%); 3 h exam (67%, submin 40%).  
DP Requirement: 40% Class mark.  
Year-long Module.

Com Nutrition Case Study Level 7  
NUTR730 P2 (2L-8T-0P-3S-67H-0R-0F-0G-0A-13W-8C)  
Prerequisite Modules: NUTR343.  
Aim: To enable students to carry out a nutritional situational analysis and propose suitable interventions in the community, with reference to the literature. The student should also propose the methods of evaluating the intervention.  
Content: Exact content will depend on the community selected.  
Practicals: Case study.  
Assessment: Case study report (100%).  
DP Requirement: Not applicable.

Research Project in Nutrition  
NUTR741 PY (10L-6T-0P-0S-304H-0R-0F-0G-0A-7W-32C)
Prerequisite Requirement: BScDiet Degree or BScHuman Nutrition Degree.

Aim: This module enables students to plan, implement, analyse and write up a relevant research project as part of a research group.

Content: A research question in the area of nutrition and dietetics as agreed with the research supervisor.

Practicals: Project related.

Assessment: Research project report (80%), group participation, research proposal (10%), oral presentation (10%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

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**Physics**

*Offered in the School of Chemistry and Physics*

**Mechanics, Optics and Thermal Physics**

PHYS110 P1 W1  
(36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)

Corequisite: MATH130.

Aim: To introduce mechanics, geometrical optics, and thermal physics.


Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%, 100% attendance at tests, tutorials and practicals

Credit may not be obtained for both PHYS110 and PHYS195.

**Electromagnetism, Waves and Modern Physics**

PHYS120 P2 W2  
(36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)

Prerequisite Requirement: 40% in PHYS110 or 60% in PHYS131.

Corequisite: MATH140.

Aim: To introduce electromagnetism, waves, physical optics and modern physics.


Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals

Credit may not be obtained for both PHYS120 and PHYS196.

**Intro Physics for Life Sciences & Agriculture**

PHYS131 P1 W1  
(36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)

Aim: To introduce basic concepts in mechanics, geometrical optics, and thermal physics.


Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Note: For the purposes of serving as prerequisite for other modules, a result of 60% or more will be regarded as equivalent to PHYS110.
Electromagnetism & Modern Phys for Life Sc
PHYS132 W2 (36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)

Prerequisite Requirement: 40% in PHYS131 or PHYS110.

Aim: To introduce the basic concepts of electricity, magnetism, physical optics and modern physics.


Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Note: For the purposes of serving as prerequisite for other modules, a result of 60% or more will be regarded as equivalent to PHYS120.

Modern Physics for Life Sciences & Agric
PHYS133 P2 (18L-6T-18P-0S-27H-8R-0F-0G-3A-13W-8C)

Prerequisite Requirement: 40% in PHYS131 or PHYS110.

Aim: To provide an introduction to Modern Physics, presented in an applied and practical manner with an emphasis on problem solving.


Assessment: Tests (24%), practicals (6%); 2 h exam (70%).

DP Requirement: Tests (24%), practicals (6%); 2 h exam (70%).

For students in the College of Health Sciences only.

Physics for Optometry
PHYS139 W1 (36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)

Aim: To introduce basic concepts in mechanics, geometrical optics, and physical optics.

Content: Mechanics: Scalars and vectors, 1-D kinematics, equilibrium and dynamics, 2-D kinematics, rotational motion, work, energy, power, momentum, simple harmonic motion, spring systems. Optics: Reflection and refraction of light, image production, lens maker’s equation, defects of the eye, myopia, hypermetropia, wave optics, polarization, interference, diffraction, thin lenses, optical instruments.

Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%. Attendance at all tests; at least 80% attendance at lectures, tutorials and practicals.

For Engineering students only.

Engineering Physics 1A
PHYS151 H1 (36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)

Aim: Introduction to, and an ability to apply, mechanics, oscillations and thermal physics at an introductory level. This is a calculus-based module.

Content: Mechanics: Units, physical quantities and vectors, motion along a straight line, motion in two or three dimensions, Newton’s laws of motion, application of Newton’s laws, work and kinetic energy, momentum, impulse and collisions, rotation of rigid bodies, dynamics of rotational motion, equilibrium and elasticity, gravitation, fluid mechanics. Oscillations and Waves: Periodic motion, mechanical waves, wave interference and normal modes, sound. Thermal physics: Temperature and heat, thermal properties of matter.

Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

For Engineering students only.

Engineering Physics 1B
PHYS152 H2 (36L-9T-36P-0S-57H-16R-0F-0G-6A-13W-16C)
Prerequisite Requirement: 40% in PHYS151.

Aim: To gain understanding of, & ability to apply, thermodynamics, electricity & magnetism, geometrical optics & atomic physics at an introductory level. This is a calculus-based module.


Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

For Engineering students only.

Chemical Engineering Physics 1A
PHYS161 H1 P1

Aim: To gain understanding of, and ability to apply, mechanics at an introductory level. This is a calculus-based module.

Content: Mechanics: Units, physical quantities and vectors, motion along a straight line, motion in two or three dimensions, Newton's laws of motion, application of Newton's laws, work and kinetic energy, momentum impulse and collisions, rotation of rigid bodies, dynamics of rotational motion, equilibrium, gravitation, fluid statics.

Assessment: Tests (24%), practicals (6%); 2 h exam (70%).

For Engineering students only.

Chemical Engineering Physics 1B
PHYS162 H2 P2

Aim: To gain understanding of & ability to apply oscillations & waves, electricity & magnetism, & atomic & nuclear physics at an introductory level. A calculus-based module.


Assessment: Tests (24%), practicals (6%); 2 h exam (70%).

For Engineering students only.

Mech Optics & Thermal Physics (Augmented)
PHYS195 P1 W1

Corequisite: MATH195.

Aim: To introduce mechanics, geometrical optics, and thermal physics.

Content: This module is only for students in the BSc4(Augmented). It covers the syllabus of PHYS110 but, in addition, includes a substantial amount of supplementary material and tuition designed for students who are under-prepared for university-level studies to a maximum of 160 Hours.

Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

Credit may not be obtained for both PHYS195 and PHYS110. This module is worth 16 degree credits and 16 foundational credits.

Electromagnetic Waves & Mod Phys (Augmented)
PHYS196 P2 W2

Prerequisite Requirement: 40% in PHYS195; 40% in (MATH150 or MATH195).

Corequisite: MATH196.
Aim: To introduce electromagnetism, waves, physical optics and modern physics.

Content: This module is available only to students registered for BSc4(Augmented). It covers the syllabus of PHYS120 but, in addition, includes a substantial amount of supplementary material and tuition designed for students who are under-prepared for university-level studies to a maximum of 160 hours.

Assessment: Tests (24%), practicals (6%); 3 h exam (70%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Credit may not be obtained for both PHYS196 and PHYS120. This module is only for students in the BSc4 (Augmented) programme. This module is worth 16 degree credits and 16 foundational credits.

Foundation Physics
PHYS199 PY WY

Corequisite: BIOL199, CHEM199, MATH199, (SCOM103 or 113).

Aim: To provide students from disadvantaged educational backgrounds with scientific reasoning, problem solving skills, and laboratory skills in Physics to enable them to pursue a BSc degree.


Assessment: Class mark (50%); 3 h Final Exam (50%).

DP Requirement: 40% Class mark, plus 80% attendance at all lectures, practicals, and tutorials.

Year long module. This module is only for students in the Foundation Stream of the BSc4. It carries 20 Foundational credits and 4 degree credits.

Mechanics and Modern Physics
PHYS201 P1 W1

Prerequisite Modules: PHYS110, 120; MATH130, 140.

Corequisite: MATH212.

Aim: To introduce students to Mechanics, Classical Thermodynamics and Waves at the intermediate level.

Content: Mechanics: Newton's laws, conservation laws, angular momentum, central forces, planetary motion, rotating frames, multi-particle systems, rigid bodies, moment of inertia; Oscillations – damped and forced harmonic oscillator, resonance, coupled oscillators. Special Relativity – inertial frames, postulates, Lorentz transformation, velocity addition, relativistic mass and energy, four-vectors. Thermal Physics: macroscopic vs. microscopic physics, zeroth, 1st, 2nd and 3rd laws, reversible and irreversible processes, thermodynamic cycles, entropy, thermodynamic potentials and relations.

Assessment: Practicals (20%), tests (15%); 3h exam (65%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Electromagnetism and Quantum Physics
PHYS204 P2 W2

Prerequisite Modules: MATH130, 140, 212. PHYS110, 120, 201.

Corequisite: MATH251.

Aim: To introduce students to electromagnetism and modern physics at an intermediate level.

Content: Electromagnetism: AC theory - LRC circuits, reactance, impedance, transients, resonance; Electrostatics - charge distributions, electric fields; Magnetostatics - magnetic fields and forces. Introduction to quantum theory: particle character of light, Planck’s radiation formula, photoelectric effect, Compton effect, Bohr’s model of the hydrogen atom; Wave theory - wave equation and solutions, standing waves, wave packets; Matter waves - probability interpretation, uncertainty relations, Schrödinger's equation and applications, measurement.

Assessment: Practicals (20%), tests (15%); 3h exam (65%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Mechanics & Modern Physics
PHYS211 P1

Prerequisite Modules: PHYS110, 120, MATH130, 140.

Corequisite: MATH212.

Aim: To introduce students to mechanics and modern physics at an intermediate level.

Assessment: Practicals (20%), tests (15%); 3h exam (65%).

DP Requirement: Class mark 40%, 100% attendance at tests, tutorials and practicals.

Electromagnetism, Waves & Vibrations

PHYS212 P2

Prerequisite Modules: MATH130, 140, PHYS110, 120.

Corequisite: MATH251.

Aim: To introduce students to electromagnetism, waves and vibrations at an intermediate level.

Content: Electromagnetism, including Maxwell’s equations in integral form. DC and AC circuit theory. Wave theory and waves in physical media. Waves, driven vibrations and coupled oscillators. Thermal Physics: macroscopic vs. microscopic physics, zeroth, 1st, 2nd and 3rd laws, reversible and irreversible processes, thermodynamic cycles, entropy, thermodynamic potentials and relations.

Assessment: Practicals (20%), tests (15%); 3h exam (65%).

DP Requirement: Class mark 40%, 100% attendance at tests, tutorials and practicals.

Theoretical & Computational Physics Methods

PHYS231 P1 W1

Prerequisite Modules: PHYS110, 120, MATH130, 140.

Corequisite: MATH212, PHYS201.

Aim: To introduce students to concepts in the physics of fluids and fields, and use these to develop key theoretical and computational skills needed for senior physics modules.


Assessment: Practicals (20%), tests (15%); 3h exam (65%).

DP Requirement: Class mark 40%, 100% attendance at tests, tutorials and practicals.

Introductory Applied Physics

PHYS242 W2

Prerequisite Modules: MATH130, 140; PHYS110, 120.

Corequisite: MATH251, PHYS204.

Aim: To introduce students to basic principles of applied physics, with emphasis on instrumentation, medical physics and energy sources.

Content: Elementary semiconductor physics, applied AC theory, diode and transistor circuits and digital electronics. Concepts in radiation physics, including coherent light sources, gamma rays, x-rays and ultrasonic waves.

Assessment: Practicals (20%), tests (15%); 3 h exam (65%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Optics & Wave Motion

PHYS251 H1

Prerequisite Requirement: 40% in PHYS152.

Prerequisite Modules: PHYS151.

Aim: To impart knowledge and understanding of, and an ability to apply, optics and wave motion at an intermediate level.

Content: Wave Equation, radiation, geometric optics, interaction of light and matter, polarisation, interference, diffraction, topics from contemporary optics.

Assessment: Class mark (25%); 2 h exam (75%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

For Engineering students only.
Instrumentation and Signal Processing
PHYS343 W1
Prerequisite Modules: PHYS231, 242.
Aim: Introduce students to techniques of instrumentation, data processing and measurements.
Content: Instrumentation electronics, including operational amplifiers, passive and active filters, and A/D and D/A converters. Elementary signal processing, measurement sensors and measurement techniques.
Assessment: Practicals (25%), tests (15%); 3 h theory exam (60%).
DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Topics in Applied Physics
PHYS345 W2
Prerequisite Modules: PHYS204 or PHYS242.
Aim: To introduce applications of radiation physics.
Assessment: Practicals (25%), tests (15%); 3 h theory exam (60%).
DP Requirement: Class mark 40%, 100% attendance at tests, 80% at lectures, tutorials and practicals.

Classical Mechanics and Quantum Physics
PHYS361 P1 W1
Prerequisite Modules: MATH212, 251, (PHYS201, 204) or (PHYS211, 212).
Aim: To provide a foundation in classical mechanics and quantum physics.
Assessment: Practicals (20%), tests (15%); 3 h theory exam (65%).
DP Requirement: Class mark 40%, 100% attendance at tests, completion of all practicals, 80% attendance at lectures and tutorials.

Statistical Physics and Condensed Matter
PHYS362 P2 W2
Prerequisite Modules: MATH212, 251, (PHYS201, 204) or (PHYS211, 212).
Aim: To provide a foundation in statistical physics and condensed matter.
Content: Statistical Physics: accessible states, entropy, ensembles, partition functions, Maxwell, Fermi-Dirac and Bose-Einstein distributions, Doppler broadening, quantum statistics, black-body radiation. Condensed Matter: bonding in solids; Bravais lattices, unit cells, lattice directions, Miller indices; the reciprocal lattice, Brillouin zones; lattice vibrations, phonons, Einstein & Debye models, lattice specific heat acoustic & optic modes; Bragg, Von Laue & X-ray diffraction; free electron Fermi gas, energy bands.
Assessment: Practicals (20%), tests (15%); 3 h theory exam (65%).
DP Requirement: Class mark 40%, 100% attendance at tests, completion of all practicals, 80% attendance at lectures and tutorials.

Electrodynamics
PHYS363 W1
Prerequisite Modules: MATH212, 251, (PHYS201, 204) or (PHYS211, 212).
Aim: To provide a foundation in electrodynamics, electromagnetic waves, and classical optics.
Content: Electromagnetic Theory - Electric fields and magnetic fields in matter; Electrodynamics - Ohm’s Law, Faraday’s Law, displacement current, Maxwell’s equations, continuity equation, Poynting’s theorem; Electromagnetic waves – waves in vacuum, reflection and transmission, plane, polarisation, waves in matter, dispersion; Classical Optics - nature and propagation of light, wave superposition, polarisers, interferometers, Fraunhofer and Fresnel diffraction, coherence.
Assessment: Practicals (20%), tests (15%); 3 h theory exam (65%).
DP Requirement: Class mark 40%, 100% attendance at tests, completion of all practicals, 80% attendance at lectures and tutorials.
Atomic, Nuclear and Particle Physics
PHYS364 W2
Prerequisite Modules: MATH212, 251, (PHYS201, 204) or (PHYS211, 212).
Aim: To introduce concepts in atomic physics, quantum optics, nuclear physics and particle physics.
Assessment: Practicals (20%), tests (15%); 3 h theory exam (65%).
DP Requirement: Class mark 40%, 100% attendance at tests, completion of all practicals, 80% attendance at lectures and tutorials.

Electromagnetic Theory and Classical Optics
PHYS365 P1
Prerequisite Modules: MATH212, 251, (PHYS201, 204) or (PHYS211, 212).
Aim: To provide a foundation in electromagnetic theory and classical optics.
Content: Electromagnetic Theory: Gauss’, Stokes’ theorems, electric charge, current, continuity equation, Maxwell’s equations, conductivity, Poisson’s & Laplace’s equations, uniqueness theorem, images, multipole expansion, electric dipoles, dielectric materials, vector potential, magnetic dipoles, electromagnetic waves, Poynting’s theorem. Classical Optics: polarisation, interference, diffraction, coherence.
Assessment: Practicals (20%), tests (15%); 3 h theory exam (65%).
DP Requirement: Class mark 40%, 100% attendance at tests, completion of all practicals, 80% attendance at lectures and tutorials.

Atomic Spectroscopy and Sub-atomic Physics
PHYS366 P2
Prerequisite Modules: MATH212, 251, (PHYS201, 204) or (PHYS211, 212).
Aim: To introduce concepts in atomic spectroscopy, nuclear physics and particle physics.
Assessment: Practicals (20%), tests (15%); 3 h theory exam (65%).
DP Requirement: Class mark 40%, 100% attendance at tests, completion of all practicals, 80% attendance at lectures and tutorials.

Classical Field Theory
PHYS701 WC
Aim: To study classical field theory.
Content: Mathematical tools; electrodynamics; special relativity; elements of general relativity; introduction to numerical methods for electrodynamics.
Assessment: Class mark (25%); 3 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures. Offered in either Semester 1 or Semester 2.

Quantum Mechanics
PHYS702 WC
Aim: To study quantum mechanics.
Content: Foundations of quantum mechanics; quantum phenomena; measurement and evolution; selected applications and quantum technology; numerical methods of quantum mechanics.
**Assessment:** Class mark (25%); 3 h exam (75%).
**DP Requirement:** 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

**Statistical Physics & Classical Mechanics**
PHYS703 WC  
(27L-0T-0P-9S-88H-30R-0F-0G-6A-13W-16C)
**Aim:** To study statistical physics and classical mechanics.
**Assessment:** Class mark (25%); 3 h exam (75%).
**DP Requirement:** 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

**Quantum Mechanics & Electrodynamics**
PHYS711 P1  
(60L-21T-0P-133H-100R-0F-0G-6A-13W-32C)
**Aim:** To consolidate and extend 3rd-year concepts of quantum mechanics and electrodynamics.
**Content:** Abstract vectors, operations, parity, displacement operators for position and momentum, coordinate representation, time evolution, Hellmann-Feynman, virial and hypervirial theorems, shift operators, oscillator angular momentum, H atom, nondegenerate, degenerate, time-dependent perturbation theories. Review of Maxwell's equations, advanced applications thereof. Electromagnetic potentials and gauge. Relativistic field transformations.
**Assessment:** Class mark (20%); two 3 h exams (80%).
**DP Requirement:** 80% attendance.

**Laser Physics and Nonlinear Optics**
PHYS720 WC  
(14L-0T-0P-44H-15R-0F-0G-3A-13W-8C)
**Aim:** To introduce the physics and properties of laser radiation and its nonlinear effects in solids and gases.
**Content:** Review of quantum properties of light. Radiative transitions and emission linewidth, absorption and stimulated emission, lasers amplifiers and resonators. Study of specific laser systems. Theory of non-linear optical processes.
**Assessment:** Class mark (25%); 1.5 h exam (75%).
**DP Requirement:** 100% attendance at tests. 80% attendance at lectures.
Offered in either Semester 1 or 2.

**Special Topics in Physics I**
PHYS721 P1  
(36L-0T-0P-77H-41R-0F-0G-6A-13W-16C)
**Aim:** To introduce the Honours student to a number of specialist topics in Physics to suit the career directions and interests of students. Students may also go outside the Physics discipline to select material with equivalent credit, subject to the approval by the School.
**Content:** Topics include: Advanced symbolic programming, cosmology, galaxies and galactic structure, group theory, particle physics, molecular spectroscopy, polarization optics, relativity, field theory, and other material subject to available expertise.
**Assessment:** Class mark (25%); 3 h exam (75%).
**DP Requirement:** 100% attendance at tests, 80% attendance at lectures.

**Physics Project**
PHYS735 PY WY  
(0L-0T-0P-6S-314H-0R-0F-0G-0A-26W-32C)
**Aim:** To provide an introduction to research methods in experimental, theoretical, computational or educational physics, and to develop communication skills through preparation of a written report and presentation of a seminar.
**Content:** Experimental, theoretical, computational or educational physics project. May include placement or fieldwork.
**Assessment:** Report (80%), seminar (20%).
**DP Requirement:** Not applicable.
Year-long module. This module has no supplementary exam.
Statistical Physics and Superfluidity
PHY742 P2  
(36L-0T-0P-0S-77H-41R-0F-0G-6A-13W-16C)

Aim: To study the theory and applications of intermediate level statistical physics.

Content: Grand canonical ensemble. Fluctuations, thermodynamic limit. Quantum statistics; the ideal fermion and boson gases, the photon gas. Properties of superfluids.

Assessment: Class mark (25%); 3 h exam (75%).

DP Requirement: 100% attendance at tests, 80% attendance at lectures.

Special Topics in Physics II
PHY752 P2  
(60L-24T-0P-3S-140H-90R-0F-0G-3A-13W-32C)

Aim: Special Topics II (and its counterpart Special Topics I in the first Semester) serve to introduce the Honours student to a number of specialist topics in Physics to suit the career directions and interests of students. Students may also go outside the Physics discipline to select material with equivalent credit, subject to the approval of the School. A total of 32C is elected.

Content: See PHYS721, Special Topics I for a list of present options, plus Solid State Physics offered in Semester 2.

Practicals: Topics may form the basis for projects in the Project modules.

Assessment: Project work &/or formal exam with a minimum Class mark of 20%.

DP Requirement: 80% attendance.

Additional Project 1
PHY760 WC  
(0L-0T-0P-3S-77H-0R-0F-0G-0A-6W-8C)

Aim: To carry out a project in pure or applied physics.

Content: Theoretical, experimental or computational project.

Assessment: Evaluation of report, and/or seminar.

DP Requirement: Not applicable.

Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Additional Project 2
PHY761 WC  
(0L-0T-0P-3S-77H-0R-0F-0G-0A-6W-8C)

Aim: To carry out a project in pure or applied physics.

Content: Theoretical, experimental or computational project.

Assessment: Evaluation of report and/or seminar.

DP Requirement: Not applicable.

Offered in either Semester 1 or Semester 2. This module has no supplementary exam.

Special Topics A
PHY762 WC  
(14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)

Aim: To introduce specialist topics in Physics.

Content: Topics include, but are not confined to: Chaos, data analysis, electronics, fluids, foundations of QM, general relativity, magnetism, Mossbauer spectroscopy, open quantum systems, particles, advanced plasmas, QM applications, special relativity, advanced superconductivity, transform methods, and other material, subject to available expertise.

Assessment: Class mark (25%); 1.5 h exam (75%).

DP Requirement: 100% attendance at tests, 80% attendance at lectures.

Offered in either Semester 1 or Semester 2.

Note: Credit cannot be obtained for the same material studied in this module and in another module.

Special Topics B
PHY763 WC  
(14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)

Aim: To introduce specialist topics in Physics.

Content: See PHYS762 (Special Topics A) for a list of options.

Assessment: Class mark (25%); 1.5 h exam (75%).
Computational Physics
PHYS766 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To give students an introduction to the power of computer simulation by solving problems often encountered in Physics.
Content: Review of basic numerical methods and programming. Computational solution of partial differential equations in physics. Computational analysis and visualisation of data in physics. Introduction to parallel computing techniques for physics. Applications, depending on students' background and interests, such as: computational fluid dynamics, plasma simulations, Monte Carlo methods for quantum systems.
Assessment: Continuous: Practical (60%), theory (40%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.
This module has no supplementary exam.

Materials
PHYS768 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To conduct a study of materials.
Content: Properties of materials: emphasis will be on one or more of the following: Magnetism and magnetic properties of materials, mechanical properties of materials, electrical properties of materials, optical properties of materials.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Mathematical Methods
PHYS769 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To equip students with mathematical tools for theoretical physics.
Content: Complex Variables, Laplace transforms, Fourier Transforms, Delta Functions and Green's Functions, Geometrical Physics, Calculus of Variations, Light Cone Coordinates, Wilson's Loops, the Hamiltonian Methods including Hamiltonian Constraints in LQG, Renormalization and Renormalization Group Equations, and Ashtekar Variables.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Plasma Physics
PHYS771 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To introduce the basic properties of space and laboratory plasmas and their single-particle and collective motions, with an emphasis on space plasmas.
Content: Occurrence of plasmas in nature with emphasis on properties of space plasmas; basic plasma parameters; single particle motions; plasmas as fluids; waves in plasmas; diffusion and resistivity of plasmas; introduction to plasma instabilities.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Solid State Physics
PHYS772 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To conduct a study of solid state physics at an advanced level.
Content: Electrons in solids, beyond the free electron model, band structure, Fermi surfaces and measurement, transport coefficients and scattering phenomena, semiconductors and semiconductor properties, preparation
Space Physics
PHYS773 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To introduce aspects of Space Physics.
Content: The Sun, solar wind, Earth's magnetosphere, plasmasphere and ionosphere. Particles in the Earth's magnetic field, the aurora.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Nuclear Physics
PHYS775 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To study Nuclear Physics.
Content: Nucleons, shell model, standard model.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Renewable Energy
PHYS782 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To introduce alternative and renewable sources of energy.
Content: Basis of energy; social demand; different sources of energy (nuclear, fossil, biomass, renewable); environmental impact; modelling; solar parameters and measurement; energy conversion; storage; photovoltaic; wind and ocean.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Atmospheric Physics
PHYS786 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To introduce students to atmospheric physics and associated observational techniques.
Content: Atmospheric thermodynamics; atmospheric radiation; atmospheric fluid dynamics; atmospheric waves; atmospheric coupling; atmospheric optics; atmospheric modelling; atmospheric remote sensing.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.

Quantum Optics & Quantum Information
PHYS788 WC (14L-0T-0P-4S-44H-15R-0F-0G-3A-13W-8C)
Aim: To introduce concepts of quantum optics and quantum information processing.
Content: Field quantization, coherent states, atom and field interactions, beam splitters and interferometers, nonclassical light, optical test of quantum mechanics, cavity QED, decoherence and entanglement. Basic concepts of quantum information processing, quantum circuits, quantum Fourier transforms and applications, quantum search algorithms, quantum computers, quantum noise and error correction, quantum cryptography.
Assessment: Class mark (25%); 1.5 h exam (75%).
DP Requirement: 100% attendance at tests, 80% attendance at lectures.
Offered in either Semester 1 or Semester 2.
Plant Breeding

Offered in the School of Agricultural, Earth and Environmental Sciences

FOR UNDERGRADUATE PROGRAMME IN PLANT BREEDING – See Rule AES-BScAg2 and Agricultural Plant Sciences.

Topics in Advanced Plant Breeding
PLBR901 PY (384L-100T-128P-0S-640H-0R-0F-0G-28A-52W-128C)

Aim: Provide ACCI students with understandings and skills relevant to PhD and to senior scientists in plant breeding.

Content: Elements of thesis; fund raising; project planning and proposal writing; budgeting and financial administration; poster and conference paper presentations; applied plant breeding; research methodology; advanced biometry for plant breeders; biotic and abiotic constraints on plant breeding; application of biotechnology to plant breeding.

Practicals: Plant breeding methods and skills.

Assessment: Portfolio of completed tests, essays, practical assignments (50%); project proposal (30%); literature review (20%).

DP Requirement: Not applicable.

Offered over Semester 1 and 2. Only for students in ACCI programme. This module has no supplementary exam.

Plant Pathology

Offered in the School of Agricultural, Earth and Environmental Sciences

Fungi, Food and Phytopathogens
PPTH214 P2 (36L-0T-36P-53H-23R-0F-0G-6A-13W-16C)

Prerequisite Modules: BIOL101 or BIMI120.

Aim: To introduce students to a basic understanding of fungi, bacteria, viruses and nematodes causing plant diseases.

Content: An introduction to the structure, function and diversity of plant pathogenic organisms, epidemiology, diseases symptoms and methods of control. Symbiotic relationships, industrial applications and the role of fungi in human health.

Practicals: Hands-on experience in inoculation, germination, infection, isolation and other techniques for identifying fungal plant pathogens.

Assessment: 3 theory tests (8%); practicals (5%); literature survey (5%); seminar presentation (2%); disease collection (10%); 3 h exam (70%).

DP Requirement: Class mark of 40%, attendance at 80% of practicals.

Introduction to Viruses
PPTH305 P1 (29L-7T-42P-5S-48H-24R-0F-0G-5A-13W-16C)

Prerequisite Modules: RDNA202.

Aim: To introduce viruses, the diseases they cause, control of viral diseases and the practical application of viruses.

Content: General characteristics of viruses, viroids, virusoids and prions. Taxonomy, identification, transmission, epidemiology, characterization, control and applications.

Practicals: Laboratory and greenhouse based experiments and one field trip to a virology laboratory.

Assessment: Practical write-ups and one test based on the practical exercises; two class tests based on the lectures; group seminar presentation (33%); 3 h exam (67%).

DP Requirement: 40% Class mark, 80% attendance at practicals.
Plant Disease Epidemiology & Bacteriology  
PPTH330 P1  
(40L-10T-40P-18S-24H-23R-0F-0G-5A-13W-16C)  
Prerequisite Modules: PPTH214 or AGPS308.  
Aim: To introduce a mathematical background to disease progress, the genetics and biochemistry of disease resistance and an introduction to plant diseases caused by bacteria.  
Content: An introduction to quantitative plant disease epidemiology, host-parasite interactions, the genetics of plant disease resistance and plant bacteriology.  
Practicals: An applied project involved in the isolation and testing of a biocontrol agent.  
Assessment: Tests (17%), bacteriology assignment (8%), prac project & assignments (9%); 3 h exam (66%).  
DP Requirement: Class mark of 40%, attendance at 80% of tutorials and practicals.

Principles of Plant Disease Management  
PPTH360 P2  
(39L-5T-29P-53H-29R-0F-0G-5A-13W-16C)  
Prerequisite Modules: PPTH214.  
Aim: To present, in detail, plant disease management strategies and tools, against a range of plant diseases.  
Content: Introduction to disease management, epidemiological concepts, cultural practices such as crop rotation, debris removal etc. and their role in disease management. Physical control measures, agrochemicals, biological control, genetics of host plant resistance.  
Practicals: Laboratory work (isolation of biological control agents and pathogens). Greenhouse based experiments – testing the above in the greenhouse to determine if pathogens cause disease. The effectiveness of biological control agents in controlling the disease.  
Assessment: Three tests and practicals (33%); 3 h exam (67%).  
DP Requirement: Class mark of 40%, 80% attendance at practicals.

Biotechnology for Plant Pathologists  
PPTH370 P2  
(39L-12T-39P-36H-24R-0F-0G-5A-13W-16C)  
Prerequisite Modules: PPTH305, RDNA202.  
Aim: To acquaint students with modern biotechnology techniques and how they can be applied to study and solve practical problems in Plant Pathology. To introduce the economic importance of plant viruses, their epidemiology and control.  
Practicals: Laboratory and greenhouse based experiments and field trips.  
Assessment: Two class tests, two practical write-ups, Group seminar presentation (33%), 3 h exam (67%).  
DP Requirement: 40% Class mark, 80% attendance at practicals.

Fungi in Phytopathology - Advanced Mycology  
PPTH713 P2  
(0L-40T-0P-42S-45H-30R-0F-0G-3A-13W-16C)  
Prerequisite Modules: PPTH310, 330 and AGPS308.  
Aim: To introduce students to advanced, current and controversial topics in phytopathology with emphasis on the impact of fungi on agriculture and food production.  
Content: An extensive reading course in advanced topics in plant phytopathology, including: advanced mycology, physiology, biochemistry, aerobiology, conidiogenesis, infection processes and host-parasite interactions, disease forecasting and modelling. A case study of a significant pathogen, the sociological impact of plant diseases. GMO's and food security. Précis and present papers in mini-séminars.  
Assessment: Assignments (17%), essays (17%); 3 h theory exam (66%).  
DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Advanced Topics in Virology  
PPTH723 P1  
(0L-40T-0P-42S-45H-30R-0F-0G-3A-13W-16C)
Prerequisite Modules: MICR305, PPTH310, 330.

Aim: To study a wide range of selected topics to fully understand the complex relationships between viruses, their hosts and vectors and to formulate disease control measures.

Content: An extensive reading course in advanced topics in plant phytopathology, and viral epidemiology including: taxonomy of viruses, infection processes, vectored diseases, virus helpers and viroids; significant plant viruses, virus control measures, GE virus resistance and the social impact of viruses; précis and present papers in mini-seminars.

Assessment: Assignments (17%), essays (17%); 3 h exam (66%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Advanced Plant Disease Epidemiology
PPTH730 P1

Prerequisite Modules: PPTH310, 330.

Aim: To develop advanced concepts and practice in plant disease epidemiology.

Content: Discussion, review and practice of the theory and application of plant disease epidemiology in the form of seminars and laboratory tutorials.

Practicals: An applied project involved in the isolation and testing of a biocontrol agent.

Assessment: Class tests (17%), essays (17%); 3 h exam (66%).

DP Requirement: Class mark of 40%, attendance at 80% of tutorials.

Field Plant Pathology
PPTH745 P1

Aim: Experiential learning of applied plant pathology provided by farm visits to diseased crops.

Content: Weekly visits to farms, nurseries and other sites of plant pathological interest, where applied disease diagnosis and control measures are developed.

Practicals: Field work and evaluations.

Assessment: Field prac reports (100%).

DP Requirement: Not applicable.

This module has no supplementary exam.

Plant Pathology Major Research Project
PPTH750 PY

Aim: To develop scientific research methods in plant pathology.

Content: An extended research project on a plant pathological topic, to give the student experiential learning of the application of the scientific process in plant pathology.

Practicals: The project will require detailed design, implementation and analysis of a series of experiments for an overall project, at a significant depth.

Assessment: Project report (70%), research paper taken from the report (15%), conference presentation of results (15%).

DP Requirement: Not applicable.

Year-long Module. This module has no supplementary exam.

Plant Pathology Literature Review
PPTH785 P1

Corequisite: PPTH750 or 790.

Aim: To develop skills in the accessing and synthesis of scientific literature in plant pathology.

Content: A detailed literature review on a plant pathology topic, using all accessible forms of technical information.

Practicals: Use of library resources, interlibrary loans, abstracting services, computer databases, the Internet, etc. to access information on the chosen subject. Collation and synthesis of the information into a coherent review correct technical writing. Formal presentation of the review in a seminar.

Assessment: Literature review (75%), seminar presentation (25%).

DP Requirement: Not applicable.

Offered in Semester 1. This module has no supplementary exam.
Plant Pathology Research Project
PPTH790 PY  (0L-40T-0P-40S-240H-0R-0F-0G-0A-26W-32C)

Aim: To develop scientific research methods in plant pathology.
Content: A research project on a plant pathological topic, to give the student experiential learning of the application of the scientific process in plant pathology.
Practicals: The project will require detailed design, implementation and analysis of a series of experiments for an overall project.
Assessment: Project report (70%), research paper taken from the report (15%), conference presentation of results (15%).
DP Requirement: Not applicable.
Year-long Module. This module has no supplementary exam.

Property Development
Offered in the School of Engineering

Introduction to the Built Environment
ENPD1BE H2  (26L-9T-0P-17S-17H-6R-0F-0G-5A-13W-8C)

Aim: An appreciation of the processes and participants within the built environment, and to provide basic study skills.
Content: An introduction to the property/construction industry including the structure of the industry, roles of the professions and employer/employee bodies and the macro-economic context. An overview of construction procurement systems to meet client needs and expectations. A view of anticipated future developments within the international and local construction sectors. Development of communication skills by using mind mapping, academic writing, and IT-based techniques. Interaction with architectural students and presentation of assignments in open forums.
Assessment: Assignments, tests (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Intro to Design Appraisal & Measurement
ENPD1DM H2  (35L-10T-0P-58S-35H-0F-0G-5A-13W-16C)

Prerequisite Requirement: 40% in ENPD1TA & ENPD1DW.
Corequisite: ENPD1TB.
Aim: To enable students to critically appraise design documentation and to select and apply price determination production techniques.
Content: Design appraisal involves an understanding of, amongst other things, the design function, building morphology and the importance of construction technology. The selection and application of price determination production techniques requires a study of the techniques themselves in addition to associated topics, for example, documentation, cost data, cost indices, etc. Introduction to general principles of measuring and bills of quantities production.
Practicals: Application of the latest versions of industry measuring guides, and analyzing bills of quantities to build a cost database.
Assessment: Assignments (40%); 4 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Construction Drawing
ENPD1DW H1  (11L-0T-32P-0S-34H-0R-0F-0G-3A-13W-8C)

Aim: To equip students to read and understand drawings, and to be able to communicate via freehand sketches with participants in the construction industry.
Content: Documentation conventions. Production of orthographic and axonometric projections, perspectives, shadow casting and freehand sketching of relevant construction details. Production of a series of working drawings (site plan,
floor plan, sections, elevations and details) for simple single storey buildings. An introduction to computer aided design (CAD).

**Practicals:** Construction drawing in free-hand and using CAD. Field trips to buildings and building sites relevant to achieving aim.

**Assessment:** Controlled practical sessions (50%); test under exam conditions (50%)

**DP Requirement:** Students are required to attend all lectures and complete all practicals and assignments and satisfactorily, as specified in the module outline.

**This module has no supplementary exam.**

**Construction Technology & Processes 1A**
ENPD1TA H1

**(35L-17T-0P-62H-15R-26F-0G-5A-13W-16C)**

**Aim:** To provide students with a basic understanding of the processes of construction from the overall procurement process focussing on the erection of a simple, single storey dwelling.

**Content:** Building technology: structural components of simple, single storey buildings, construction materials. Building processes: briefing, site selection and usage, design, tendering and erection.

**Practicals:** Field trips to building sites, manufacturers of materials and submission of assignments implementing procedures covered in lectures.

**Assessment:** Site report (10%) assignments (10%), tests (20%); 3 h exam (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

**Construction Technology & Processes 1B**
ENPD1TB H2

**(35L-0T-17P-62H-15R-26F-0G-5A-13W-16C)**

**Prerequisite Requirement:** ENPD1TA (40%).

**Aim:** This module follows ENPD1TA continuing with the provision of a basic understanding and knowledge of the processes of construction involved in the erection of a single, simple storey dwelling.

**Content:** (i) The processes and materials involved in finishing and servicing simple, single storey dwellings (ii) The Programme of Land Surveying provides a site survey component.

**Practicals:** Field trips to building sites, manufacturers of materials and submission of assignments implementing procedures covered in lectures.

**Assessment:** Tests and assignments (40%); 3 h exam (60%)

**DP Requirement:** Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.

**Design Appraisal & Measurement 2A**
ENPD2DA H1

**(32L-0T-21P-69H-12R-0F-0G-6A-13W-16C)**

**Prerequisite Modules:** ENPD1DM.

**Aim:** To enable students to produce bills of quantities for load-bearing structures based on the latest versions of industry measuring guides, and provide an understanding of pricing bill items.

**Content:** Principles of measurement, taking-off quantities using appropriate methods, design appraisal, abstracting and billing. An introduction to and a study of the standard documents involved in this process, for example, standard system, model preambles, model preliminaries, model bill, contract document, etc., pricing selected bill items.

**Practicals:** Production of a bill of quantities for load-bearing structures for a particular building project using a combination of manual methods of “taking off” abstracting and billing.

**Assessment:** Assignments & tests (40%); 4 h exam (60%).

**DP Requirement:** Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.

**Design Appraisal & Measurement 2B**
ENPD2DB H2

**(26L-9T-17P-89H-7R-6F-0G-6A-13W-16C)**

**Prerequisite Requirement:** ENPD2DA (40%).

**Aim:** To enable students to produce bills of quantities for structural steel construction, based on the latest versions of industry measuring guides, and provide an understanding of pricing bill items
Content: Measurement principles, ‘taking-off’ quantities using appropriate methods, design appraisal, abstracting and billing. An introduction to and a study of the standard documents involved in this process, for example, standard system, model preambles, model preliminaries, model bill, contract document, etc., pricing selected bill items.

Practicals: Production of bills of quantities for structural steel construction for a particular building project using a combination of manual methods of “taking off”, abstracting and billing.

Assessment: Assignments & tests (40%); 4 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Construction Economics & Management 2A
ENPD2EA H1

Prerequisite Requirement: ECON102 (40%).

Aim: To provide an understanding of economic principles related to the construction industry and to be able to apply the principles in an international environment.

Content: Relevance of economics in the construction industry. Legal requirements for operation in an international environment. Economic indicators in the construction industry. Logistics of construction projects.

Assessment: Assignments (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

Construction Economics & Management 2B
ENPD2EB H2

Aim: To provide an understanding of management principles pertaining to the construction industry.


Assessment: Assignments & tests (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

Construction Technology & Processes 2A
ENPD2TA H1

Prerequisite Modules: ENPD1TA & ENPD1TB.

Aim: To familiarise students with the concepts of technology, resource requirements, programming and cost analysis associated with various building types.

Content: Thermal acoustic and fire properties and requirements. Construction methods involving steel frames, portal frames and shell roofs. Waterproofing and flat roofs, and lightweight claddings and coverings.

Practicals: Site surveys and data presentation.

Assessment: Assignments & tests (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

Construction Technology & Processes 2B
ENPD2TB H2

Prerequisite Requirement: ENPD2TA (40%).

Aim: To familiarise students with alternate forms of construction of reinforced concrete frames, including the usage of plant and equipment and the applicable statutory health and safety considerations.

Content: Foundation considerations including dewatering, piling, underpinning, shoring and basement construction. Slab types including prestressing and post tensioning, formwork and movement joints.

Practicals: Site investigations and data presentation.

Assessment: Assignments & tests (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.
Construction Contracts
ENPD3CC H2 (20L-6T-6P-OS-31H-6R-6F-0G-5A-13W-8C)

Prerequisite Requirement: LAWS1IL (40%).
Aim: To introduce standard building contract forms in common usage, sub-contract documentation, and the relationship between this formal documentation, common law principles and delict.
Content: Model preliminaries. Development of construction contracts in South Africa. International forms of contract. How to make appropriate choices and recommendations regarding the form of contract to be employed on a project. Targeted procurement procedures.
Assessment: Case study presentation and test (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Design Appraisal & Measurement 3A
ENPD3DA H1 (26L-9T-17P-OS-65H-6R-32F-0G-5A-13W-16C)

Prerequisite Modules: ENPD2DA & ENPD2DB.
Aim: To develop the procurement documentation expertise of students by application of Standard System of Measuring Building Work clauses to the measurement of framed reinforced concrete multi-storey structures.
Content: Students are set various measuring tasks on specific projects to afford them contact with actual conditions in the workplace. Aspects covered: bulk earthworks; column bases, foundation beams, various slab forms together with columns, beams, staircases.
Practicals: Real-life case studies.
Assessment: Assignments & tests (40%); 4 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Design Appraisal & Measurement 3B
ENPD3DB H2 (26L-15T-17P-OS-91H-6R-0F-0G-5A-13W-16C)

Prerequisite Requirement: ENPD3DA (40%).
Aim: To equip students to undertake the production of bills of quantities for complex, multi-storey buildings. To promote an understanding of principles relating to the synthesis of prices for construction units.
Content: Piling, structural steel, handrailings, sheet roofing, flat roof coverings. Preparation and pricing documents for preliminaries, tender forms, bills of quantities rates including sub-contract items.
Practicals: Real-life case studies
Assessment: Assignments & tests (40%); 4 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Construction Economics & Management 3A
ENPD3EA H1 (47L-32T-0P-0S-34H-42R-0F-0G-5A-13W-16C)

Prerequisite Requirement: ENPD2EB (50%).
Aim: To introduce students to the operations of the development industry. Further to consider appropriate forms of procurement across a broad spectrum of project types.
Content: Issues in development projects, procurement and contemporary management principles applied to various development projects, including land access, financial and marketing management, planning, implementation and community participation. Job creation. Urban dynamics.
Assessment: Assignments & tests (40%); 3 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

Project Planning
ENPD3PL H1 (48L-12T-0P-0S-80H-10R-0F-0G-10A-13W-16C)

Prerequisite Requirement: Students must be registered in at least the 3rd year of study.
Aim: To equip candidates with the skills and knowledge of technology necessary for the effective planning and control
of sizeable projects.


**Assessment**: Assignments & tests (40%); 3 h exam (60%).

**DP Requirement**: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

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**Project Management**

ENPD3PM H2  
(36L-6T-16P-0S-162H-15R-0F-0G-5A-13W-24C)

**Prerequisite Requirement**: Students must be registered at least in the 3rd year of study.

**Aim**: To provide a conceptual framework for the discipline of project management as well as an appreciation of environmental complexity and change.

**Content**: Systems thinking. Design management: Understanding the design process. Human resource management: leadership in project management, project team building, negotiation strategies, communication skills. Project strategy: procurement strategy, characteristics of construction projects, the role of the client, conflicting project objectives. Theory of construction project management: formulation of project strategy, project organisation structure. Conflict management

**Assessment**: Assignments & tests (40%); 3 h exam (60%).

**DP Requirement**: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

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**Project Planning & Management Control**

ENPD3PP H1  
(26L-12T-0P-32H-5R-0F-0G-5A-13W-8C)

**Prerequisite Requirement**: Students must be registered in at least the 3rd year of study.

**Aim**: To analyse projects to model alternative methods in order to plan and then control sizeable projects, and to make strategic and tactical planning decisions. To apply operations research techniques to project management problems.


**Assessment**: Test and assignment (30%); 3 h exam (70%).

**DP Requirement**: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

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**Property Law**

ENPD3PR H2  
(36L-9T-0P-9S-84H-17R-0F-0G-5A-13W-16C)

**Aim**: Develop an understanding of the basic principles of property law in South Africa.

**Content**: Legal classification of immovable property in South Africa; the concept, acquisition, exercising, and loss of rights over immovable property; statutes and ordinances affecting property development and valuation in South Africa.

**Assessment**: Tests & assignment (40%); 3 h exam (60%).

**DP Requirement**: Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

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**Property Studies**

ENPD3PS H1  
(36L-9T-0P-9S-84H-17R-0F-0G-5A-13W-16C)

**Prerequisite Requirement**: Students must be registered at least in the 3rd year of study.

**Aim**: To introduce students to the nature of land ownership, use and development and the financial tools required for the evaluation of development and investment opportunities. Develop practical skills in financial mathematics used in
the property industry.


**Assessment:** Tests & assignment (30%); 3h exam (70%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

### Construction Technology & Processes 3A

**ENPD3TA H1**

**Prerequisite Modules:** ENPD2TA & ENPD2TB.

**Aim:** The study of advanced building construction and services.

**Content:** Critical evaluation of design layouts and detailing in relation to viability of cost, ease of construction and aesthetic acceptability. The production process relating to the interaction of specialist services within the context of the overall building programme for complex and specialist buildings.

**Practicals:** Practical case study.

**Assessment:** Assignments & tests (40%); 3h exam (60%).

**DP Requirement:** Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.

### Law of Building Contracts

**ENPD7BC H2**

**Prerequisite Modules:** LAWS1AS or LAWS1IL

**Aim:** To introduce the legal principles and case law in construction. To evaluate contracts; the legal aspects of procurement; their relation to other rights, obligations ad conduct of the parties; law in South Africa

**Content:** Building contract law: contracts; tendering and conventional penalties act; contract insurances; certificates, instructions and variations; defects; patent and latent; extensions of time; sureties; arbitration and mediation. Common law applications: Lien and spoliation orders; liquid documents; voidable contracts. Principal statutes: prescription; Conventional Penalties Act; Arbitration Act; Insolvency Act; Administration of Estates Act.

**Assessment:** Assignments & tests (40%); 3h exam (60%).

**DP Requirement:** Satisfactory attendance at tutorials/lectures and satisfactory completion of all assignments and tutorials as applicable.

### Cost Engineering

**ENPD7CE H1**

**Aim:** Display an understanding of the client briefing process and the importance of effective communication. Recognise the long term impact of properly planned construction costs. Consider and apply whole life costs through life cycle costing.

**Content:** The client briefing process; the theory and techniques of construction cost planning and control; design economics; cost and price indices; pricing of contract preliminaries - profit and overheads. The preparation of price forecasts; communication applied to the cost management environment; risk management and risk analysis; life cycle costing; artificial intelligence and expert systems; facilities management; The cost-centred approach to viability studies.

**Assessment:** Assignments (40%); two 3 exams (60%).

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

### Management of Construction Contracts

**ENPD7CL H2**

**Prerequisite Requirement:** Only students registered in the 4th year of study permitted to undertake this module.

**Aim:** To expose students to forms of contract adopted internationally, as well as statutes governing Occupational Health and Safety standards within the built environment in South Africa.
Content: International Construction Contracts; Primary legal principles adopted in construction contracts; Occupational Health and Safety legislation in South Africa.

Assessment: Assignments (40%); 3 h exam (60%). Engineering students are required to show competence in ECSA Outcomes 7 & 10 relevant to this module.

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Applied Construction Management
ENPD7CM H2

Aim: To prepare students for the management of a construction site: construction health and safety, work study and method statements, site planning, plant management, management of construction project risk.

Content: Legislated and practical requirements relative to construction health and safety; work study in theory and practice within a construction site environment; preparation and use of method statements; selection and management of construction plant.

Assessment: Major assignment and presentation (100%)

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Advanced Construction Technology
ENPD7CT H1

Aim: Advanced concepts in construction technology and practice, integrating technology, management and economics. The provision of Engineering services and infrastructure design and documentation, and appropriate, alternative technology for residential township development.

Content: Lean construction. Detailed construction method statements, site establishment, applications of laws and regulations pertaining to construction sites. Health and safety planning and practical applications. Plant selection. Industrial building systems.

Assessment: Assignments (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Advanced Design Appraisal & Measurement
ENPD7DA H2

Aim: The study of basic financial control functions demanded of a Quantity Surveyor in private practice.

Content: Tender preparation, submission and evaluation; cash flow projections; cash reports and budgets; interim payment certificates; final account preparation; professional fee accounts; cost/price adjustment (escalation) applications.

Assessment: Assignments (40%); 3 h exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Project Administration
ENPD7PA H1

Aim: To introduce specialist management techniques in the construction industry, in the areas of site management, health and safety, operations research, life cycle costs and value management. The subject emphasises the importance quality change management and sustainability.

Content: Site management: work study, plant selection and management, site layout and planning, site safety. Process and production management: business complexity, competition, linear and non-linear programming, decision theory. Specialist management: life cycle costing, value management, total quality management, business process re-engineering, sustainability, procurement methods for major projects.

Assessment: Assignments, test (40%); two 2 h exams (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.
Property Development Economics
ENPD7PE H1  (36L-6T-6P-0S-96H-5R-6F-0G-5A-13W-16C)
Aim: To expose students to the full spectrum of property-related disciplines and issues with the aim of providing the necessary skills to enter the property field at a professional managerial level.
Content: Land tenure and forms of ownership; leases and tenants; Investment in real property; property unit trusts; dynamics of retail location; principles of property development; Finance for property development; introduction to property portfolio management; important property legislation; effects of planning controls on development and value; viability studies; financial evaluation techniques; rating.
Assessment: Assignments, tests (40%); 3 h exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Professional Practice
ENPD7PP H1  (26L-6T-6P-0S-31H-6R-0F-0G-5A-13W-8C)
Prerequisite Requirement: Only students registered in the 4th year of study permitted to undertake this module.
Aim: To expose students to the statutes governing the property/construction industry professions - with the specific objective of preparing them for the establishment and development of a professional practice. Introduce students to the complexity of modern professional office administration and practice management.
Content: Structuring the professional practice and contractual agreements; marketing the practice; legislation governing professional practice; practice administration and management; financial management; tax planning; insurances; elements of social interactions/interpersonal communication.
Assessment: Assignments (40%); 3 h exam (60%). Engineering students are required to show competence in ECSA Outcomes 8 & 10 relevant to this module.
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals, assignments and tutorials satisfactorily, as specified in the module outline.

Property Valuations
ENPD7PV H2  (26L-0T-6P-0S-31H-6R-6F-0G-5A-13W-8C)
Aim: Advanced applications of economic and mathematical theory to real estate to develop a comprehensive understanding of property valuation and investment principles and the complexity of modern property ownership and the effect of legislation and taxation.
Content: Definitions of value and cost; factors affecting property values; functions of valuers - Valuation Act 23 of 1982 (as amended); valuation of vacant land; sales comparison approach; replacement/reproduction cost technique; income capitalisation method; valuation for insurance; interests in property - freehold & leasehold. Valuation of 'special type' properties; expropriation; rating and taxation of real estate.
Assessment: Assignment (30%); 3 h exam (70%).
DP Requirement: Students are required to attend all lectures and complete all practicals and assignments satisfactorily, as specified in the module outline.

Research Methodology
ENPD7RM H1  (36L-6T-6P-0S-112H-0R-0F-0G-0A-13W-16C)
Aim: To develop the personal skills of students as researchers investigating in depth a particular issue for the construction industry. This forms the foundation for a research report to be completed as part of ENPD7RR.
Content: Data acquisition - the use of library resources; selecting and justifying a research topic; planning the research project; literature searching; analysing data; gathering data; data processing packages for research output management; executing the research; presentation of the research findings
Assessment: Research proposal (100%).
This module has no supplementary exam.

Research Report
ENPD7RR H2  (0L-12T-0P-0S-228H-0R-0F-0G-0A-13W-24C)
Aim: To study a defined topic illustrating creativity, critical analysis, synthesis, evaluation, discrimination and
academic objectivity. To provide evidence of management of own study within pre-determined objectives and present the work cogently.

**Content:** This module flows directly from ENPD7RM and registration for the module can be confirmed only once a synopsis and programme of proposed study has been accepted by the Module Leader. Students' progress is closely monitored - supervisors and students being expected to meet for approximately 1 hour per week. The student is expected to plan and execute the research report on their own initiative.

**Assessment:** Major assignment and presentation (100%)

**DP Requirement:** Report of satisfactory progress by supervisor.

This module has no supplementary exam.

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**Simulated Office Project**

ENPD7SO H2

(26L-9T-0P-125H-0R-0G-0A-13W-16C)

**Prerequisite Modules:** ENPD7CE.

**Aim:** To integrate theoretical study of procurement management, in terms of a multi-disciplinary based project representing typical conditions of professional practice.

**Content:** Students ‘practice’ as a quantity surveying consultancy. Each group is allocated an architectural ‘firm’. Professional teams interact with client bodies in the formulation of a project brief, the establishment of budget limitations and the ascertainment of project time considerations and produce a detailed project appraisal report. Quantity surveying ‘firms’ to provide a full service to their architectural counterparts. Detailed procurement documentation is compiled and tender bids/proposals.

**Assessment:** Major assignment and presentation (100%)

**DP Requirement:** Students are required to attend all tutorials/lectures and complete all assignments and tutorials satisfactorily, as specified in the module outline.

This module has no supplementary exam.

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**Advanced Research Methodology**

ENPD8RM HC

(12L-0T-0P-68H-0R-0G-0A-6W-8C)

**Aim:** To develop the personal skills of students as researchers investigating in depth a particular issue for the property construction industry. This forms the foundation for a research dissertation. Candidates are required to demonstrate understanding of scientific and research methods, and mastery of the necessary techniques, whilst becoming sufficiently acquainted with the relevant literature. Being able to assess the significance of their findings.

**Content:** The module covers qualitative versus quantitative approaches to: data acquisition; planning the research project; literature searching; gathering and analysing data; presentation of the research findings.

**Assessment:** Research proposal (100%).

**DP Requirement:** Report of satisfactory progress by supervisor.

This module has no supplementary exam.

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**Recombinant DNA Technology**

Offered in the School of Life Sciences

**Molecular DNA Technology**

RDNA202 P2 W2

(39L-10T-39P-60H-7R-0F-0G-5A-13W-16C)

**Prerequisite Modules:** BIOL101 or BIMI120; CHEM110, 120.

**Aim:** To provide a strong foundation in bacterial and viral molecular biology and recombinant DNA technology.


**Practicals:** Hands on experience in screening for bacterial mutants, detection of antibiotic resistance, conjugation and transduction and bacteriophage cultivation. Hands on experience with basic recombinant DNA technology techniques.

**Assessment:** Practicals (25%), 2 h theory tests (25%); 3 h exam (50%).

**DP Requirement:** Class mark of 40%, attendance at 80% of tutorials and practicals.
Resource Management
Offered in the School of Agricultural, Earth and Environmental Sciences

Natural Resource Identification
RMGT151 P1  (39L-0T-32P-0S-40H-20R-0F-24G-5A-13W-16C)

Aim: To provide an introduction into the different natural resources that play a pivotal role in farming systems.
Content: Natural Resource terminology; Bioresource units and bioresource groups; climate; soil erosion; water sources and use; stock watering; soil physical properties; soil water; vegetation dynamics; land units; veld condition assessments.
Practicals: Weekly 2 hour practical.
Assessment: Tests (20%), assignments (20%), practical assessments (10%); 3 h exam (50%).
DP Requirement: 40% Class mark; 80% attendance at lectures and practicals.
Only for students registered at Cedara College of Agriculture.

Impact on Natural Resources
RMGT152 P2  (39L-0T-32P-0S-40H-20R-0F-24G-5A-13W-16C)

Aim: To provide insight into the consequences of interventions on the environment and therefore management decisions.
Content: Soil chemical properties; soil fertility; vegetation cover; erosion and its control; gully reclamation; classification and structure of vegetation; vegetation encroachment.
Practicals: Bi-weekly 2 hour practical; scheduled field trip to study natural resource management in a real life setting.
Assessment: Tests (20%), assignments (20%), practical assessments (10%); 3 h exam (50%).
DP Requirement: 40% Class mark; 80% attendance at lectures and practicals.
Only for students registered at Cedara College of Agriculture.

Land Use Planning*
RMGT153 P2  (10L-10T-40P-17S-170H-30R-40F-0G-3A-26W-32C)

Prerequisite Modules: FRME262.
Corequisite: FMBT371.
Aim: To enable students to produce, in a real-world setting, a comprehensive farm plan.
Content: Application of land use planning and general agricultural principles.
Practicals: Weekly 2 hour practical.
Assessment: Land use plan, oral and examination (100%). There is no separate class mark. All students are required to produce a land use plan, make an oral presentation and write an examination. Each one of these components has to be passed. Students will receive a single final mark for the module.
DP Requirement: 40% Class mark; 80% attendance at lectures and practicals.
Year-long Module. Only for students registered at Cedara College of Agriculture.

Rural Resource Management
Offered in the School of Agricultural, Earth and Environmental Sciences

Systems Thinking Foundations
RRMG700 PY  (45L-0T-0P-115H-0R-0F-0G-0A-26W-16C)

Aim: To give students a foundation in experiential learning and systems methodologies.
Assessment: 1 report on a project in which systems methodology is applied to a real world problem situation (100%).
Agriculture, Engineering & Science

**Rural Development Placement**
RRMG710 PY  
(6L-0T-0P-314H-0R-0F-0G-0A-26W-32C)

**Corequisite:** RRMG711 or 712.

**Aim:** To develop and apply a learning framework in the acquisition of a competency based on the theory learned in RRMG711 and/or RRMG712.

**Content:** Developing and applying a learning framework. Practical application of a learning framework in a real-life experience (internship) in rural development/agricultural extension within a government department, NGO or other relevant agency or organisation. Reflecting on the practical application of the framework and evaluating the framework and the internship experience.

**Practicals:** An internship with an organisation/institution.

**Assessment:** Portfolio (80%), oral presentation reflecting on the internship experience (20%). [Portfolio: Placement report (30%), Reflection Report (20%), Programme Proposal (30%)]

**DP Requirement:** Not applicable.

**Year-long module. This module has no supplementary exam.**

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**Advanced Communication & Innovation**
RRMG711 PY  
(45L-0T-0P-115H-0R-0F-0G-0A-26W-16C)

**Aim:** To give students an understanding of, and hands on experience with innovation in agriculture and rural development.

**Content:** Social learning theory; Participatory Technology Development (PTD); farmer to farmer learning through Farmer Field Schools (FFS); Rapid Appraisal of Agricultural Knowledge Systems (RAAKS); facilitating joint learning and action through Participatory Learning & Action methodologies.

**Assessment:** Papers (40%), project plan (10%), final paper (40%), presentation (10%).

**DP Requirement:** Not applicable.

**Year-long Module. This module has no supplementary exam.**

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**Project Design & Management**
RRMG712 PY  
(45L-0T-0P-115H-0R-0F-0G-0A-26W-16C)

**Prerequisite Requirement:** RRMG350 or similar project management module or experience in working with organisational systems recommended in consultation with the Academic Director and approved by the Dean.

**Aim:** To give students advanced project design & management skills.

**Content:** Development & development projects. Project cycle: blueprint vs. process approach. Project boundaries & environments: taxonomy of environments & insights from CST. Project Appraisal. Implementation planning: work breakdown structure; Gantt Charts; Critical Path Analysis; PERT. Recent trends in the development paradigm.

**Assessment:** 1 report on the process & outcome of a project designing activity (100%).

**DP Requirement:** Not applicable.

**Year-long Module. This module has no supplementary exam.**

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**Ag Extension / Development Research Project**
RRMG750 PY  
(12L-0T-0P-4S-384H-0R-0F-0G-0A-26W-40C)

**Aim:** To undertake supervised research on a theme relevant to rural development, agricultural development, agricultural extension or a related area to develop post-graduate level research and writing skills.

**Content:** Structured development of a research project. Seminars and mini-dissertation on the chosen theme.

**Assessment:** Research journal (20%), Examination of mini-dissertation (80%).

**DP Requirement:** Not applicable.

**Year-long module. This module has no supplementary exam.**
Soil Science

*Offered in the School of Agricultural, Earth and Environmental Sciences*

**Introduction to Soil Science**

**SSCI212 P1**  
(18L-4T-18P-0S-24H-12R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** CHEM110.

**Aim:** To provide a basic introduction to the physical and chemical properties and processes of soils.

**Content:** Particulate nature of soil; texture, structure and porosity; retention and movement of water in soil; plant available water. Types of clay minerals; cation exchange capacity and ion exchange reactions; flocculation/dispersion behaviour of colloids and its effect on soil aggregation.

**Practicals:** Field determination of texture, colour, structure and water infiltration. Laboratory analysis of particle size, pH, exchangeable cations, extractable acidity and hydraulic conductivity.

**Assessment:** 2 theory tests (20%), prac laboratory reports & tutorial reports (13%), 2 h exam (67%).

**DP Requirement:** 80% attendance at practicals; 40% Class mark.

Credit may not be obtained for both SSCI212 and SSCI217.

**Introduction to Soils & the Environment**

**SSCI217 P1**  
(37L-6T-33P-0S-54H-25R-0F-0G-5A-13W-16C)

**Aim:** To understand soil processes and their role within the environment.

**Content:** Soil-quality; formation; properties; survey; land evaluation. Reactions of nutrients with soil mineral and organic surfaces, land treatment of wastes and soil pollution. Major & trace elements and fertilizer sources. Water retention & movement; water availability; infiltration and evaporation. Soil compaction, aggregate stability and crusting.

**Practicals:** Field: texture; colour, structure, infiltration; soil identification; land evaluation. Laboratory: particle size; pH; cation exchange properties; P; C; hydraulic conductivity; fertilizer sources; assessment of variability.

**Assessment:** 2 theory tests (17%), laboratory & field reports & tutorials (16%); 3 h exam (67%).

**DP Requirement:** 80% attendance at practicals and tutorials; 40% Class mark.

**Pedology**

**SSCI230 P2**  
(36L-0T-61P-0S-40H-19R-0F-0G-4A-13W-16C)

**Prerequisite Modules:** SSCI217.

**Aim:** To provide an understanding of the field study of soils.

**Content:** The morphology, genesis and spatial distribution of soils. Palaeopedology and recognition of relic features within current surface soils. Soil classification - South African, FAO, and USDA systems. Soil survey and mapping methods and objectives. Land capability and suitability using international and local systems.

**Practicals:** The field description and classification of soils. Attendance at two full day field trips held on weekends is compulsory. A compulsory one week field mapping project may also be held and students are required to contribute towards the costs.

**Assessment:** 2 tests (20%), & project reports (20%); 3 h exam (60%).

**DP Requirement:** 40% Class mark.

**Soil Fertility & Plant Nutrition**

**SSCI320 P2**  
(36L-5T-40P-0S-51H-23R-0F-0G-5A-13W-16C)

**Prerequisite Modules:** SSCI217 or 212.

**Aim:** To provide a scientific and practical understanding of the management of agricultural and horticultural soils for sustainable crop production.

**Content:** Soil testing and plant analysis as aids to making fertilizer recommendations and diagnosing nutrient deficiencies/imbalances. Fundamentals of fertilizer practice. Chemistry/biochemistry of nitrogen, phosphorus, potassium, magnesium, calcium, sulphur and micronutrients in soils in relation to their uptake and use by crops. Nature of soil acidity, tolerance of crops to acidity, use of lime and gypsum as ameliorants.

**Practicals:** Soil fertility evaluation involving a glasshouse experiment.

**Assessment:** 2 tests (20%), project report (30%); 3 h exam (50%).

**DP Requirement:** 80% attendance at practicals; 40% Class mark.
Soil Water Use & Management
SSCI351 P1  (17L-4T-18P-0S-25H-12R-0F-0G-4A-13W-8C)
Prerequisite Modules: SSCI217 or 212.
Aim: To provide a fundamental understanding of soil-water relationships and their applications.
Content: Soil water content and energy; water retention characteristics; measurement of soil water; water flow under saturated and unsaturated conditions. Soil physical properties in relation to hydrological processes; infiltration; internal drainage and redistribution; evaporation from bare and vegetated surfaces; soil water management in irrigated agriculture.
Practicals: A laboratory project involving measurement of soil water status and water flow through soils.
Assessment: 2 theory tests (17%), laboratory project report (16%); 2 h exam (67%).
DP Requirement: 40% Class mark.

Soil Structure & its Management
SSCI352 PC  (18L-3T-18P-0S-25H-12R-0F-0G-4A-13W-8C)
Prerequisite Modules: SSCI217 or 212.
Aim: To gain an understanding of the structural make-up of soils and its implications.
Content: Factors influencing soil strength and consistency and the formation and stabilization of micro- and macrostructure. Effects of dissolved salts on hydraulic properties, crusting and hard setting. Quality of irrigation water and liquid wastes and their effects on soil structure. Sodic soils and their reclamation. Sources and consequences of soil compaction and corrective measures.
Practicals: A laboratory project on selected local soils involving measurement of various soil structural characteristics.
Assessment: 2 theory tests (20%), laboratory project report (13%); 2 h exam (67%).
DP Requirement: 40% Class mark.
Offered in either Semester 1 or 2.

Contaminants of the Soil Environment
SSCI371 P1  (18L-4T-18P-0S-25H-12R-0F-0G-3A-13W-8C)
Prerequisite Modules: SSCI217 or 212.
Aim: To provide an understanding of the causes and consequences of contamination of soils.
Content: Source and nature of the major contaminants added to soils (e.g. industrial, municipal and agricultural wastes, pesticides, petroleum hydrocarbons and other organic materials). Reactions of inorganic (e.g. heavy metals) and organic (e.g. pesticides) contaminants with soils and soil components; factors affecting their mobility and/or degradation in soils; their effect on soil processes; management and amelioration of contaminated soils.
Practicals: A laboratory project on soil contamination and its effect on soil processes.
Assessment: 1 theory test (17%), laboratory project report (16%); 2 h exam (67%).
DP Requirement: 40% Class mark.

Soil Processes, Ground Water, AtmosPollution
SSCI372 P2  (18L-4T-18P-0S-25H-12R-0F-0G-3A-13W-8C)
Prerequisite Modules: SSCI217 or 212.
Aim: To provide an understanding of soil processes that lead to pollution of waterways and the atmosphere.
Content: Leaching losses of nitrate and other solutes from soils; principles and modelling of solute movement: factors affecting leaching and effects on groundwater pollution. Processes involved in gaseous emissions of nitrous oxide, ammonia and methane from soils including denitrification, ammonia volatilization and methanogenesis. Extent and consequences and such losses.
Practicals: A laboratory project on soil processes leading to environmental pollution.
Assessment: 1 test (17%), laboratory project report (16%); 2 h exam (67%).
DP Requirement: 40% Class mark.

Chemical Processes in the Soil Environment
SSCI710 P1  (18L-4T-18P-0S-25H-12R-0F-0G-3A-13W-8C)
Prerequisite Modules: SSCI217 or 212.
### Syllabus

**Aim:** To provide an understanding of basic chemical processes which occur in the soils.

**Content:** Soil solution chemistry; colloidal chemistry; electrical double layer theory; adsorption phenomena; mineral solubility; ion exchange; redox equilibria; organic interactions with soil surfaces. Applications of soil chemical processes in agriculture and environmental protection.

**Practicals:** Laboratory measurements of chemical properties and processes in soils.

**Assessment:** One theory test (17%) and a written laboratory project report (16%); 2 h exam (67%).

**DP Requirement:** 40% Class mark.

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**Biological Processes in the Soil Environment**  
SSCI760 PC  
(18L-4T-18P-0S-25H-12R-0F-0G-3A-13W-8C)

**Prerequisite Modules:** SSCI217 or 212.

**Aim:** To provide an understanding of biota and the biological processes that occur in soils.

**Content:** Nature of microorganisms and fauna that inhabit soils. Role of the soil microbial biomass and soil enzymes in nutrient availability and as indicators of soil quality. Role of earthworm and termite communities in nutrient turnover and soil structural condition. Manipulation of the soil microbial community to ameliorate contaminated soils.

**Practicals:** A laboratory project on soil biological processes.

**Assessment:** One theory test (17%) and a written laboratory project report (16%); 2 h exam (67%).

**DP Requirement:** 40% Class mark.

**Offered in either Semester 1 or Semester 2.**

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**Sustainable Soil Fertility Management**  
SSCI770 P2  
(18L-4T-18P-0S-24H-12R-0F-0G-4A-13W-8C)

**Prerequisite Modules:** SSCI217 or 212.

**Aim:** To provide an understanding of selected contemporary issues in soil fertility management.

**Content:** Nature and management of acid soils; chemistry of soil Al, speciation of Al in soil solution, Al toxicity in plants, lime as an ameliorant; P/lime interactions. Nature of subsoil acidity, role of gypsum. Role of soil organic matter in sustainable agriculture, alternative agricultural practices, effects of tillage practice and crop rotations on soil fertility. Concept and role of soil quality indices.

**Practicals:** A field/laboratory project on soil fertility evaluation.

**Assessment:** Two tests (20%), written field/laboratory report (13%); 2 h exam (67%).

**DP Requirement:** 40% Class mark, compulsory attendance at all academic contact activities.

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**Pedological Processes in the Environment**  
SSCI780 P2  
(18L-4T-20P-0S-22H-10R-3F-0G-3A-13W-8C)

**Prerequisite Modules:** SSCI217 or 212.

**Aim:** To provide a detailed understanding of selected contemporary pedological topics.

**Content:** Weathering and humification processes and environmental factors; movement of material in soils and across landscapes; time as a factor of soil formation; soils and archaeology; alternative theories of soil formation; micromorphological and electron optical studies of soil materials; pedological modelling; X-ray diffraction as a pedological tool.

**Practicals:** Computer simulation techniques for pedology; introduction to electron microscopy and X-ray diffraction for clay mineral identification; field trip.

**Assessment:** One theory test (17%) and written reports (16%) on practical work; 2 h exam (67%).

**DP Requirement:** 40% Class mark.

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**Soil Science Seminar**  
SSCI792 PY  
(0L-0T-0P-160S-0H-0R-0F-0G-0A-26W-16C)

**Prerequisite Modules:** SSCI217 or 212.

**Aim:** To provide experience in researching and synthesizing scientific literature on a specific topic.

**Content:** Search for information in the scientific literature on an approved topic; prepare a scientific review paper; present the paper orally.

**Assessment:** Written review paper (70%), oral presentation (30%).

**DP Requirement:** Not applicable.

**Year-long Module. This module has no supplementary exam.**
Research Project in Soil Science
SSCI793 PY (0L-0T-320P-0S-160H-0R-0F-0G-0A-26W-48C)
Prerequisite Requirement: Admission to BSc (Hons) majoring in Soil Science or to Level 4 of BSc (Agric) majoring in Soil Science.
Aim: To provide experience in conducting a research project and preparation of a scientific paper.
Content: Conduct an approved research project, prepare a scientific paper on the results, present the results orally.
Assessment: Written scientific paper (75%), oral presentation (25%).
DP Requirement: Not applicable.
Year-long Module. This module has no supplementary exam.

Advanced Topics in Soil Science
SSCI794 PY (0L-0T-50P-0S-100H-10R-0F-0G-0A-26W-16C)
Prerequisite Modules: SSCI217 or 212.
Aim: To introduce students to a range of advanced topics in soil science.
Content: Selected advanced topics and contemporary issues in soil science from an environmental and agricultural perspective.
Practicals: Field trips and laboratory exercises.
Assessment: Assignments (100%).
DP Requirement: Not applicable.
Year-Long Module. This module has no supplementary exam.

Statistics
Offered in the School of Mathematics, Statistics and Computer Science

Introduction to Statistics
STAT130 PB WB (39L-36T-0P-0S-65H-13R-0F-0G-7A-13W-16C)
Prerequisite Requirement: Higher Grade D or Standard Grade A for Matric Mathematics or NSC Level 5 Maths.
Aim: To introduce a wide range of statistical techniques required for the analysis of quantitative data.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.
Credit may not be obtained for both STAT130 and STAT370.

Statistical Methods
STAT140 P2 W2 (39L-36T-0P-0S-65H-13R-0F-0G-7A-13W-16C)
Prerequisite Requirement: 40% in MATH130.
Prerequisite Modules: STAT130.
Corequisite: MATH140.
Aim: To introduce the student to basic probability concepts and theory as well as nonparametric techniques.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.
Sampling and Nonparametric Methods
STAT221 P1 W1

Prerequisite Requirement: 40% in one of MATH130, 133, 134 or 195.
Corequisite: STAT130.
Aim: To equip the student with the tools to design and effectively analyze the results of a sample drawn from a finite population. To introduce the student to nonparametric methods for survey data.
Assessment: Two tests (20%), practical assignments (10%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at practicals and tutorials. Completion of all assignments.
Students may not obtain credit for STAT222 and either of BMET210 or BMET222.

Experimental Design and Analysis
STAT222 P2 W2

Prerequisite Requirement: 40% in one MATH130, 133, 134 or 195.
Prerequisite Modules: STAT130.
Aim: To provide the skills necessary to analyze & summarize various types of data with an emphasis on experimental design. Stress will be placed on statistical reasoning & applications, rather than derivation of theoretical details.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.
Students may not obtain credit for STAT222 and either of BMET210 or BMET222.

Probability Distributions
STAT230 P1 W1

Prerequisite Modules: MATH140, STAT140.
Corequisite: MATH212.
Aim: To introduce the student to univariate and bivariate distributions.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.

Statistical Inference
STAT240 P2 W2

Prerequisite Requirement: 40% in MATH212.
Prerequisite Modules: STAT230.
Corequisite: MATH251.
Aim: To introduce the student to statistical inference.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.
Linear Models
STAT301 P1 W1

Prerequisite Modules: MATH212 and 251, (STAT240 or BMET314).
Aim: To introduce the student to the theory and application of the general linear model.
Content: Topics from linear algebra. The Gauss-Markov Theorem. The general linear model of full rank and less than full rank. Regression analysis. Analysis of variance and covariance.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.

Biostatistics Methods
STAT305 P2 W2

Prerequisite Modules: STAT230 and (STAT301 or BMET314).
Aim: To provide the student with a thorough understanding of biostatistics and to expose the student to a range of practical problems in that area.
Practicals: Computer-based exercises on the above topics.
Assessment: Two tests (20%), practicals (10%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at practicals.

Applied Statistics
STAT330 P2 W2

Prerequisite Modules: STAT301.
Aim: To provide the student with practical applications of statistical topics.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.

Random Processes
STAT350 P2 W2

Prerequisite Modules: STAT360.
Aim: To introduce the student to the theory and applications of stochastic models.
Assessment: Two tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.

Applied Probability Theory
STAT360 P1 W1

Prerequisite Requirement: 40% in MATH212 and 251.
Prerequisite Modules: STAT240.
Aim: To expose the student to a range of applications of probability theory and to provide the student with the necessary techniques for recognizing and solving problems in probability.
Assessment: Tests (30%); 3 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.

Engineering Statistics
STAT370 H1

Prerequisite Requirement: DP in MATH248.
Aim: To introduce engineering students to elementary probability theory and statistical methods.

Content: Elementary probability, standard distributions, bivariate distributions. Estimation of parameters and testing of hypotheses. Regression analysis.

Assessment: Tests (30%); 2 h exam (70%).

DP Requirement: 30% Class mark, 80% attendance at tutorials.

Offered only at Howard College to Engineering students. Credit may not be obtained for both STAT370 and STAT130.

Time Series & Forecasting

STAT710 PC WC

Aim: To provide the student with a thorough understanding of time series methodology and forecasting and to expose the student to a range of practical problems in those areas.

Content: Descriptive techniques for time series. Probability models for time series. Estimation in the time domain. Principles of forecasting. A miscellany of topics in time series analysis which may include, inter alia, stationary processes in the frequency domain, spectral analysis, bivariate processes and state-space modelling.

Practicals: Computer-based exercises on the above topics.

Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Bayesian Inference

STAT711 PC WC

Aim: To introduce the student to Bayesian theory and methods.

Content: Inference and estimation using Bayesian methods.

Assessment: Class mark (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Regression Diagnostics

STAT712 PC WC

Aim: To equip the student with regression diagnostic techniques to employ when fitting regression models to data and checking on the adequacy of the model.

Content: Checking the linear model assumptions of normality, independent errors and constant variance. Transformations of variables. The problem of multicollinearity. Other diagnostic tests including Cook's D, DIFFITS and DIFFBETAS.

Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

Econometrics

STAT713 PC WC

Aim: To enable the student to understand the theory and practical applications of econometric methods.


Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 100% computer lab attendance.

Offered in either Semester 1 or 2.

The Generalized Linear Model

STAT714 PC WC

Aim: To provide the student with a thorough understanding of generalized linear models and to expose the student to a range of practical problems in that area.

Content: The principles of model fitting. Exponential family of distributions and generalized linear models. Estimation

**Practicals:** Computer-based exercises on the above topics.

**Assessment:** Tests (20%); 3 h exam (80%).

**DP Requirement:** 80% attendance.

**Offered in either Semester 1 or 2.**

### Multivariate Analysis

STAT715 PC WC

Aim: To introduce the student to some multivariate distributions, multivariate models and statistical testing procedures.


Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

### Advanced Probability Theory

STAT716 PC WC

Aim: To expose the student to a measure-theoretic approach to modern probability theory.

Content: Advanced probability theory with the relevant measure theory.

Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

### Queueing Theory

STAT717 PC WC

Aim: To give a systematic account of the basic formulae of queueing theory and their applications.


Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

### Stochastic Processes

STAT718 PC WC

Aim: To establish the theoretical foundations of stochastic models and the applications thereof.


Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.

### Sampling Theory

STAT719 PC WC

Aim: To investigate principles of sampling by focusing on various survey procedures commonly used by government departments, in industry and in commerce.


Assessment: Tests (20%); 3 h exam (80%).

DP Requirement: 80% attendance.

Offered in either Semester 1 or 2.
Time Series Analysis
STAT721 PC WC (39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide a thorough understanding of the theory and computer applications of time series techniques.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 100% computer lab attendance.
Offered in either Semester 1 or 2.

Advanced Topics in Statistics
STAT723 PC WC (29L-10T-0P-0S-102H-13R-0F-0G-6A-13W-16C)
Aim: To investigate some statistical topics of current research interest.
Content: Topics in statistics, not included in the list of specified modules or additional aspects of the listed modules (e.g. multivariate analysis, time series analysis, econometrics), may be offered.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Statistical Inference II
STAT729 PC WC (29L-10T-0P-0S-102H-13R-0F-0G-6A-13W-16C)
Aim: To expose the student to non-parametric statistics and sequential analysis.
Content: Sequential analysis, goodness-of-fit, Kolmogorov-Smirnov test, sign test, rank tests, tolerance intervals.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Mixed Models & Spatial Statistics
STAT730 PC WC (39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide the student with a basic theory of linear mixed models and the particular extension to spatial forms of covariance.
Practicals: Computer-based exercises on the above topics.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Experimental Design
STAT740 PC WC (39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide the student with a basic theory of experimental design, particularly in incomplete blocks and in the design and analysis of complex experiments.
Content: Partial confounding in factorials. Fractional replication. Incomplete block designs and the recovery of inter-block information. Incomplete blocks from a mixed model perspective. Experimental design for repeated measures including cross-overs. Alpha lattices & designs for spatial models. Practical analysis of complex designs using SAS and GENSTAT.
Practicals: Computer-based exercises on the above topics.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

Simulation with R
STAT741 PC WC (39L-18T-18P-0S-63H-13R-0F-0G-9A-13W-16C)
Aim: To study the theory and practical applications of simulation methods using R as a programming language.
Statistical validation techniques. Practical computing using R.
Assessment: 3 tests (20%); 3h exam (80%).
DP Requirement: 30% average for tests; 90% attendance at computing practical sessions; 80% attendance at
lectures.
Offered in either Semester 1 or Semester 2.

Applied Multivariate Analysis
STAT751 PC WC
(39L-18T-18P-0S-65H-13R-0F-0G-7A-13W-16C)
Aim: To investigate multivariate statistical methods: Data reduction techniques, grouping and dependence amongst
variables.
Canonical correlation. Clustering.
Assessment: 3 tests (20%); 3h exam (80%).
DP Requirement: 30% average for tests; 90% attendance at computing practical sessions; 80% attendance at
lectures.
Offered in either Semester 1 or Semester 2.

Recent Topics in Statistics
STAT752 PC WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide the student with knowledge and skills in selected topics in Statistics.
Content: Miscellaneous topics from areas in Statistics which are of current interest to researchers and practitioners.
Practicals: Computer-based exercises.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 40% Class mark, 80% attendance.
Offered in either Semester 1 or 2.

Special Topics in Biostatistics
STAT753 PC WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide the student with knowledge and skills in special topics in Biostatistics.
Content: Special Biostatistics topics from the areas in Biostatistics which may not have been covered by other
honours courses offered.
Practicals: Computer-based exercises.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 40% Class mark, 80% attendance.
Offered in either Semester 1 or 2.

Nonparametric Inference
STAT754 PC WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide the student with knowledge and skills in nonparametric statistical theories and methods.
Content: The general theory of nonparametric statistics, including order statistics, theory of ranks, U-statistics in
nonparametric estimation and testing, linear rank statistics and their application to location and scale problems;
goodness-of-fit, and other distribution-free procedures.
Practicals: Computer-based exercises.
Assessment: Tests (20%); 3 h exam (80%).
DP Requirement: 40% Class mark, 80% attendance.
Offered in either Semester 1 or 2.

Financial Statistics
STAT760 PC WC
(39L-18T-18P-0S-66H-13R-0F-0G-6A-13W-16C)
Aim: To provide the student with an understanding of the basic concepts pertaining to financial statistics and to
expose the student to a range of practical problems in that area.
**Practicals:** Computer-based exercises on the above topics.
**Assessment:** Tests (20%); 3 h exam (80%).
**DP Requirement:** 80% attendance.
**Offered in either Semester 1 or 2.**

**Project in Statistics**
STAT795 PY WY (5L-5T-0P-4S-306H-0R-0F-0G-0A-26W-32C)
**Aim:** To allow and enable the student to work independently on a statistical topic of an applied or theoretical nature.
**Content:** A project of either theoretical or practical nature from a list of suggested topics under the guidance of a supervisor will be undertaken, a typed report submitted and an oral presentation given.
**Assessment:** Oral presentations: Project proposal and research findings (15%), written report (85%).
**DP Requirement:** Not applicable.
**Year-long module. This module has no supplementary examination.**
Academic Literacy and Development

Scientific Communication

Communication in Science A
SCOM101 P1 W1
Aim: To develop students' control of grammatical and discourse competence in English to improve their ability to read basic scientific texts, to write and to give oral presentations in science.
Content: Attention will be given to areas of grammatical and discourse competence in English that present difficulties for speakers of English as a second language. Through the process of short research projects relating to science, students will be supported in their reading in order to understand the purpose of a range of scientific texts. They will test their understanding of these genres by writing lab reports, essays and posters. There may also be a field trip.
Assessment: 100% Continuous - written assignments (60%), tests (25%), oral presentations (15%).
DP Requirement: Not applicable.
This module is primarily for students in the BSc4 Augmented Stream. This module has no supplementary exam. In order to pass, students must attend 80% of classes and complete all assignments.

Communication in Science B
SCOM102 P2 W2
Aim: To further develop students' control of grammatical and discourse competence in English and ability to read scientific texts, to write and to give oral presentations in science.
Content: The module extends the knowledge and skills of SCOM101. There will be further attention to grammatical and discourse competence in English that present difficulties for speakers of English as a second language. Through short research projects relating to science, students will be further supported in their reading in order to understand the purpose of a range of scientific texts. They will test their understanding of these genres by writing lab reports, essays and posters.
Assessment: 100% Continuous: written assignments (60%), tests (25%) and oral presentations (15%).
DP Requirement: Not applicable.
This module is primarily for students in the BSc4 Augmented Stream. This module has no supplementary exam. In order to pass, students must attend 80% of classes and complete all assignments.

Communication in Science C
SCOM103 PY WY
Aim: To develop control of grammatical and discourse competence in English to improve the ability to read basic scientific texts, to write and to give oral presentations in science.
Content: Attention will be given to areas of grammatical and discourse competence in English that present difficulties for speakers of English as a second language. Through the process of short research projects relating to science, students will be supported in their reading in order to understand the purpose of a range of scientific texts. They will test their understanding of these genres through a process of writing lab reports, essays and posters. There may also be a field trip.
Assessment: 100% Continuous: written assignments (60%), tests (25%) and oral presentations(15%).
DP Requirement: Not applicable.
Year-long module. For students in the BSc4 Foundation Stream only. This module has no supplementary exam. In order to pass, students must attend 80% of classes and complete all assignments.

Scientific Writing & Reporting A
SCOM111 P1 W1
Aim: To develop students' ability to use scientific sources and to write and give oral presentations in science.
Content: Short research projects relating to science. Scientific Writing and Reporting is a practical module in which students give oral presentations and improve their writing through practical experience of a number of different kinds of writing: essay, report and poster. There may also be a field trip.

Assessment: 100% continuous assessment: written assignments 60%, tests 25%, oral presentation 15%.

DP Requirement: Not applicable.

This module is primarily for students in the BSc4 Augmented Stream. This module has no supplementary exam. In order to pass, students must attend 80% of classes and complete all assignments.

Scientific Writing & Reporting B
SCOM112 P2 W2

Aim: To develop students’ ability to use scientific sources and to write and give oral presentations in science.

Content: Short research projects relating to science. The module extends the skills developed in SCOM111. Ability to use scientific sources, and to write and give oral presentations in science. The types of writing that the module deals with are: essay, report and poster. There may also be a field trip.

Assessment: 100% continuous: written assignments 60%, tests 25%, oral presentation 15%.

DP Requirement: Not applicable.

This module is primarily for students in the BSc4 Augmented Stream. This module has no supplementary exam. In order to pass, students must attend 80% of classes and complete all assignments.

Scientific Writing & Reporting C
SCOM113 PY WY

Aim: To develop students’ ability to access and read scientific sources, and their ability to write and make oral presentations in science.

Content: Attention will be given to areas of grammatical and discourse competence in English that present difficulties for speakers of English as a second language. Through the process of short research projects relating to science, students will be supported in their reading in order to understand the purpose of a range of scientific texts. They will test their understanding of these genres through a process of writing lab reports, essays, posters and doing oral presentations. There may also be a field trip.

Assessment: 100% continuous assessment: written assignments 60%, tests 25%, oral presentation 15%.

DP Requirement: Not applicable.

Year-long module. For students in the BSc4 Foundation Stream only. This module has no supplementary exam. In order to pass, students must attend 80% of classes and complete all assignments.
UNITE Mathematics A
ENUN0M1 H1

Aim: To offer foundation teaching and support to the first year level teaching of MATH131. To bridge the academic gap between high school mathematics and university mathematics. To prepare students for current and future courses within the engineering degree that require understanding of mathematics.


Assessment: Individual assignments, tests and group assignments (100%).

DP Requirement: Students are required to attend all formal instruction sessions. Students are required to complete all assignments satisfactorily.

UNITE Mathematics B
ENUN0M2 H2

Prerequisite Modules: ENUN0M1.

Aim: To offer foundation teaching and support for MATH141. To bridge the academic gap between high school mathematics and university mathematics. To prepare students for current and future modules within the engineering degree that require understanding of mathematics.


Assessment: Individual assignments, tests and group assignments (100%).

DP Requirement: Students are required to attend all formal instruction sessions. Students are required to complete all assignments satisfactorily.

UNITE Physics A
ENUN0P1 H1

Aim: To offer foundation teaching and support for PHYS151. To bridge the academic gap between high school physical science and university physics. To prepare students for current and future modules within the engineering degree that require understanding of physics.


Practicals: As per the module outline. Field trips are arranged to support the module and depend on year to year arrangements.

Assessment: Individual assignments, tests and group assignments (100%).

DP Requirement: Students are required to attend all formal instruction sessions. Students are required to complete all assignments satisfactorily.

UNITE Physics B
ENUN0P2 H2

Prerequisite Modules: ENUN0P1.

Aim: To offer foundation teaching and support for PHYS152. To bridge the academic gap between high school physical science and university physics. To prepare students for current and future modules within the engineering degree that require understanding of physics.

Content: Thermal Physics: First and second laws of thermodynamics. Electricity and magnetism: Charge and electric field. Gauss’ law, electric potential, capacitance and dielectrics, current resistance, electromotive force, direct current circuits. Magnetic fields, magnetic forces, electromagnetic induction, inductance and alternating current. Optics:

Practicals: As per the module outline. Field trips are arranged to support the module and depend on year to year arrangements.

Assessment: Individual assignments, tests and group assignments (100%).

DP Requirement: Students are required to attend all formal instruction sessions. Students are required to complete all assignments satisfactorily.

Unite Technical Communication & Drawing
ENUN0TC H1

Aim: To offer foundation teaching and support to the first year level teaching in English language tuition and technical communication in written, graphical (drawing) and oral forms. To provide direct support for the modules, ENCH1TC and ENME1DR. To prepare students for current and future modules within the engineering degree that require communication skills.


Practicals: As per the module outline. Field trips are arranged to support the module and depend on year to year arrangements.

Assessment: Individual assignments, tests and group assignments (100%).

DP Requirement: Students are required to attend all formal instruction sessions. Students are required to complete all assignments satisfactorily.

UNITE A
ENUN0UA H1

Aim: To participate actively in non-academic core activities of the UNITE programme.

Content: Content is flexible but may include the following topics: Integrating into a university environment; How democracy works. Rights and responsibilities of citizens; How technical things work; How society works; Sports participation (fishing, rock climbing, soccer, racket sports, etc); Experiential learning - Construction Group Activities.

Practicals: As per the module outline. Field trips are arranged to support the module and depend on year to year arrangements.

Assessment: Participation is evaluated by the course co-ordinator.

DP Requirement: Active participation in the UNITE programme extra-curricular activities.

UNITE B
ENUN0UB H2

Aim: To participate actively in non-academic core activities of the UNITE programme.

Content: Content is flexible but may include the following topics: Integrating into a university environment; How democracy works. Rights and responsibilities of citizens; How technical things work; How society works; Sports participation (fishing, rock climbing, soccer, racket sports, etc); Experiential Learning - Construction Group Activities.

Practicals: As per the module outline. Field trips are arranged to support the module and depend on year to year arrangements.

Assessment: Participation is evaluated by the course co-ordinator.

DP Requirement: Active participation in the UNITE programme extra-curricular activities.
Agriculture, Engineering & Science

MODULES FROM OTHER COLLEGES

IN THE COLLEGE OF HEALTH SCIENCES

Biomedical Sciences

Offered in the School of Laboratory Medicine & Medical Sciences

Bioenergetics & Exercise Physiology
HMBC3EB W2 (16L-5T-15P-0S-37H-0R-0F-0G-6A-6W-8C)

Prerequisite Modules: (BIOC201 or 203), HPHS2C1, HPHS2E2, HPHS2G2, HPHS2N1.

Aim: To introduce students to the concept of bioenergetics and the impact of exercise on the functioning of the human body. Students will gain an understanding of the energy producing pathways of metabolism. Differences in metabolism at rest and following exercise will be discussed. The influence of mutations on energy metabolism will be explored.

Content: Introduction to nutritional requirements of exercise. Introduction to energy transfer (Systems of energy delivery and utilization), oxidative phosphorylation, metabolism of macronutrients during physical activity. Different types of muscle fibres with emphasis on their energy metabolism. Lactate metabolism and the metabolic basis of fatigue in humans. The effect of exercise training on metabolic disorders such as diabetes (I & II), hypertension and hyperlipidemia are discussed.

Practicals: Various methods are employed to assess the effect of exercise on the human body. Student volunteers will perform different types of endurance exercises; a blood sample will be extracted before and after the exercise routine. Lymphocytes and serum (Histopaque 1077) will be isolated from the blood and stained with JC-1 (to determine the role of mitochondria in energy metabolism. In addition, the following methods will be performed, viz., Single Cell Gel Electrophoresis, protein isolation and SDS-PAGE. Other biochemical assays that utilise spectrophotometry may be employed, viz., creatine kinase and lactate dehydrogenase assays.

Assessment: A written test covering the content covered during the semester. Practicals will be assessed by a comprehensive practical report at the end of each practical. Assignments as determined by lecturer. Final mark consists of 40% formative and 60% summative marks Formative: 60% tests and 40% classwork Summative: 100% exam mark.

DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee will be charged for this module.

Environmental Toxicology
HMBC3ET W1 (16L-5T-15P-0S-37H-3R-0F-0G-6A-6W-8C)

Prerequisite Modules: BIOC201 or 203.

Aim: This module will introduce students to the basic principles of toxicology and diseases associated with hazardous environmental substances.

Content: Basic principles of toxicology with emphasis on the biochemical, cellular and organ system basis of intoxication including biotransformation of toxicants, biochemical mechanisms underlying toxicity and biomarkers of exposure will be covered. Various classes of toxicants will also be studied including heavy metals, pesticides and mycotoxins. Specific organ systems susceptible to toxicant exposure will also be introduced (these include pulmonary, hepatic and renal toxicity).

Practicals: The course includes five 3-hour practical sessions. These aim to introduce students to the different
methods used in toxicology. The impact the toxicant has at cellular and molecular level will be studied using tissue culture, cytotoxicity tests such as MTT and JC-1 and the comet assay.

**Assessment:** A written test covering the content covered during the semester. Practicals will be assessed by a comprehensive practical report at the end of each practical. Assignments as determined by lecturer. Final mark consists of 40% formative and 60% summative marks. Formative: 60% tests and 40% classwork. Summative: 100% exam mark.

**DP Requirement:** 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee will be charged for this module.

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**Metabolic Diseases**

HMBC3MD W1

(32L-9T-12P-0S-104H-0R-0F-0G-6A-13W-16C)

**Prerequisite Modules:** BIOC201 or 203.

**Aim:** Knowledge of the advanced theory of molecular biology and how this relates to various genetic defects that impact human health. This module will explore the molecular/genetic mechanisms of non-infectious and non-cancerous diseases.

**Content:** Biochemistry/mechanisms of the disorders associated carbohydrate, lipid, protein, purine and pyrimidine metabolism. The following major themes: advances in modern molecular biology (recombinant DNA technology); abnormal metabolism and inborn errors of metabolism such as phenylketonuria, sickle cell anaemia, mitochondrial myopathies, collagen disorders, etc. will also be discussed. Practicals or case studies will be used to facilitate application of knowledge gained.

**Practicals:** Practicals include the oral glucose tolerance test, cholesterol and lipid quantitation in serum using spectrophotometry, thin layer chromatography to detect amino acids in unknown solutions and electrophoresis to determine plasma protein content and detect haemoglobinopathies. Case studies will be used to facilitate application of knowledge gained.

**Assessment:** A written test covering the content covered during the semester. Practicals will be assessed by a comprehensive practical report at the end of each practical. Assignments as determined by lecturer. Final mark consists of 40% formative and 60% summative marks. Formative: 60% tests (equally weighted) and 40% classmark. Summative: 100% exam mark.

**DP Requirement:** 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee will be charged for this module.

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**Medical Biochemistry Research Project**

HMBC3RP W2

(8L-12T-72P-8S-60H-0R-0F-0G-0A-15W-16C)

**Prerequisite Requirement:** 128C at Level 2 from the modules in the Biomedical Sciences Programme.

**Aim:** To introduce students to the research milieu in the field of Medical Science and expose them to other ‘working scientists’.

**Content:** Content: Designing, undertaking, interpretation and reporting on a small independent research project.

**Practicals:** Practicals: Relevant laboratory-based techniques.

**Assessment:** Written project motivation (15%), oral presentation of results (10%), formal written project report (75%).

**DP Requirement:** Attendance at all laboratory sessions.

A laboratory fee will be charged for this module. This module is offered in semesters 1 & 2.

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**Wound Healing**

HMBC3WH W2

(16L-5T-15P-0S-37H-0R-0F-0G-6A-6W-8C)

**Prerequisite Modules:** (BIOC201 or 203), HPHS2C1, HPHS2E2, HPHS2G2, HPHS2N1.

**Aim:** To introduce the basics of wound healing, as well as the modern developments in the understanding of wound healing.

**Content:** Introduction to the basic and biochemical principles involved in wound healing. Importance of extracellular matrix in wound healing. Factors regulating wound healing, with emphasis on the role of growth factors, cytokines and various nutrients. Wound healing and wound infection. The cellular and molecular basis for therapy (cell cycle & apoptosis as they relate to wound repair). Complicating factors (diabetes, scars, keloids and wound infection). Healing in specialised tissues (GIT, bone, skin).
Practicals: Practical include: Wound care and basic first aid (sprains, fractures, burns). In vitro testing models are used to assess the body's response to different types of injury (mechanical, thermal, chemical, radiation). Cells are exposed to the above stresses and proteins (SDS-PAGE) and DNA (SCGE) are analysed. Also, standard histological staining will be employed to demonstrate the importance of the extracellular matrix in wound healing.

Assessment: A written test covering the content covered during the semester. Practicals will be assessed by a comprehensive practical report at the end of each practical. Assignments as determined by lecturer. Final mark consists of 40% formative and 60% summative marks Formative: 60% test and 40% classmark Summative: 100% exam mark

DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee will be charged for this module.

CVS/Respiratory
HPHS2C1 W1

Prerequisite Modules: CHEM110, CHEM120, PHYS131.

Aim: To provide core knowledge on the integrated function and control of the cardiorespiratory system.


Practicals: Practical: Histology of epithelial and connective tissues, the cardiovascular and respiratory systems. CVS response to exercise, ECG, Haemodynamics and lung function testing.

Assessment: Two theory tests (32%), two practical tests (8%); 3 h exam (60%).

DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee of R45-00 will be charged for this module.

Endocrine & Renal
HPHS2E2 W2

Prerequisite Modules: CHEM110, CHEM120, PHYS131.

Aim: To provide core knowledge of the structure and functions of the endocrine and renal systems.


Assessment: Two theory tests (32%), two Practical tests (8%); 3 h exam (60%).

DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee of R45-00 will be charged for this module.

Gastrointestinal and Blood
HPHS2G2 W2

Prerequisite Modules: CHEM110, 120, PHYS131.

Aim: To provide core knowledge of the structure and function of the human gastrointestinal system and blood.

Content: GIT: Composition of food; basic gross anatomy and the functional histology of the formed blood elements and the organs of the gastrointestinal tract and the associated accessory organs/structures; The physiology of the gastrointestinal tract. Blood: Composition and functions of blood; Anaemia; Leucopaenia and leucocytosis; Basic concepts of immunity; Blood groups and transfusion; Haemostasis; Basic diagnostic tests.

Practicals: Histology of the gastrointestinal tract, blood, lymphoid tissue and the haemopoietic organs. Quantitative blood constituents, blood groupings.

Assessment: Two theory tests (32%), two Practical tests (8%); 3 h exam (60%).

DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

A lecture note fee of R45-00 will be charged for this module.
Neurophysiology
HPHS2N1 W1  (32L-0T-27P-0S-86H-0R-0F-0G-15A-15W-16C)
Prerequisite Modules: CHEM110, CHEM120, PHYS131.
Aim: To provide relevant core knowledge of excitability in cells, and extrapolate this principle to a comprehension of the mechanisms governing neural and muscular responses and the functioning of sense organs.
Practicals: Histology of nerve, muscle and the sensory organs. Application of physiological principles in nerve and muscle interactions; vision, hearing and reflex testing.
Assessment: Two theory tests (32%), two practical tests (8%); 3 h exam (60%).
DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.
A lecture note fee of R45-00 will be charged for this module.

MedS3N2 Neuro-endocrinology
HPHS3N2 W2  (15L-5T-0P-0S-52H-0R-0F-0G-8A-15W-8C)
Prerequisite Modules: HPHS2E2, HPHS2G2, HPHS2C1, HPHS2N1.
Aim: To extend the understanding of neuro-endocrine physiology and its application to the human body.
Assessment: Theory tests (40%); 2 h exam (60%).
DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.
A lecture note fee of R45-00 will be charged for this module.

MedS3P2 Research Project
HPHS3P2 W2  (0L-0T-0P-0S-160H-0R-0F-0G-0A-13W-16C)
Prerequisite Requirement: 128C at Level 2 from the modules in the Biomedical Sciences Programme.
Aim: To introduce the student to a research environment and to apply selected research techniques in a research project.
Content: Designing, undertaking and reporting of a small independent research project.
Assessment: Written project motivation (15%), oral presentation of results (10%), formal written project report (75%).
DP Requirement: Not applicable.
A lecture note fee of R45-00 will be charged for this module.

MedS3P1 Research Project
HPHS3R1 W1  (0L-0T-0P-0S-160H-0R-0F-0G-0A-13W-16C)
Prerequisite Requirement: 128C at Level 2 from the modules in the Biomedical Sciences Programme.
Aim: To introduce the student to a research environment and to apply selected research techniques in a research project.
Content: Designing, undertaking and reporting of a small independent research project.
Assessment: Assessment: Written project motivation (15%), oral presentation of results (10%), formal written project report (75%).
DP Requirement: Not applicable.
A lecture note fee of R45-00 will be charged for this module.

MedH3H1 Haematology
MHA3HA1 W1  (14L-5T-18P-0S-37H-0R-0F-0G-6A-13W-8C)
Prerequisite Requirement: 80 C at Level 2 from modules in the Bio-medical Science programme.
Aim: To understand the physiology of haemopoiesis, functions of blood components and disorders of the haemopoietic system.
Content: Detailed functions of blood. Erythropoiesis. Anaemias. Granulocytes, macrophages and lymphocytes in
Practicals: Morphology, haemolytic, flow cytometry, molecular, coagulation. These are conducted at the Haematology laboratory at the Inkosi Albert Luthuli Central Hospital.

Assessment: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

Non-Biomedical Science students taking this module as an elective must have been vaccinated against Hepatitis B at their own expense.

MedM3M2 Medical Microbiology

Aim: To introduce the role of medically-significant micro-organisms, their immuno-pathogenesis and the role of the laboratory in the diagnosis of infection.

Content: Pathogenic mechanisms of micro-organisms, host defence mechanisms, principles of antimicrobial activity, sterilisation and disinfection, molecular approach to infectious diseases e.g. outbreak and population-based analysis for epidemiological control of infection, syndrome-based infections.

Practicals: The practicals are geared to define the role of the Medical Microbiology laboratory and to reinforce diagnostic procedures and their significance.

Assessment: 40% classmark, 60% exam.

DP Requirement: 40% classmark, 80% attendance at all lectures, tutorials and practicals, 100% attendance at all tests.

Non-Biomedical Science students taking this module as an elective must have been vaccinated against Hepatitis B at their own expense.

MedV3V1 Molecular Virology

Prerequisite Modules: BIOC201 or 203.

Aim: To instill core knowledge of the principles of human virology; the diagnosis, treatment and prevention of viral disease in humans; and the application of science and technology to the study of viruses.

Content: Viral taxonomy, pathogenesis and immunology. Diagnosis, treatment and prevention of viral disease (including viral vaccines, gene therapy and antiviral drugs). Common examples of viruses causing human disease (Hepatitis B and C, Polio, influenza, HIV). Molecular Virology and Bioinformatics including antiretroviral resistance and recombinant DNA technology.

Assessment: 40% classmark, 60% exam.

DP Requirement: 40% classmark, 80% attendance at all lectures and tutorials, 100% attendance at all tests.

IN THE COLLEGE OF HUMANITIES

Housing

Offered in the School of Built Environment and Development Studies

Housing Theory and Practice 2A

Prerequisite Requirement: Housing Theory and Practice 1B

Corequisite: Housing Technology 2A

Aim: To understand, community participation programmes and their impact on housing production.
Content: Introduction of community participation models and the implications of other state delivery programmes.
Assessment: Continuous evaluation, summative assessment with final portfolio review.
DP Requirement: Submission of all assignments on time and compliance with the attendance requirements of the School.

Housing Theory and Practice 2B
HOU204 H2
Prerequisite Requirement: Housing Theory and Practice 2A
Corequisite: Housing Technology 2B
Aim: Introduction to social housing and the implications of high density housing.
Content: High density housing norms and standards, housing typologies, housing performance.
Assessment: Continuous evaluation, summative assessment with portfolio review.
DP Requirement: Submission of all assignments on time and compliance with the attendance requirements of the School.

Town Planning
Offered in the School of Architecture, Planning & Housing

Law for Planners
TNPL401 H1
Corequisite: TNPL301 Introduction to Town Planning.
Aim: To provide an overview of law for planners.
Assessment: Examination (50%), project work (50%).
DP Requirement: Submission of all assignments on time and compliance with the attendance requirements of the School.

IN THE COLLEGE OF LAW AND MANAGEMENT STUDIES

Accounting
Offered in the School of Accounting, Economics & Finance

Accounting 103
ACCT103 P2 W2 H2
Prerequisite Requirement: A minimum final mark of 40% in Accounting 101 or a minimum final mark of 50% in Financial Reporting 1A.
Content: The objectives of the module are to provide students with the business knowledge necessary to formulate a successful business plan; to expose students to sound business controls and tools for the running of a successful business; and to introduce students to basic taxation in a small business.
Assessment: Class Mark (33%), Examination (67%)
DP Requirement: A 40% class mark, an 80% attendance of tutorials and the satisfactory completion of the project.
Economics

Offered in the School of Accounting, Economics & Finance

Principles of Microeconomics
ECON101 H1 P1 W1
(39L-0T-0P-0S-75H-40R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Nil
Content: Introductory economic concepts including the principles of supply and demand, the efficient production of goods, market structures under perfect competition and monopoly. The markets for labour, capital and land are analysed and the manner in which income and wealth is distributed.
Assessment: 3 tests (40%), 1 three-hour examination (60%)
DP Requirement: Students must write all class tests and obtain a class record of at least 40%.

Principles of Macroeconomics
ECON102 H2 P2 W2
(39L-0T-0P-0S-75H-40R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Nil
Content: An introduction to macroeconomics. The operation of the money market is examined, and the main components of expenditure (consumption, investment, government spending and net exports) are used to build simple macroeconomic models. Fiscal and monetary policy tools and their ability to influence key macroeconomics concerns of inflation, unemployment and growth are assessed.
Assessment: 3 tests (40%), 1 three-hour examination (60%)
DP Requirement: Students must write all class tests and obtain a class record of at least 40%.

Intermediate Macroeconomic & Applications
ECON201 H1 P1 W1
(39L-4T-0P-0S-61H-50R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Economics 102
Content: Intermediate macroeconomics and applications. This module covers theories of income determination and employment. These are examined in the context of the analysis of goods and money markets as well as in an aggregate demand/aggregate supply framework. Fiscal and monetary policies and their impact on output, employment and prices are analysed, as are trade-offs between inflation and unemployment. Key macroeconomic issues are assessed in the context of developed and developing economies.
Assessment: Tests/Assignments (40%), Examination (60%)
DP Requirement: Students must write all class tests and obtain a class record of at least 40%.

Intermediate Microeconomics & Applications
ECON202 H2 P2 W2
(39L-4T-0P-0S-61H-50R-0F-0G-6A-13W-16C)
Prerequisite Requirement: Economics 101
Content: Intermediate microeconomics and applications. This module covers intermediate microeconomic theory, its application to solving real-world economic problems and the analysis of policy-related issues. Traditional theories of consumer (utility) behaviour and production (output and profit optimisation) behaviour are examined. In addition, students are exposed to modern theories – such as game theory and transaction cost theory. Applications include the analysis of risk in consumption, investment and insurance decisions and the efficient allocation of resources and output under welfare economics.
Assessment: Tests/assignments (40%), Examination (60%)
DP Requirement: Students must write all class tests and obtain a class record of at least 40%.

Business Statistics 2
ECON203 W1
(29L-15T-0P-0S-56H-54R-0F-0G-6A-13W-16C)
Prerequisite Requirement: General Mathematics 1 or equivalent
Content: This module covers the basic concepts of probability; the binomial, normal and other distributions; decision-making; sampling distributions; and techniques for drawing conclusions about large populations with often limited samples of data. Forecasting, using time-series and prediction, using regression techniques, are applied to common
finance and marketing problems, such as tracking trends in financial measures over time, or predicting the relationship between a company's advertising spending and its sales.

Assessment: Assignments/tests (40%), Examination (60%).

DP Requirement: Attend 75% of both lecture and practical sessions. Students must write all class tests and obtain a class record of at least 40%.

Macroeconomic Policy in SA
ECON309 W2 H2 (30L-10T-0P-0S-76H-40R-0F-0G-4A-13W-16C)

Prerequisite Requirement: Economics 201

Content: The theoretical foundations of macroeconomics are used to understand the objectives of and conflicts in macroeconomic policy. The module will examine monetary policy and the S.A. financial system, as well as fiscal and budgetary policy. Open-economy macroeconomic issues will be analysed, as will the co-ordination between monetary, fiscal and balance of payments policies.

Assessment: Assignments/tests (40%), Examination (60%)

DP Requirement: Write all tests and submit all assignments.

*options offered at various campuses will depend on staff availability and student numbers. Details will be given each semester by the Economics 3 co-ordinators.

Labour Economics
ECON311 P2 W2 (30L-10T-0P-0S-76H-40R-0F-0G-4A-13W-16C)

Prerequisite Requirement: Economics 202

Content: Key issues in the SA labour market are addressed, including wage determination, inequality and discrimination, affirmative action, unemployment, labour relations and globalisation. The module examines critically the tools that economists have used to analyse these issues and explores current policy initiatives and policy debates in the SA economy.

Assessment: Assignments/tests (40%), Examination (60%)

DP Requirement: Write all tests and submit all assignments.

*options offered at various campuses will depend on staff availability and student numbers. Details will be given each semester by the Economics 3 co-ordinators.

Quantitative Economics
ECON314 H2 P1 W2 (30L-10T-0P-0S-76H-40R-0F-0G-4A-13W-16C)

Prerequisite Requirement: Economics 201 and 202

Content: This module will cover the essential elements of the application of economic theory to real-world data using the tools of mathematics and econometrics at a basic level. A brief introduction to the necessary mathematical tools lays the foundation for the estimation and interpretation of single-equation models with continuous dependent variables. The emphasis will be on practical application rather than theory.

Assessment: Assignments/tests (40%); Examination (60%)

DP Requirement: Students must attend 75% of practical sessions, write all tests and submit all assignments.

Core module

Applied Microeconomics
ECON330 P2 W1 (30L-10T-0P-0S-76H-40R-0F-0G-4A-6W-16C)

Prerequisite Requirement: Economics 202

Aim: To develop the analytical skills of learners in the application of micro-economic theory using graphs, algebra and elementary calculus.

Content: The theory of consumer behaviour and demand, the theory of production and cost, pricing and market structures, the theory of the firm, inter-temporal choice, asset markets and consumption under uncertainty.

Assessment: Assignments/tests 40%; Exam 60%

DP Requirement: Write all tests and submit all assignments.

*options offered at various campuses will depend on staff availability and student numbers. Details will be given each semester by the Economics 3 co-ordinators.
Monetary Economics  
ECON340 P1  
(30L-10T-0P-76H-40R-0F-0G-4A-6W-16C)  
**Prerequisite Requirement:** Economics 201  
**Aim:** To develop a conceptual framework which will enable learners to critically analyse national and international monetary behaviour and markets.  
**Content:** Demand for money, supply of money, level and structure of interest rates, inflation, balance of payments and exchange rates, the transmission mechanism, South African monetary policy.  
**Assessment:** Assignments/tests (40%), Examination (60%)  
**DP Requirement:** Write all tests and submit all assignments.  
*options offered at various campuses will depend on staff availability and student numbers. Details will be given each semester by the Economics 3 co-ordinators.

International Trade  
ECON360 P2  
(30L-10T-0P-76H-40R-0F-0G-4A-13W-16C)  
**Prerequisite Requirement:** Economics 102 and Economics 202  
**Aim:** To enable learners to understand why countries trade and the impact of international trade in the world economy. The nature and consequences of trade policies, the balance of payments and the operation of the foreign exchange are also examined.  
**Content:** International Trade Theory and Policy, Exchange Rate Determination and Policy, South African Applications.  
**Assessment:** Assignments/tests 40%; Exam 60%  
**DP Requirement:** Write all tests and submit all assignments.  
*options offered at various campuses will depend on staff availability and student numbers. Details will be given each semester by the Economics 3 co-ordinators.

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Financial Reporting  
*Offered in the School of Accounting, Economics & Finance*

Financial Reporting 1 A  
FINR104 W1 P1  
(39L-8T-4P-65H-40R-0F-0G-4A-13W-16C)  
**Prerequisite Requirement:** Nil  
**Content:** This module provides an understanding of entrepreneurship and the role of accounting in business, knowledge of various forms of business entities and the ability to record certain financial transactions and to prepare basic financial statements in accordance with generally accepted accounting principles (IFRSs).  
**Assessment:** tests (33%), examination (67%)  
**DP Requirement:** 40% class mark and 80% attendance of tutorials with adequately prepared work.

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Information Systems & Technology  
*Offered in the School of Management, IT & Governance*

IS & T for Business  
ISTN101 W1 P1  
(29L-8T-19P-55H-44R-0F-0G-5A-13W-16C)  
**Prerequisite Requirement:** None  
**Aim:** To provide an understanding of organisational systems, planning, and decision processes, and how information and systems are used in organisations.  
**Content:** Organisational Systems (business processes, management levels, business decisions); Systems theory and concepts, including systems components and relationships; Information systems in organisations (decision-support, roles of people using, developing and managing systems, societal and ethical issues relating to IS & T use, business applications of spreadsheets and databases, types of information systems in business); The Systems Development
Life Cycle, Information system security; E-Business.

Practicals: Computer-based exercises on the above topics.

Assessment: 2 h exam (50%), tests / assignments (50%).

DP Requirement: Students must obtain a class record of at least 40%.

**IS & T Development Fundamentals**

ISTN102 W2 P2

Prerequisite Requirement: None (Note that 101 and 102 are prerequisites for IST 200 level modules)

Aim: To provide an introduction to Systems Analysis & Design, Web Page Design and Programming in a business context.

Content: Information Systems management; Systems Analysis and Design; Human-Computer Interaction; Web page design; Hypertext Markup Language (HTML) and Web Page creation; Programming fundamentals.

Practicals: Computer-based exercises on the above topics.

Assessment: 2 h exam (50%), tests / assignments (50%).

DP Requirement: Students must obtain a class record of at least 40%.

**Development and Applications Fundamentals**

ISTN103 W2 P2

Prerequisite Requirement: None (Note that 101 and 102 are prerequisites for level 2 IST modules).

Aim: To provide an introduction to Systems Analysis and Design, Web Page Design and Business Applications.


Practicals: Computer-based exercises on the above topics.

Assessment: 2 hour examination (50%), tests / assignments (50%).

DP Requirement: Students must obtain a class record of at least 40%.

**Systems Analysis and Design**

ISTN211 W1 P1

Prerequisite Requirement: (ISTN101 or COMP100) and (ISTN102 or COMP102)

Aim: To provide students with the knowledge and skills to apply the methods, tools and techniques of analysis and design to business and information technology problems. The module provides the foundation for the major project in the next level of study.

Content: Approaches to systems development (Structured and Object-Oriented); Systems Analysis (Requirements discovery, Modelling systems requirements, Feasibility analysis); Systems Design (Application architecture, output, input and user interface design).

Practicals: Computer-based exercises on the above topics.

Assessment: 3 h exam (60%), tests / assignments (40%). Students must obtain at least 40% in the examination paper.

DP Requirement: Students must obtain a class record of at least 40%.

**Databases and Programming**

ISTN212 W2 P2

Prerequisite Requirement: (ISTN101 or COMP100) and (ISTN102 or COMP102)

Aim: To enable students to develop skills in moulding, designing and implementing databases, designing, developing, testing and implementing programs and using databases in application programs. A foundation for the major project in Year 3 is provided.

Content: Databases (Models and concepts, Normalization, Design, Queries and Reports, Features and capabilities, Implementation). Programming (Fundamentals, Algorithms, Control structures, Traditional, Event Driven and OO, Implementation including DB connectivity, Verification and validation).

Practicals: Computer-based exercises on the above topics.

Assessment: 3 h exam (60%), tests / assignments (40%). Students must obtain at least 40% in the examination paper.

DP Requirement: Students must obtain a class record of at least 40%.
**Advanced Systems Analysis**

ISTN31A W1 P1 (15L-5T-0P-0S-47H-10R-0F-0G-3A-13W-8C)

**Prerequisite Requirement:** ISTN211 and ISTN212

**Aim:** To enable students to be proficient at the specification of user requirements of business information and technology systems.

**Content:** Topics include Advanced Methods in Information Systems Analysis, Requirements Analysis & Specifications, Software Quality Requirements and Feasibility.

**Practicals:** Exercises on the above topics.

**Assessment:** 1.5 hour examination (60%), tests/assignments (40%). Students must obtain at least 40% for the examination.

**DP Requirement:** Students must obtain a class record mark of at least 40%.

**Applied Systems Analysis**

ISTN31B W1 P1 (6L-0T-18P-0S-43H-10R-0F-0G-3A-13W-8C)

**Prerequisite Requirement:** ISTN211 and ISTN212

**Corequisite:** ISTN31A

**Aim:** To provide students with direct experience of the analysis and specification of a live system (major project).

**Content:** Topics include application of Advanced Methods in Information Systems Analysis, Requirements Analysis & Specification, Software Quality Requirements and Feasibility.

**Practicals:** Project work.

**Assessment:** Group Project and individual assignments (100%)

**DP Requirement:** None

**Advanced Systems Design**

ISTN31D W1 P1 (15L-5T-0P-0S-47H-10R-0F-0G-3A-13W-8C)

**Prerequisite Requirement:** ISTN211 and ISTN212

**Aim:** To enable students to be proficient at the design of business information and technology systems.

**Content:** Topics include Advanced Methods and Principles in Information Systems Design and Software Quality Assurance.

**Practicals:** Exercises on the above topics.

**Assessment:** 1.5 hour examination (60%), tests/assignments (40%). Students must obtain at least 40% for the examination.

**DP Requirement:** Students must obtain a class record mark of at least 40%.

**Project Management**

ISTN31E W1 P1 (15L-5T-18P-0S-29H-10R-0F-0G-3A-13W-8C)

**Prerequisite Requirement:** ISTN211 and ISTN212

**Aim:** To enable students to manage information systems projects.

**Content:** Topics include Project Management Life Cycle; Teams; Scope; Scheduling; Quality; Risk; Resources; Procurement; Execution and Closure.

**Practicals:** Exercises on the above topics.

**Assessment:** 1.5 hour examination (60%), tests/assignments (40%). Students must obtain at least 40% for the examination.

**DP Requirement:** Students must obtain a class mark of at least 40%.

**Advanced Systems Implementation**

ISTN32A W2 P2 (15L-5T-12P-0S-35H-10R-0F-0G-3A-13W-8C)

**Prerequisite Requirement:** ISTN211 and ISTN212

**Aim:** To enable students to be proficient at the design and implementation of business information and technology systems.

**Content:** Topics include Advanced Design; Database Connectivity; Server-side Scripting.

**Practicals:** Computer-based exercises on the above topics.
**Assessment:** 1.5 hour examination (60%), tests/assignments (40%). Students must obtain at least 40% for the examination.

**DP Requirement:** Students must obtain a class record mark of at least 40%.

### Applied Systems Implementation
ISTN32B W2 P2

**Prerequisite Requirement:** ISTN31B

**Corequisite:** ISTN32A

**Aim:** To provide students with direct experience of the design and implementation of a live system (major project).

**Content:** Topics include the design and implementation of a live system.

**Practicals:** Project work.

**Assessment:** Project work and assignments (100%).

**DP Requirement:** None

### Info Infrastructure for Bus Solutions
ISTN32E W2 P2

**Prerequisite Requirement:** ISTN211 and ISTN212

**Aim:** To provide students with knowledge of the technical background of information systems in a web environment.

**Content:** Topics include Internet and Server Technologies, Hardware and Software, Design of Infrastructure, Infrastructure for Application Services (e.g. Integrated Supply Chain Management), and Internet Security Solutions.

**Practicals:** Exercises on the above topics.

**Assessment:** 1.5 hour examination (60%), tests/assignments (40%). Students must obtain at least 40% for the examination.

**DP Requirement:** Students must obtain a class record mark of at least 40%.

### Database Management
ISTN32F W2 P2

**Prerequisite Requirement:** ISTN211 and ISTN212

**Aim:** To enable students to design and manage databases in a business context.

**Content:** Topics include Database Design, Transaction Management and Concurrency Control, Distributed Database Management Systems, Data Warehouses, Databases and the Internet, and Database Administration.

**Practicals:** Computer-based exercises on the above topics.

**Assessment:** 1.5 hour examination (60%), tests/assignments (40%). Students must obtain at least 40% for the examination.

**DP Requirement:** Students must obtain a class mark of at least 40%.

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### Law

*Offered in the School of Law*

#### Aspects of South African Law
LAWS1AS H2 P2

**Content:** Aspects of South African Law will provide students with a background to some areas of South African Law. Students will acquire an understanding of: -The history of South African Law and the understand the reasons for the current political and legal systems in South Africa. -The general scheme of the constitution, the Bill of Rights and the equality an property clauses in particular. -The basic principles of the law of Delict and Contract and Family Law and be able to apply these principles to factual scenarios.

**Assessment:** Class mark 50%, Examination 50%

**DP Requirement:** The DP requirements are listed on the module outline.

#### Introduction to Law
LAWS1IL H1 P1

**Content:**

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**Artificial Intelligence**

**Prerequisite Requirement:** ISTN210

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Applied Mathematics**

**Prerequisite Requirement:** MATH101

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Computer Science**

**Prerequisite Requirement:** ISTN101

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Economics**

**Prerequisite Requirement:**

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Finance**

**Prerequisite Requirement:**

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Management Information Systems**

**Prerequisite Requirement:**

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Psychology**

**Prerequisite Requirement:**

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Sociology**

**Prerequisite Requirement:**

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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**Statistics**

**Prerequisite Requirement:**

**Aim:**

**Content:**

**Practicals:**

**Assessment:**

**DP Requirement:**

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Content: Introduction to law will provide students with a basic background to law and the legal system in South Africa. Students will acquire an understanding of: - Some legal philosophies and be able to apply these philosophies to current legal situations. - The structure of the legal system and be able to identify the correct tribunal and procedure. - The sources and classifications of South African Law. - The basic principles of criminal law and be able to apply these principles to a factual scenario.

Assessment: Class mark: 50%, Examination: 50%

DP Requirement: The DP requirements are listed on the module outline.