Faculty of Engineering

2008

UNIVERSITY OF KWAZULU-NATAL

FACULTY OF ENGINEERING

in the College of Agriculture, Engineering & Science
Howard College Campus
Pietermaritzburg Campus

HANDBOOK FOR 2008

Deputy Vice-Chancellor and Head of College
Professor PJK Zacharias
BScAgric MScAgric (Natal) DSc (UFH) M.G.S.S.A.

Dean
Professor NM Ijumba
PrEng, CEng, REng (Kenya and Tanzania), BSc(Hons)Eng (Dar-es-Salaam), MSc (Salford), PhD (Strathclyde), MIET, MIEEE

Deputy Dean
Professor E Eitelberg
PrEng, Dipl.-Ing., Dr.-Ing., Dr.-Ing. habil (Karlsruhe), LL.M. (UDW),LLD. (UKZN), SMSAIMC

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FACULTY OF ENGINEERING

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CONTENTS

STAFF OF THE FACULTY OF ENGINEERING

School of Chemical Engineering

Head of School
Dr J. Pocock (Acting)

Professors

C A Buckley *PrEng, BScEng, MScEng (Natal), SFWISA, MSACI, FSAIChE, FIChemE*	Water & Cleaner Production
M Carsky *PrEng, Dipl.-Ing, PhD (Prague), MSAIChemE, IchemE*	Fluidisation
M Mulholland[AgDHoS] *PrEng, BScEng , PhD (Natal), CEng, MSAIChE, MIChemE*	Process Control/Design
D Ramjugernath *BScEng, PhD (Natal) MSAIChE*	Thermodynamics/ Separation

Associate Professors

D Ikhu-Omoregbe *BEng, MSc, PhD (Birmingham), MIChE*	Food & Bioproducts Engineering
M Starzak *BSc, MSc, PhD (Lodz)*	Process Modelling Pulping & Refining

Senior Lecturers

J Pocock *BEng(Hons), MPhil(Eng), PhD (Birmingham), MSAIChE, MSAIMM*	Minerals/Education

Lecturers

C Baah PrEng, *MSc (Lvov), MSc (Calgary)*	Corrosion, Materials of Constr.
AFC Bassa *BTech (IIT, Bombay), MSc (Newcastle), MSAIChemE*	Process Control
K Foxon BScEng (Natal)	Bioprocess Engineering
Iain Kerr *BSc (Ind Chem) (Wits); MDP (UNISA); MSc (Env Biotech) (Rhodes)*	Pulping & Refining
L Maharaj *BScEng MSc (UKZN)*	Minerals Processing
Jean Mulopo *BSc (Congo); MSc (Wits)*	Process Surfaces/Reactor Design
P Naidoo *BScEng, PhD (Natal)*	Thermodynamics/Separation
C. Narasigadu *BScEng MSc (UKZN)*	Thermodynamics/Separation
EM Obwaka *HDip (Strathmore), BScEng, MScEng (UDW), MSAIChE*	Environmental Engineering
A Singh *BScEng, MScEng (UDW), MSAIChE*	Minerals/CFD

Honorary Professors

D R Arnold *PrEng, BSc(Hons), PhD (Aston), CEng, DipBusMan, FSAIChE, FIChemE*	Mass Transfer
J Rarey *Diploma, PhD (Dortmund)*	Thermodynamics
I Tincul *BEng, MS (Timisoara), PhD (Bucharest)*	Polymers

Honorary Senior Lecturers

H. W. Bernhardt *PhD (Natal) B.Ed Pr.Eng*	Biofuels/Education

Senior Research Fellows

C J Brouckaert *BScEng (Natal) MSAIChE*	Water & Waste Water/Modelling

Research Fellows

B Brouckaert *BScEng MSc, PhD (Georgia Tech), MWISA* — Environmental Engineering

Emeritus Professors

BK Loveday *PrEng, BScEng, PhD (Natal). FSAIMM* — Mineral Processing

J D Raal *BScEng (Witwatersrand), MASc, PhD (Toronto), MAIChE, FSAIChE* — Thermodynamics

School of Civil Engineering, Surveying & Construction

Head of School
Professor D D Stretch

Professors

R G Pearl *Dip(QS), MScQS (UCT), MRICS, PMAQS, PrQS, ICECA.* — Dispute Resolution, Construction Procurement

H D Schreiner *PrEng, BScEng, MScEng (Natal), DIC, PhD (London), CEng, MSAICE, MICE.* — Geotechnical Engineering

D D Stretch *BScEng, MScEng (Natal), PhD (Cantab)* — Fluid Mechanics/Hydraulics

Associate Professors

P R Everitt *PrEng, BScEng, MScEng, (Natal), FSAICE* — Pavements, Geotech, & Enviro Management

C Trois *Environmental Engineer (Italy), PhD (Cagliari), MWISA* — Geotech & Environmental

Senior Lecturers

A A E Othman *BSc(Arch Eng), MSc (Heriot-Watt), PhD (Loughborough)* — Construction Project Management

A A Oladapo BSc (Hons) Building Technology-Quantity Surveying Option (Kwame Nkrumah), MSc Construction Management (Lagos), PhD (Obafemi Awolowo). NIQS, Reg QS (Nigeria) — Quantity Surveying

Lecturers

J J Blight PrEng, BScEng, MScEng (Witwatersrand) — Hydrology, Hydraulics, Environmental

S.H.P. Chikafalamani BSc (Malawi), MSc (Real Estate) (Pretoria), MSAIV, MSIM, Reg. Assoc. Valuer — Property Valuations

S. M. Chilufya *BEng (UNZA), MSc (ITC), MSIZ* — Geomatics (GIS & LIS)

E. Friedrich BScHons, MScEng — Environmental Management

N. Harinarain *BSc (QS) (Natal) MCIOB, Candidate PrQS* — Risk Management

C.H. McLeod *BScEng (Natal)* — Structures & Design

J J Mututo Building Economics-Quantity Surveying (Nairobi), MBA (Regent Business School), Candidate PrQS — Quantity Surveyor

E Musonda BEng (UNZA), MSc (ITC) — GIS/Land Surveying

Emeritus Professors

G.G.S. Pegram *PrEng, BScEng, MScEng (Natal), PhD (Lancaster), FSAICE, MAGU AMASCE* — Hydrology & Hydraulics

School of Electrical, Electronic & Computer Engineering

Head of School
Professor F Takawira

Professors

E S Boje *PrEng, BScEng (Witwatersrand), MScEng, PhD (Natal), Dipl Data (Unisa), SMSAIMC, MIEEE (Professor of Control)*	Control Systems
D S Dawoud *BSc, MSc (Telecommunications) (Cairo), PhD (Leningrad). SoEPr, MESE, MIEEE, MBITS (Professor of Computer Engineering)*	Computer Engineering & DSP
Ed Eitelberg *PrEng, Dipl.-Ing., Dr.-Ing., Dr.-Ing. habil (Karlsruhe), LL.M. (UDW),LL.D. (UKZN), SMSAIMC*	Control Engineering
N M Ijumba *PrEng, CEng, REng (Kenya and Tanzania), BSc(Hons)Eng (Dar-es-Salaam), MSc (Salford), PhD (Strathclyde), MIET, MIEEE*	High Voltage & Power Systems
S H Mneney *PrEng, BSc(Hons)Eng (Kumasi), MASc (Toronto), PhD (Dar-es-Salaam), MIET, SMSAIEE*	Communications & Signal Processing
F Takawira *BScElecEng (Manchester), PhD (Cantab) MIEEE (Professor of Digital Communications)*	Communications, Signal Processing

Associate Professors

TJO Afullo *PrEng, R.Eng (Kenya), BSc(Eng)(Hons) (Nairobi), MSEE (West Virginia), PhD (Brussels), MIEEE, MBIE, SMSAIEE*	Microwaves & Communications
M Hippner *MScEng (Poznan), PhD (Wroclaw), MIEEE*	Electrical Machines
E J Odendal *PrEng, CEng, BScEng (Pret), MScEng (Natal), FSAIEE, MIEEE, MIEE*	Power Electronics
R C S Peplow *BScEng, MScEng (Natal)MIEEE*	Data Communications, Analogue Electronics, Digital Systems
B Rigby *BScEng, MScEng, PhD (Natal), MIEEE*	Power Systems Stability
H Xu *BSc (Guilin), MSc (Shijiazhuang), PhD (Beijing), MIEEE, MIEICE*	Digital Systems Communications

Senior Lecturers

G Diana *BScEng (Natal)*	Power & Energy Systems
A L Jarvis *BScEng (Natal), PhD (UKZN),MSAIEE*	Superconductivity & Lasers
H Jay *BScEng (Natal), MSAAI, MSAIMC*	Analogue Systems
B Naidoo *BScEng, MScEng (Natal), MSAIEE*	Software Systems
T Ngatched *B.Sc, MSc, MScEng, PhD [UKZN]*	Digital and Wireless Communications
R Sewsunker *PrEng, BScEng, MScEng (Natal), MSEE (Washington State), MSAIEE*	Communications

Lecturers

L Benn BSc Eng (UKZN)	Power Electronics, Electrical Machines & Control

R Chidzonga *BScEng, MSc(UK), MZwiE*	Control Engineering
T Quazi *BScEng (UKZN)*	Communications & Computer Engineering

Adjunct Professor

A C Britten, *BScEng, MScEng (Wits), PrEng, FSAIEE*	High Voltage Engineering

School of Mechanical Engineering

Head of School
Professor G Bright (Acting)

Professors

S Adali *BScEng (METechU), PhD (Cornell), FASME, FRSSAf (Sugar Millers Chair of Mechanical Design)*	Solid Mechanics, Composites
G Bright *BScEng, MScEng, PhD (Natal), MIEEE, MIASTED, MISPE*	Mechatronics & Robotics
J Bindon* *BScEng, MScEng, PhD (Natal)*	Thermodynamics,Turbomachinery, Technology Education.
LW Roberts* *Pr Eng, BScEng, MScEng (Natal), PhD (London), DIC, HFSAIMechE*	Design, Thermofluids

Senior Lecturers

N Ashrafi Khorasani *BSc (Iran), MScEng, PhD (W. Ontario)*	Nonlinear Dynamics, Rheology, Nonlinear Fluid Mechanics
F L Inambao *MSc, PhD (Volgograd), MBIE*	Mechanical Engineering
R Bodger* *Pr Eng, BScEng (Natal)*	Design, Solid Mechanics

Lecturers

N K Sookay *BScEng (Natal)*	Solid Mechanics, Heat Transfer
M J Brooks *Pr Eng, BScEng (Natal), MScEng (Stellenbosch)*	Thermofluids, Renewable Energy

Part Time Lecturers

R Loubser* *BScEng, MScEng, PhD (Natal)*	Mechanical Vibrations, Theory of Machines, Dynamics

* Contract staff

PIETERMARITZBURG CAMPUS

School of Bioresources Engineering & Environmental Hydrology

Head of School
Professor JC Smithers

Professors

G P W Jewitt *BSc, BScHons, MSc (Natal), PhD (Stellenbosch), (Professor of Hydrology)* — Hydrology

J C Smithers *PrEng, BScEng, MScEng, PhD (Natal), FSAIAE (Professor of Agricultural Engineering)* — Agricultural Engineering

Associate Professors

C N Bezuidenhout *BSc (Potchefstroom), MTechEng (Technikon Natal), PhD (UKZN)* — Agricultural Engineering

S A Lorentz *BScEng (Witwatersrand), MS, PhD (Colorado)* — Hydrology

Senior Lecturers

D E Ciolkosz *BAE, MSc (Penn. State), PhD (Cornell)* — Agricultural Engineering

L F Lagrange *BEng, MEng (Pretoria), MSAIAE* — Agricultural Engineering

A Senzanje *BScHons, MSc(Cranfield), PhD (Colorado)* — Agricultural Engineering

Vacant — Hydrology

Lecturers

K T Chetty *BSc, BScHons (Natal)* — Hydrology

M L Warburton *BSc, BScHons, MSc (Natal)* — Hydrology

Senior Research Fellows

D J Clark *BScEng, MScEng (Natal)* — Agricultural Engineering

Research Fellows

T G Lumsden *BSc, BscHons, MSc (Natal)* — Hydrology

Emeritus Professors

P W Lyne *PrEng, BScEng, MScEng, PhD (Natal), FSAIAE* — Agricultural Engineering

R E Schulze *BScHons, MSc, PhD (Natal), UED (Natal), FRSSAf, PH(USA)* — Hydrology

Honorary Professors

P J T Roberts *Pr.SciNat, BSc, BScHons, MSc, PhD (Rhodes)* — Hydrology

Honorary Associate Professors

C W S Dickens *BScHons, HDE (Natal), PhD (Natal)* — Hydrology

N L Lecler *BScEng, MScEng, PhD (UKZN), MSAIAE* — Agricultural Engineering

UNITE (University Intensive Tuition for Engineers)

Head of Programme
N Powell

Senior Lecturers
N Powell *NTSD, HDE, BEd, MEd* — Engineering Drawing

Lecturers
R Kimmie BA, HDE, BEd, MEd — Communication

GENERAL INFORMATION FOR STUDENTS

Faculty Structure

The Faculty of Engineering comprises the following five schools:

- Bioresources Engineering and Environmental Hydrology;
- Chemical Engineering;
- Civil Engineering, Surveying and Construction;
- Electrical, Electronic & Computer Engineering and;
- Mechanical Engineering

The Faculty of Engineering offers instruction and research opportunities in the programmes of Agricultural Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Electronic Engineering, Environmental Engineering, Mechanical Engineering, Land Surveying as well as Quantity Surveying and Construction Management leading to degrees at various undergraduate and postgraduate levels, as listed in the rules section of this Handbook.

The University of KwaZulu-Natal Intensive Tuition for Engineers (UNITE) Programme provides assisted access to engineering for candidates from a disadvantaged school backgrounds.

In general, the emphasis of our training is to equip students with knowledge and skills to apply the fundamental principles in dealing with a wide range of practical problems they will encounter in their professions as engineers, construction project managers, land surveyors and quantity surveyors.

Admission to Bachelors Degree Programmes

POINTS ALLOCATION AND MINIMUM REQUIREMENTS FOR BScEng DEGREE IN ENGINEERING FACULTY

SYMBOL/GRADE											
Admission Points	HG	SG	A Level	AS Level	O Level	International Baccalaureate Higher	International Baccalaureate Standard	HIGCSE/ NSSC Higher	IGCSE/ NSSC Ordinary	NSC	NSC Percentages
12			A			7					
11											
10			B			6					
9											
8	A		C	A		5		1		8	90-100%
7	B		D	B		4	7	2		7	80% to 89%
6	C	A	E	C		3	6	3		6	70% to 79%
5	D	B		D	A		5	4	A	5	60% to 69%
4	E	C		E	B		4		B	4	50% to 59%
3	F	D			C				C	3	40% to 49%
2		E								2	30% to 39%
1		F								1	0% to 29%
0											

Matriculation Higher Grade (HG), Standard Grade (SG), including IEB

Applicants must have passed English as Home Language or First Additional Language with at a minimum of 50%

A pass corresponding to a minimum of a C symbol on the HG for both Mathematics and Physical Science/Physics

Applicants with at least 35 points may apply for entry to the faculty

National Senior Certificate (NSC), including IEB

Applicants must have passed English as Home Language or First Additional Language at a minimum of level 4 (50%)

Applicants must have passed the subject Life Orientation at a minimum of level 4 (50%)

Points score calculated from 6 NSC designated subjects, excluding Life Orientation

Mathematical Literacy is not accepted as a replacement for Mathematics

A pass corresponding to a minimum of at least 6 points in the above table must be obtained for both Maths and Physical Science/Physics. Applicants with at least 33 points may apply for entry to the faculty

Foreign Qualifications (A, A/S & O-levels, International Baccalureate, HIGCSE, IGCSE and NSSC)

Appropriate combinations of at least 5 AS or O levels, as used to gain Matric exemption, with at least 4 AS level subjects

Appropriate combinations of 5 HIGCSE or IGCSE levels, as used to gain Matric exemption, with at least 4 HIGCSE subjects

Points score will be scaled to be equivalent to 6 subjects if fewer subjects used to gain Matric exemption

Applicants with at least 35 points may apply for entry to the faculty.

Admission subject to Faculty and HESA approval

Note: In terms of capacity constraints, the above admission requirements are to be considered minimum performance levels required of applicants; not all applicants who meet the minimum admission requirements will necessarily be offered a study place. Priority will be given to higher levels of achievement and to applications submitted punctually.

Alternative Admission Routes to the Faculty

Admission to the UNITE Programme

Prospective candidates who want to register in the programmes for the Bachelor of Science in Engineering and Bachelor of Science in Land Surveying who are from previously disadvantaged schools may be eligible to register for the UNITE programme.
Applications for admission to the UNITE Programme may be made directly to sponsoring companies who advertise their willingness to grant bursaries for programmes such as this. Candidates may also apply directly to the UNITE Director, who might be able to make a referral to a potential sponsor, if financial support is required.
During the selection process consideration is given to the academic record of the candidate from the last two years at school. Aptitude or other testing is frequently used, and in most cases the candidate is required to attend an interview. For guidance purposes a successful candidate will need to be assessed as being able to achieve the equivalent of a matriculation symbol 'D' at Higher Grade in Mathematics, Physical Science and English.
It must be noted that the UNITE Programme does not provide bursaries or financial aid, but it refers candidates to sources of funding whose decisions are final.

Admission by Means of the Science Foundation Programme

Students wanting to proceed to Engineering from the Science Foundation Programme (SFP) will after the 1st semester, and if they achieve at least 65% for Mathematics and an average of 65% for the other modules, be encouraged to take Additional Foundation Mathematics and to drop Biology and take a module called Engineering. See Rule EB1(c) for information on the required performance in the SFP.

Minimum Duration of Undergraduate and Honours Degree Programmes

Agricultural*, Chemical, Civil, Computer, Electrical, Electronic and Mechanical Engineering	4 yrs
Land Surveying	4 yrs
Property Development	3 yrs
Honours in Construction Management and Quantity Surveying	1 yr

(Either first three years at the Howard College campus and the remaining year in Pietermaritzburg or 1st and 4th years in Pietermaritzburg and 2nd and 3rd years at Howard College).

(The first year of the Engineering degree may be taken at the Howard College or Pietermaritzburg campus)

Professional Status

The Bachelors degrees in Engineering in the fields of Agricultural, Chemical, Civil, Computer, Electrical, Electronic and Mechanical Engineering are recognised as qualifying degrees for registration as a professional engineer under the Professional Engineers' Act, 1968. They are accredited by the Engineering Council of South Africa and thus enjoy international recognition through the Washington Accord.

The degrees, certificates and diplomas granted in the Faculty of Engineering by the University of KwaZulu-Natal are widely recognised, and give exemption from the qualifying examinations of the following professional bodies:

The South African Institute of Agricultural Engineers: Graduates of this University, who hold degrees in Agricultural, Chemical, Civil, Electrical or Mechanical Engineering, and who are employed in or practise in fields related to Agricultural Engineering, may be admitted to corporate membership of the Institute without further examination.

The South African Institution of Chemical Engineers: Graduates in Chemical Engineering qualify for admission as Graduate members of the Institution.

The South African Institution of Civil Engineering: Graduates in Civil Engineering may be admitted without further examination to corporate membership.

The South African Institute of Electrical Engineers: Graduates in Electrical Engineering are eligible for corporate membership of the Institute.

The South African Institution of Mechanical Engineering: Graduates in Mechanical Engineering are exempt from the Membership examination. Graduates in Chemical, Civil and Electrical Engineering are exempt from Part I and certain subjects in Part II.

The South African Council for Quantity Surveyors: Holders of the degree of Bachelor of Science in Property Development and Bachelor of Science in Property Development Honours who have completed, after graduation, a period of prescribed practical experience, and an assessment of professional competence are eligible for registration as professional quantity surveyors under the Quantity Surveyor's Act, (No 49 of 2000 as amended).

The Royal Institution of Chartered Surveyors: The Bachelor degrees in Property Development and Property Development Honours of the University of KwaZulu-Natal are recognised by the ***Royal Institution of Chartered Surveyors*** as exempting candidates from its final examination.

The Bachelor of Science in Land Surveying degree is recognised by the ***South African Council for Professional and Technical Surveyors*** as the theoretical qualification required in Section 7 (1)(h) of Act No 40 of 1984, for registration as a Professional Land Surveyor, provided a period of articles has been served with a Professional Land Surveyor and a Trial Survey performed. On registration, membership of any of the Institutes of Professional Land Surveyors in South Africa can be obtained.

Registration as a Professional Land Surveyor in South Africa is regarded as equivalent to Associate Membership of the ***Royal Institute of Chartered Surveyors*** in most parts of the Commonwealth.

The Institute of Topographical and Engineering Surveyors of South Africa will normally exempt holders of the Bachelor of Science in Land Surveying degree from its theoretical examination but requires a period of practical experience before admission to Associate Membership.

ECSA Exit Level Outcomes

The exit level outcomes and the competencies, as defined in the 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.

Prizes and Medals

The following Faculty-specific prizes and medals are awarded.
In Engineering:

PRIZE/MEDAL	AVAILABILITY	DISCIPLINE
MBB Consulting Engineers Inc Prize	Best final year design project	Agricultural Eng
SAIAE Bronze Medal	Best final year candidate	Agricultural Eng
KZN Branch of SAIAE Trophy	Best final year design project	Agricultural Eng
KZN Branch of SAIAE Award	Best final year seminar	Agricultural Eng
SAPREF Prize	Best first year candidate taking both Petroleum & Synthetic Fuel Processing and Process Dynamics & Control.	Chemical Eng
SAPREF Prize	Most promising candidate in 3rd year who does not have a bursary.	Chemical Eng
SAIChE's Silver Medal	Best final year candidate	Chemical Eng
SAIChE/SASTECH Award	Best Practical Training Report	Chemical Eng
SASOL Prize	Best performance in Advanced Mass Transfer.	Chemical Eng
Illovo Sugar Prize	Best final year candidate: Design Project	Chemical Eng
Tongaat-Hulett Prize	Best final year candidate in Laboratory/Industry Project.	Chemical Eng
P D Naidoo & Associates Prize	Candidate who achieves the highest academic merit in first year.	Civil Eng
Goba Prize	Candidate who achieves the highest academic merit in second year.	Civil Eng
Grinaker LTA Prize	Candidate who achieves the highest academic merit in third year.	Civil Eng
Arcus Gibb Prize	Third year candidate who achieves the highest academic merit in Fluids	Civil Eng
J R Daymond Prize	Final year candidate who achieves the highest academic merit in Fluids and Hydraulics.	Civil Eng
K Knight Prize	Final year candidate who achieves the highest academic merit in Soil Mechanics and Foundation Engineering.	Civil Eng

Joint Structural Division of SAICE and IStructE Prize	Final year candidate who achieves the highest academic merit in Structures.	Civil Eng
H A Smith Memorial Prize	Final year candidate who achieved the highest academic merit in Transport.	Civil Eng
SAFCEC KZN Prize	Final year candidate whose design project is considered to show especial construction merit.	Civil Eng
Wilson and Pass Prize	Final year candidate who submits a meritorious dissertation on Environmental Engineering	Civil Eng
S A Institute of Steel Construction Prize	Final year candidate who submits a meritorious design or dissertation involving steel.	Civil Eng
Natal Portland Cement Co (Pty) Ltd Prize	Final year candidate who submits an outstanding design or dissertation on Portland Cement based products.	Civil Eng
Concrete Society of Southern Africa (KZN Branch) – Prof Bill King Memorial Prize	Final year candidate who submits a meritorious design or dissertation involving concrete.	Civil Eng
Vela VKE Prize	Final year candidate who submits an outstanding design or dissertation for Transport.	Civil Eng
Iliso Consulting Prize	Final year candidate who submits the best dissertation.	Civil Eng
Walter Morgan Thomas Prize	Final year candidate who achieves the highest academic merit in final year.	Civil Eng
ABB South Africa	Best final year student in Electrical Engineering	Electrical Eng
ABB South Africa	Automation prize for the best Control Systems project	Electronic Eng
Accenture	Most Innovative Design Project in Computer Engineering	Computer Eng
Accenture	Best final year Electronic Engineering design project	Electronic Eng
Accenture	Best third year Computer Engineering design project	Computer Eng
Accenture	Best third year Electrical Engineering design project	Electrical Eng
Alcatel South Africa	Best final year Communications Project	Electronic Eng
Alstom	Best Machines project	Electrical Eng
Altron Group	Best final year student in Electronic Engineering	Electronic Eng
Altron Group	Top second & third year students in Electrical Engineering	Electrical Eng
Altron Group	Top second & third year students in Electronic Engineering	Electronic Eng
Altron Group	Top second & third year students in Computer Engineering	Computer Eng
Conlog	Third year Design	Electronic Eng
CSIR Defence Technology	Best final year student in Computer Engineering	Computer Eng
CSIR Defence Technology	Best final year Design Project in Computer Engineering	Computer Eng

Rainbow Technologies	Best final year student in Power Systems	Electrical Eng
RDI Communications	Most innovative design implementation by a final year student in Electronic Engineering	Electronic Eng
Siemens Ltd	Best Electrical Engineering final year Design Project	Electrical Eng
Siemens Prize	Best fourth year project	Electrical Eng
AECI Prize	Best first year candidate	Mechanical Eng
S A Institute of Mechanical Engineers	Best fourth year project	Mechanical Eng
ECSA Merit Medal	Most outstanding final year candidate	All Programmes
Damant Engineering Prize	For leadership and achievements in final year activities	All Programmes
Eskom Award	For the best Engineering student	All Programmes

In Property Development (Construction Management and Quantity Surveying):

PRIZE/MEDAL	AVAILABILITY	DISCIPLINE
Natal Branch of the S A Institute of Building	Best candidate for Project Planning	Property Development
Natal Branch of the S A Institute of Building	Best candidate in Applied Construction Management	Property Development
Natal Branch of the S A Institute of Building	Best candidate in Construction Management 3A & 3B	Property Development
John Reardon Memorial Prize of the Natal Branch of the S A Institute of Building	Best candidate in the final year subject "Property Development Economics"	Property Development
J O Prize	Highest overall mark in the first year of study	Property Development
Stephen Tanner Memorial Award	Meritorious performance in first year	Property Development
Armstrong Construction	Best candidate of the year: Construction Technology & Process 1	Property Development
Armstrong Construction	Best candidate of the year: Construction Technology & Process 2	Property Development
Association of S A Quantity Surveyors Prize	Best candidate of the year: Design Appraisal & Measurement 2	Property Development
Association of S A Quantity Surveyors Prize	Best candidate of the year: Design Appraisal & Measurements 3	Property Development
Walters & Simpson Prize	Best overall performance of a candidate in final year	Property Development
Tongaat-Hulett	Best BScPropDev 2nd year student	Property Development
Tongaat-Hulett	Best BScPropDev 3rd year student	Property Development
Association of S A Quantity Surveyors Prize	Best candidate of the year: Adv. Design Appraisal & Measurement	Property Development
Bell John prize	Best all round candidate in any year	Property Development

Dem Rouse Prize	Candidate who has attained especially meritorious academic results in Professional Practice / Simulated Office Project	Property Development
RICS	Best dissertation by a Construction Management student	Construction Management
RICS	Best dissertation by a Quantity Surveying student	Quantity Surveying

Candidate Workload for Undergraduate Programmes

The figures given below represent a guideline to the amount of work which undergraduate candidates in the Faculty may be expected to undertake. These figures represent the typical situation and are liable to variation in the various Programmes.

For a first year candidate a full load of 72 credits per 13 week semester consists of 450 45-minute periods of which no more than 234 are lectures; the balance of 216 periods can be tutorials, seminars or practicals. The formal homework plus self-study should not require more than 18 hours per week from an average candidate. In addition candidates are expected to spend a further 12 hours per week on preparing for laboratories and seminars.

For second, third and fourth year candidates, a full load of 72 credits per 13 week semester consists of 378 periods of which no more than 234 are lectures; the balance can be tutorials, seminars, projects or practicals. The formal homework plus self-study should not require more than 22½ hours per week from an average candidate. In addition candidates are expected to spend a further 12 hours per week on preparing for laboratories and seminars.

Candidate Workload for Honours Programmes and the Master of Science (Construction Project Management)

The Honours programmes in Property Development and the Master of Science (Construction Project Management) are presented on a block release basis. The typical format for an 8 credit module would be:

Pre-module readings in the candidate's own time	18 hours
Attendance at 3 days of workshops/seminars/lectures	22 hours
Assignment in student's own time	30 hours
Preparation for examination	7 or 8 hours
Examination	2 or 3 hours

The underlying principle is that the candidate should have part-time employment whilst studying. This will enable the candidate to relate theory to practice in their working environment, and to obtain mentoring from professionals.

SESSIONAL DATES – 2008

HOWARD COLLEGE, PIETERMARITZBURG AND WESTVILLE CAMPUSES

UNIVERSITY OF KWAZULU-NATAL

FIRST SEMESTER: Monday, 11 February – Saturday, 14 June

WINTER VACATION: Monday, 16 June – Sunday, 27 July

SECOND SEMESTER: Monday, 28 July – Saturday, 22 November

PRE-SEMESTER:

	Tues, 01 – Fri, 04 Jan	Wed, 02 Jan	University Offices open
	Mon, 07 – Fri, 11 Jan	Tues, 08 Jan	Deadline for submission of Exclusion Appeals to Faculty Offices (for November 2007 examinations)
		Thurs, 10 – Thurs, 17 Jan	Supplementary Exams
	Mon, 14 – Fri,18 Jan	Mon, 14 Jan – Fri, 18 Jan	FEAComm meetings
	Mon, 21 – Fri, 25 Jan	Thurs, 24 Jan	Supp Exam marks to be captured
	Mon, 28 Jan – Fri, 01 Feb	Mon, 28 Jan – Sat, 02 Feb	Orientation (HC, PMB, WV)
		Wed, 30 Jan	Arrival: International students
		Thurs, 31 Jan	Release of Supp results
		Thurs, 31 Jan – Fri, 01 Feb	Orientation: International students
	Mon, 04 – Fri, 08 Feb	Mon, 04 Feb – Sat, 09 Feb	Registration (HC, PMB, WV)

SEMESTER 1:

1	Mon, 11 – Fri, 15 Feb	Mon, 11 Feb	Lectures commence
		Thurs, 14 Feb	Applications for re-marks to Faculty Offices
			Final date for registration (1st semester & Year registrations)
2	Mon, 18 – Fri, 22 Feb	Fri, 22 Feb	Final date for curriculum changes
			Final date – Applications for extended DP's
3	Mon, 25 – Fri, 29 Feb		
4	Mon, 03 – Fri, 07 Mar		
5	Mon, 10 – Fri, 14 Mar	Fri, 14 Mar	Final day for capturing of graduation decisions onto the computer system (Undergraduate Studies)

6	Mon, 17 – Fri, 21 Mar	Tues, 18 Mar	Follow Friday timetable
		Wed, 19 Mar	Lectures cease
		Thurs, 20 – Fri, 28 Mar	STUDENT EASTER VACATION
		Fri, 21 Mar	*Good Friday (Holiday)*
			Human Rights Day (Public Holiday)
	Mon 24 – Fri, 28 Mar	*Mon, 24 Mar*	*Family Day*
		Fri, 28 Mar	Final day for capturing of graduation decisions onto the computer system (Postgraduate Studies)
7	Mon, 31 – Fri, 04 Apr	Mon, 31 Mar	Lectures resume
			Final day for submission of graduation programmes to Central Graduation Office
8	Mon 07 – Fri, 11 Apr	Fri, 11 Apr	Final day for withdrawal from a module
			(1st semester & Year registrations)
			Final day for withdrawal from the University
			(1st semester & Year registrations)
9	Mon, 14 - Fri, 18 Apr	Mon, 14 – Tues, 15 Apr	Graduation Ceremonies (PMB)
		Wed, 16 Sat, 19 Apr	Graduation Ceremonies (WV)
10	Mon, 21 – Fri, 25 Apr	Mon, 21 Apr – Thurs, 24 Apr	Graduation Ceremonies (WV)
11	Mon, 28 Apr – Fri, 02 May	*Mon, 28 Apr*	*in lieu* of Sunday*(Freedom Day)*
		Wed, 30 Apr	Follow Thursday timetable
		Thurs, 1 May	*Workers Day (Public Holiday)*
12	Mon, 05 – Fri, 09 May		
13	Mon, 12 – Fri, 16 May		
14	Mon, 19 – Fri, 23 May	Wed, 21 May	DP Refusals published and sent to Faculty Offices
		Thurs, 22 May	Lectures cease
	Fri, 23 May – Fri, 30 May	Mon, 26 May	Deadline for submission of DP Appeals to Faculty Offices
			Study period
		Fri, 23 - Thurs, 29 May	

15	Mon, 26 – Fri, 30 May	Fri, 30 May	Exams commence (incl. Sat.)
16	Mon, 02 – Sat, 07 Jun		Exam week
17	Mon, 09 – Sat, 14 Jun	Sat, 14 Jun	Exams and semester end.
18	Mon, 16 – Fri, 20 Jun	*Mon, 16 Jun*	*Youth Day (Public Holiday)*

SEMESTER 1

Teaching days: Monday 13, Tuesday 13, Wednesday 13, Thursday 13, Friday 13: **65 days**

Study leave: 7days; Examinations: 14 days

MID-YEAR BREAK:

	Mon, 16 Jun – Sun, 27 Jul		STUDENT WINTER VACATION
	Mon, 23 – Fri, 27 Jun	Tues, 24 Jun	June Exam results to be captured (HC, PMB, WV)
	Mon, 30 Jun – Fri, 04 Jul	Fri, 04 Jul	Release of Exam results
	Mon, 7 – Fri, 11 Jul		
	Mon, 14 – Fri, 18 Jul	Tues, 15 – Tues, 22 Jul Fri, 18 Jul	1st-semester Supplementary Exams Deadline for submission of Exclusion Appeals
	Mon, 21 – Fri, 25 Jul	Thurs, 24 Jul – Fri, 25 Jul	Registration (2nd semester)

SEMESTER 2:

1	Mon, 28 Jul – Fri, 01 Aug	Mon, 28 Jul Tues 29 Jul Wed, 30 Jul	Lectures commence Supplementary Exam results to be captured Final date for registration (2nd-semester)
2	Mon, 04 – Fri, 08 Aug	Tues, 05 Aug Fri, 08 Aug	Release of Supp results Final date for curriculum changes Final date - Applications for extended DP's
3	Fri, 08 – Sat, 09 Aug	*Sat, 09 Aug*	*National Women's Day (Public Holiday)*
4	Mon, 11 – Fri, 15 Aug		
5	Mon, 18 – Fri, 22 Aug	Tues 19 Aug	Applications for re-marks to Faculty Offices
6	Mon, 25 - Fri, 29 Aug		
7	Mon, 01 – Fri, 05 Sept	Fri, 05 Sept	Final date for withdrawal from a module (2nd-semester registrations) Final date for withdrawal from the University (2nd-semester registrations)

8	Mon, 08 – Fri, 12 Sept		
9	Mon, 15 – Fri, 19 Sept	Fri, 19 Sept	Lectures cease
	Fri, 19 – Fri, 26 Sept	Sat, 20 Sept – Sun, 28 Sept	STUDENT MID-TERM BREAK
		Wed, 24 Sept	*Heritage Day (Public Holiday)*
10	Mon, 29 Sept – Fri, 03 Oct	Mon, 29 Sept	Lectures resume
		Tues, 30 Sept	*Rosh Hashanah (day of condoned absence)*
		Thurs, 02 Oct	*Eid-ul-Fitr (day of condoned absence)*
12	Mon, 06 – Fri, 10 Oct	*Thurs, 09 Oct*	*Yom Kippur (day of condoned absence)*
13	Mon, 13 – Fri, 17 Oct		
14	Mon, 20 – Fri, 24 Oct		Institutional Audit
15	Mon, 27 Oct – Fri, 31 Oct	*Tues, 28 Oct*	*Diwali/Deepavali (day of condoned absence)*
		Thurs, 30 Oct	DP Refusals published and sent to Faculty Office
		Fri, 31 Oct	Lectures cease
16	Sat, 01 – Fri, 07 Nov	Tues, 04 Nov	Deadline for submission of DP Appeals to Faculty Office
			Study period
		Sat, 01 Nov – Thurs, 06 Nov Fri, 07 Nov	Exams commence (incl. Saturdays)
17	Mon, 10 – Fri, 14 Nov		Exam week
18	Mon, 17 – Sat, 22 Nov	Sat, 22 Nov	Exams and academic year end.

YEAR-END BREAK:

	Mon, 24 – Fri, 28 Nov		
	Mon, 01 – Fri, 05 Dec	Tues, 02 Dec	Exam marks to be captured
	Mon, 08 – Fri, 12 Dec	*Tues, 09 Dec*	*Eid-ul-Adha*
		Fri, 12 Dec	Release of results
	Mon, 15 – Fri, 19 Dec	Mon, 15 Dec	**Last day for submission of theses/dissertations to the Faculty Offices for Graduation in April 2009**
		Tues, 16 Dec	*Day of Reconciliation (Public Holiday)*
	Mon, 22 – Fri, 26 Dec	Wed, 24 Dec	University Offices closed

SEMESTER 2:

Teaching days: Monday 13 Tuesday 13, Wednesday 13, Thursday 13, Friday 13: **65 days**

Study leave: 6 days; Examinations: 14 days

(Supplementary Exams	Thursday, 10 January – Thursday, 17 January)
Registration	Monday, 04 February – Saturday, 09 February
Term 1	Monday, 11 February – Wednesday, 19 March
Easter Vacation	Thursday, 20 March – Sunday, 30 March
Term 2	Monday, 31 Mar – Thursday, 22 May
Study period	Friday, 23 May – Thursday, 29, May
1st-Semester Exams	Friday, 30 May - Saturday, 14 June
July Vacation	Monday, 16 June – Sunday, 27 July
(Supplementary Exams	Tuesday, 15 July – Tuesday, 22 July
Term 3	Monday, 28 July – Friday, 19 September
Mid term Break	Saturday, 20 September – Saturday, 28 September
Term 4	Monday, 29 September – Friday, 31 October
Study period	Saturday, 01 November – Thursday, 06 November
2nd-Semester Exams	Thursday, 06 November - Saturday, 22 November

PUBLIC HOLIDAYS

DATE	DAY	HOLIDAY
01-Jan	Tuesday	New Year's Day
21-Mar	Friday	Good Friday **AND** Human Rights Day
24-Mar	Monday	Family Day
28-Apr	Monday	*in lieu* of Sunday
01-May	Thursday	Worker Day
16-Jun	Monday	Youth Day
09-Aug	Saturday	National Women's Day
24-Sep	Wednesday	Heritage Day
16-Dec	Tuesday	Day of Reconciliation
25-Dec	Thursday	Christmas Day
26-Dec	Friday	Day of Goodwill

RELIGIOUS HOLIDAYS and DAYS OF CONDONED ABSENCE

DATE	DAY	HOLY DAY
30-Sep	Wednesday	Rosh Hashanah *(commences at nightfall the previous day)*
02-Oct	Thursday	Eid-ul-Fitr *(fasting commences on 02 September)*
09-Oct	Thursday	Yom Kippur *(commences at nightfall the previous day)*
28-Oct	Tuesday	Diwali/Deepavali
09-Dec	Tuesday	Eid-ul-Adha

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 faculties, may be restricted in circumstances provided for in the rules of those faculties 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.

"**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.

"**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.

"**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 faculty-determined requirements for a module which must be met to permit a student to be eligible for final assessment in that module.

"**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 National Qualifications Framework (NQF) for a qualification.

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

"**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 semester.

"**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 staff other than the supervisor(s).

"**module**" means any separate course of study for which credits may be obtained.

"**qualification**" means a degree, diploma or certificate.

"**prerequisite module**" means a module which must have been passed, with at least the minimum mark required by the relevant faculty, 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.

"**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, 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.

"**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.

"**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.

"**the University**" means the University of KwaZulu-Natal.

"**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.

GENERAL RULES

GR1 Changes in rules

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.

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 Faculty handbooks.

GR3 Approval of curricula

The Council, upon the approval of the Senate after consultation with the relevant Boards of the Faculties, shall approve the curricula for all qualifications of the University.

GR4 Faculty rules

Subject to the provisions of the Higher Education Act, the Statute of the University, and the following Rules, the Council may, upon the approval of the Senate, make or amend rules for each faculty 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 in any faculty 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 in any faculty of the University.

GR8 Exemption from a module

Exemption from a module may be granted and credit may be awarded for a relevant module where an applicant has already obtained credit for an equivalent module or can demonstrate an equivalent level of competence through prior learning.

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) On application to the relevant Faculty Office, and with the approval of the Senate, a student's registration may be suspended for a specified period of time. Such student 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 any 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.

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 Faculty 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 faculty may prescribe ancillary modules in any curriculum.
b) A faculty 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 Head of the School in which they have studied that module 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 Board of the Faculty 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 Faculty Handbook and in any other manner deemed appropriate by the Faculty.
e) Save as may otherwise be provided by the Faculty, for each module a list of those students refused DP certification shall be published, in a manner deemed appropriate by the Faculty, 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 in the relevant Faculty Office, in the prescribed manner, within three (3) University working days of 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) On application and/or on the recommendation of the Head of School, with the approval of the Senate, 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 in the relevant Faculty Office, in the prescribed manner, within ten (10) University working days of the release of supplementary 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, Masters 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 Faculty Rules, as approved by the Senate.

GR23 Special examinations

a) A student who has not been able to attempt or 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, normally during the next applicable supplementary examination session.

b) An application for a special examination shall be made on the prescribed form, accompanied by all relevant documentation, and lodged in the relevant Faculty Office within five (5) working days of the date of the examination concerned.

c) 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 faculty requirements have been met; and
c) all monies due to the University have been paid.

GR29 Classification of results

a) The result of any assessment shall be classified as follows:
   75% upward = 1st Class; 70 – 74%. = 2nd Class, Upper Division;
   60 – 69% = Second Class, Lower Division; 50 – 59% = 3rd Class;
   less than 50% = Fail.
b) A module may be passed with such distinctions as may be prescribed by the Senate on the recommendation of the Board of the Faculty concerned.
c) A qualification may be conferred or awarded with such distinctions as may be prescribed by the Senate on the recommendation of the Board of the Faculty concerned.

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 Faculty 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 in the Faculty of registration, in the prescribed manner, within ten (10) University working days of the release of final 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 the right to reproduce it in whole or in part for any person or institution who states that it is for study and research but not for commercial gain; provided that the University may waive this right if the work in question has been or is being published in a manner satisfactory to the University.

b) 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 the Matriculation Certificate of the Matriculation Board, or satisfied the conditions prescribed by the Board for exemption from the Matriculation Examination and obtained the Board's certificate to that effect, or obtained a certificate of conditional exemption issued by the 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 faculty 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 Faculty.

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 faculty 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 or eight semesters; 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
   (ii) 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 Supplementary examinations

Provided that the rules of any faculty, as approved by the Senate, 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 Senate, a student who has failed a module with a mark of less than 40% may be awarded a supplementary examination.

BR6 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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, the student has:
   (i) obtained a credit-weighted average of at least 75% in those modules specified by the Faculty; 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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, the student has:
(i) obtained a credit-weighted average of at least 80% in those modules specified by the Faculty; 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.

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 degree of Honours in any faculty provided that they have:
(i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty may prescribe further minimum criteria for admission to study.

HR3 Attendance

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

b) Save by permission of the Senate, all modules shall be completed at the University.

HR4 Curriculum

Save by permission of the Senate, the curriculum for a degree of Honours shall include a prescribed project as one of the modules.

HR5 Supplementary examinations

Provided that the rules of a faculty, as approved by the Senate, do not prohibit this for a particular module:

a) a student who fails a module other than the 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 Senate, a student who has failed a module other than the prescribed 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 faculty, as approved by the Senate, permit this, a prescribed project that is failed may be referred back once for revision and resubmission before the close of the applicable supplementary examination session.

HR7 Failed modules

Failed modules may not be repeated, except with the permission of the Senate.

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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, 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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, 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 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 in any faculty unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty 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 in any faculty 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) at least 75% of the total number of credits required for the degree are at Masters level and the remainder at Honours level or above; and
c) 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 in any faculty 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.

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 faculty, 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 Senate, and comply with such other conditions as may be prescribed by the Senate and the rules of the Faculty concerned.
b) The dissertation module shall comprise 25% to 50% of the total credits for the degree.

CR7 Proposed research topic

a) The Senate 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 un-satisfactory.
b) Ethical approval in terms of Rule GR32 is required where applicable.

CR8 Supervision

The Board of the Faculty 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 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 as the Senate may direct.

CR9 Supplementary examinations

Provided that the rules of a faculty, as approved by the Senate, 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 Senate, 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 Senate.

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, to the Dean of the faculty concerned of the 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 Faculty; 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 Board of the relevant Faculty, accompanied by introductory and concluding material.

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 Senate shall appoint for each dissertation two examiners, at least one of whom shall be responsible for external examination.
b) Except with the permission of the Senate, a supervisor or co-supervisor shall not be appointed as an examiner.

CR16 Re-examination of dissertation

a) A failed dissertation may not be re-examined.
b) On the advice of the Board of the Faculty, the Senate may invite a student to re-submit a dissertation in a revised or extended form.

CR17 Award of degree cum laude and summa cum laude

On the recommendation of the examiners of the dissertation, and in accordance with rules of the relevant faculty, the degree of Master by coursework may be awarded *cum laude* or *summa cum laude*.
a) For *cum laude* the student should obtain a weighted average of 75% or more in the coursework component of the degree at the first attempt and without recourse to supplementary examinations.
b) For *summa cum laude* the student should obtain a weighted average of 80% or more in the coursework component of the degree at the first attempt and without recourse to supplementary examinations.

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 in any faculty unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty may prescribe further minimum criteria for admission to study.

MR3 Periods of registration

A student registered for the degree of Master by research in any faculty 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 Faculty concerned.

MR5 Proposed subject of study

a) Before registration, an applicant for the degree of Master by research in any faculty shall submit for the approval of the Senate 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.

MR6 Supervision

The Board of the Faculty 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 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 as the Senate may direct.

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, to the Dean of the faculty concerned of the 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 Faculty; 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 Board of the relevant Faculty, accompanied by introductory and concluding material.

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 Senate shall appoint for each dissertation two examiners, at least one of whom shall be responsible for external examination.
b) Except with the permission of the Senate, a supervisor or co-supervisor shall not be appointed as an examiner.

MR12 Re-examination of dissertation

a) A failed dissertation may not be re-examined.
b) On the advice of the Board of the Faculty, the Senate may invite a student to re-submit a dissertation in a revised or extended form.

MR13 Award of degree cum laude

On the recommendation of the examiners, and in accordance with rules of the relevant faculty, the degree of Master by research may be awarded *cum laude* or *summa cum laude*.

RULES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY and SUPERVISED DOCTORAL DEGREES BY RESEARCH

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

DR1 Applicability

Except as may be prescribed by the Senate in the rules of any particular faculty, the following rules, DR2 to DR13 inclusive, shall be applicable to every candidate for the degree of Doctor of Philosophy / a supervised Doctoral degree by research.

DR2 Criteria for admission to study

a) An applicant shall not be registered for the degree of Doctor of Philosophy / a supervised Doctoral degree by research in any faculty unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty may prescribe further minimum criteria for admission to study.

DR3 Periods of registration

A student registered for the degree of Doctor of Philosophy / a supervised Doctoral degree by research in any faculty 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 the degree of Doctor of Philosophy / a supervised Doctoral degree 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) 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 Faculty concerned.

DR5 Proposed subject of study

a) Before registration, an applicant for the degree of Doctor of Philosophy / a supervised Doctoral degree by research shall submit for the approval of the Senate 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 Board of the Faculty 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 as the Senate may direct.

DR7 Progression

A student who, after eight semesters as a full-time student or twelve 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.

DR8 Submission of thesis

a) Every student for the degree of Doctor of Philosophy / a supervised Doctoral degree by research shall be required to submit a thesis embodying the results of their research.

b) At least three months before the thesis is to be submitted for examination, a student shall give notice, in writing, to the Dean of the faculty concerned of the 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 Faculty; 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 Board of the relevant Faculty, accompanied by introductory and concluding integrative material.

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 Senate 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 Senate, at least one of the external examiners shall be based external to the country.
c) Except with the permission of the Senate, a supervisor or co-supervisor shall not be appointed as an examiner.

DR12 Re-examination of thesis

a) A failed thesis may not be re-examined.
b) On the advice of the Board of the Faculty, the Senate may invite a student to re-submit a thesis in a revised or extended form.

DR13 Defence of thesis

The Senate may require a student to defend a thesis.

RULES FOR SENIOR (UNSUPERVISED) DOCTORAL DEGREES

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

DS1 Applicability

a) Except as may be prescribed by the Senate in the rules of any particular faculty, the preceding rules DR2 to DR13 shall also be applicable where relevant to every candidate for a senior (unsupervised) Doctoral degree.
b) Additional rules governing the requirements for senior Doctoral degrees in particular faculties may be prescribed by the Senate and the Council.

RULES FOR CERTIFICATES AND DIPLOMAS

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

CD1 Applicability

The rules governing certificates and diplomas in any faculty shall be as prescribed by the Senate and the Council in the Handbook of the applicable faculty.

ENGINEERING FACULTY RULES FOR DEGREES, DIPLOMAS AND CERTIFICATES

Students are expected to attend all lectures, tutorials, practicals and must meet all DP requirements.

Note: *The inclusion of any programme, course of study or module in this Handbook does not imply that the Faculty of Engineering is compelled to offer it.*

Definition of Terms

The following definitions apply to programmes offered by Schools in the Faculty of Engineering.

(a) Module: any separate course of study for which credits may be obtained. 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 7 (Honours or fourth year), level 8 (Masters) and level 9 (Doctoral). The level of a module may be read from its module code. It is given by the first numeric character in that code. Modules may be further subdivided as follows:
Corequisite module: 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.
Prerequisite module: a module which must have been passed, with at least the minimum mark required by the Faculty, before registration of the proposed module is permitted.
Core module: these are modules that are common over more than one campus and core (compulsory) to a major or a programme.
Elective module: modules from which a student selects according to preference. The selection may have to be from a restricted list and credit for an elective may not be obtained more than once.

(b) Assessment: means the evaluation and grading of work, supervised or unsupervised, carried out by a student in satisfying the requirements of a module. This includes examinations.

(c) Credit: the value assigned to ten notional hours of learning and assessment.

(d) Credit-weighted average: the average mark of a set of modules weighted in proportion to the credit value of the modules concerned.

(e) Curriculum: consists of the set of modules which together comprise the programme of study leading to a qualification.

(f) Subject: related module material which may spread over several modules at one or more levels of study.

(g) Examination: means a formal assessment, conducted within an officially designated examination session, usually invigilated, and bound by time constraints.

(h) Notional study hours: the learning time that it is conceived it would take to meet the defined outcomes for the module by an average undergraduate learner.

(i) Programme: a structured curriculum in an area of specialisation leading to a qualification such that at least 50 per cent of the credits are prescribed by the programme.

(j) Year of Study: the level at which undergraduate students are registered academically.

(1) Foundation year: applies to students who are registered for the University of Kwazulu-Natal Intensive Tuition for Engineers programme, known as UNITE, or the University's science foundation programme (SFP),

(2) First year of study: applies to students who have not yet obtained at least 96 credits points.

(3) Second year of study:

(i) in three-year programmes this applies to students who have obtained at least 96 credits points, 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 credit points, but have not yet obtained 50% of the credit points needed for the qualification

(4) 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 degree.

(ii) in four-year programmes this applies to students who have obtained 50% of the credit points needed for the qualification, but who have not yet registered for such modules as will, if passed, lead to the completion of the degree

(5) 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 degree.

(k) Faculty Board: the Faculty Board shall mean the Board of the Faculty of Engineering of the University.

General Rules

EG1 Applicability of Rules

a) The General Academic Rules of UKZN apply to all students in the Faculty of Engineering. Their effect cannot be avoided by any interpretation of the Faculty Rules.

b) Admission to modules offered in other Faculties shall be subject to the approval of those Faculties.

c) The time at which examinations are written in modules offered in other Faculties shall be determined by those Faculties.

EG2 Qualification Offerings

The following degrees are conferred, and certificates and diplomas awarded

a) In Construction Management, Quantity Surveying and Construction Project Management

Bachelor of Science in Property Development	BScPropDev
Bachelor of Science in Property Development Honours (Construction Management)	BScPropDevHons(CM)
Bachelor of Science in Property Development Honours (Quantity Surveying)	BScPropDevHons(QS)
Master of Science (Construction Project Management)	MSc(ConstProjMan)
Master of Science in Construction Management	MScConstMan
Master of Science in Quantity Surveying	MScQS
Doctor of Philosophy	PhD
Doctor of Science in Construction Management	DScConstMan
Doctor of Science in Quantity Surveying	DScQS

b) In Engineering

Bachelor of Science in Engineering	BScEng
(Candidates may take the Bachelor's degree in Agricultural, Chemical, Civil, Computer, Electrical, Electronic or Mechanical Engineering)	
Master of Science in Engineering	MScEng
Doctor of Philosophy	PhD
Doctor of Science in Engineering	DScEng

c) In Land Surveying

Bachelor of Science in Land Surveying	BScSur
Master of Science in Land Surveying	MScSur
Doctor of Philosophy	PhD
Doctor of Science in Land Surveying	DScSur

EG3 General Module Assessment Rule

a) In the Faculty of Engineering, a credit-earning module mark is the weighted average of the continuous assessment mark (also called class mark) and the examination mark, as approved by the Faculty. The weights are included in each module's syllabus in this handbook.
b) Completion of a non-credit-earning module requires a DP certificate only.
c) DP certification shall be refused when a student fails to meet the Faculty approved DP requirements, which are included in each module's syllabus in this handbook.
d) Lack of DP certification results in an examination mark of 0. Absence from a scheduled examination has the same effect.

EG4 Award of Certificates of Merit

The following criteria apply for the award of a Merit Certificate:

a) subject to the limitations of b), c), and d) below, a maximum of three awards per module per campus may be made. The size of the class would not limit or increase the number of awards.
b) the student must achieve a minimum of 75% for the module to be eligible for the award.
c) awards may be made in all modules of 8 credits or more at the Bachelors and Honours degree levels and all taught Coursework Masters modules; i.e. all modules at levels 5, 6 and 7 and taught modules at level-8 would be considered.
d) where a module has 2 or more components the award could be made either for individual components (each component should have a code) OR for the module as a whole but not for both. Faculties should make the decision.
e) all students registered for the module including those registered NDP are eligible for merit awards.

Alternative Access Programme

Unite Programme

The UNITE Programme offers a Preparatory Certificate in Engineering for candidates who have had a disadvantaged educational background. Candidates shall obtain credit for the following modules in the course of one academic year.

Preparatory Certificate in Engineering

1st Semester

ENUN0ID H1 Introduction to Engineering Drawing	8
ENUN0MA H1 Supplementary Mathematics A	16
MATH131 H1 Mathematics 1A (Eng)	16
ENUN0CY H1 Chemistry A	8
ENUN0EC H1 Engineering Communication A	8
ENUN0ME H1 Mechanics A	8
ENUN0PY H1 Physics A	8

2nd Semester

ENUN1ED H2 Engineering Drawing	8
ENUN1MA H2 Supplementary Mathematics B	16
MATH141 H2 Mathematics 1B (Eng)	16
ENUN1CY H2 Chemistry B	8
ENUN1PY H2 Physics B	8
ENUN1EC H2 Engineering Communication B	8
ENUN1ME H2 Mechanics B	8

EU1 Progression in the UNITE Programme

To proceed to *semester 2*, students must obtain at least 40% for the following first semester modules: ENUN01DIntroduction to Engineering Drawing, ENUN0PYPhysics, ENUN0CYChemistry, ENUN0MEMechanics, ENUN0EC Engineering Communications, ENUN0MASupplementary Mathematics. Furthermore, they must pass MATH131Maths 1A and have a credit weighted average of 50%. All students who do not qualify to proceed to second semester *will be excluded* at the end of the first semester.

EU2 Admission to the BScEng Degree

Students will qualify to enrol in the Faculty of Engineering at the first year level if they pass all second semester modules (50%) and obtain a credit weighted average of not less than 60% in those modules. Students wanting to study Chemical Engineering must obtain a credit weighted average of at least 65% in those modules. No modules may be repeated.

EU3 Conditions for Award of Preparatory Certificate in Engineering

In order to qualify for a 'Preparatory Certificate in Engineering' a candidate and they must pass all second semester modules (50%). This certificate will be granted only to students who cannot or do not enrol in the Faculty.

EU4 Conditions for the Award of Supplementary Examinations

A student who fails MATH131 Mathematics 1A (Eng) or MATH141 Mathematics 1B (Eng) with a mark between 40% and 49% incl., will be allowed to write a supplementary examination. No other supplementary examinations will be granted.

Bachelors Degrees

This section refers to the following degrees:

a) Bachelor of Science in Engineering - BScEng
b) Bachelor of Science in Land Surveying - BScSur
c) Bachelor of Science in Property Development - BScPropDev

EB1 Undergraduate Bachelors Degrees Admission Requirements

(a) In order to register in the degree programmes for BScEng and BScSur applicants must have passed Matriculation or the equivalent examination with Mathematics and Physical Science on the Higher Grade. Normally a mark of at least 60 percent in these subjects is considered necessary for admission. Only a Standard Grade result of more than 90% will be considered for admission purposes.

(b) In order to register in the degree programme for BScPropDev applicants must have passed Matriculation or the equivalent examination with Mathematics. Normally a mark of at least 50 percent on the Higher Grade or 70 percent on the Standard Grade in Mathematics is considered necessary for admission.
The number of applicants admitted will be dependent on the number of places available.

(c) In order to gain entry to Engineering from the Centre of Science Access, an aggregate of 70% & 70% for each of Engineering Mathematics, Chemistry and Physics, plus 60% for Additional Maths and no failed modules, is required.
Students can gain entry to Engineering if they do not take the Engineering stream but they would require 70% for Mathematics in addition to 70% aggregate and 70% for Chemistry and Physics.

EB2 Bachelors Degrees Progression Rule

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

b) Subject to c), student may register for modules at the level no higher than two above the lowest which is incomplete.

c) Students may not register any modules for which all prerequisite requirements are not met. Students may register for modules in time table clashes only with adequate concessions for previously attended modules. It is the responsibility of the students to apply for deregistration from clashing modules.

d) Students are expected to register for and complete 72 credits in a semester, except when a different load is authorised by the Dean.

e) Registration for an elective module shall require the approval by the Dean of the Faculty of Engineering, and if the module is offered in another Faculty, also by the Dean of the Faculty concerned. The consequences of the elective module selection resulting in examination time-table clashes must be borne by the student concerned.

f) Students may apply for a change of curriculum, based on post-registration change in relevant facts that relate to timetable, prerequisites, or module completion. This change may not be unreasonably withheld.

g) Only in exceptional circumstances of a student and based on a strong motivation from the relevant Head of School, the Dean may relax the progression rule for this student.

EB3 Bachelors Degrees Exclusion

a) The academic progress of a student in a semester is slow when
(i) the student fails to accumulate credits for the registered degree according to the minimum progression requirement in the table below, or

(ii) the student has not completed the degree in the indicated maximum time (12 semesters for a 4-year qualification and 9 semesters for a 3-year qualification).

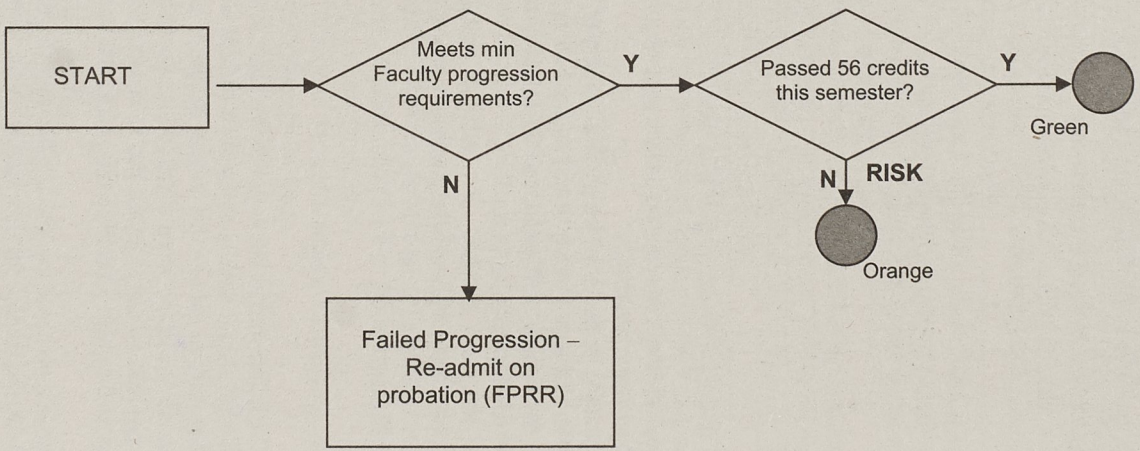
Number of semesters registered	Minimum progression requirement	Normal progression
1	48	72
2	96	144
3	144	216
4	192	288
5	240	360
6	288	**432** (3-year degree)
7	336	504
8	384	**576** (4-year degree)
9	**432**	
10	480	
11	528	
12	**576**	

Credits exempted and the corresponding periods of study are included in this calculation, but the foundation year is excluded.

b) All slowly progressing students will be given a warning of slow academic progress. A student who has progressed slowly in two successive registered semesters, shall be excluded from the Faculty of Engineering. The warning and exclusion decision shall remain in the student's record.

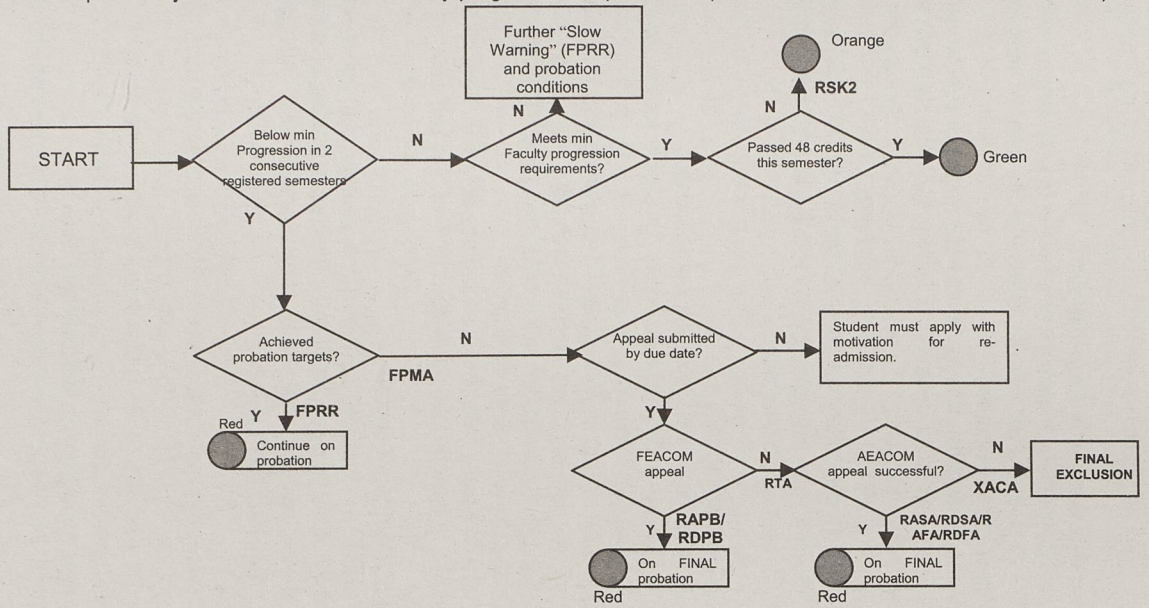
c) A student that has been admitted, or re-admitted, subject to conditions, shall be excluded from the Faculty of Engineering without warning, if any such condition is not satisfied.

Undergraduate Progression Flowchart
Students current status is:
Was never previously below the minimum Faculty progression requirement



Students current status is:

Was previously below the minimum Faculty progression requirement. (FPRR, FPRD, FPMA, SLOW, XEB3 etc.)



Standard probation conditions of "Must pass 56 credits in next semester" should be applied where probation is required. Note: Students who are granted Supplementary exams are considered to have failed the exam. Term decisions may be rescinded after successful supplementary exams.

EB4 Minor Substitutions in Curriculum
The Board may permit minor substitutions in the modules prescribed for any degree.

EB5 Bachelor Degrees Supplementary Examinations
a) Subject to c), 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) Subject to c), where a student has failed a module with a mark of 30% or more and has failed not more than one other module for which the mark is 40% or more a supplementary exam may be awarded if it enables the student to complete the academic semester as defined in EB9, EB10, EB11, EH7, EH8, or EM7.
c) Certain modules, which are dominated by project-work, do not have supplementary examinations. This information, approved by the Faculty, is available from the Faculty Office and recorded in the Syllabus section.

EB6 Award of Dean's Commendation
The following criteria apply for the award of a Dean's Commendation:
a) Students registered for any undergraduate degree are eligible for the award. (i.e. not Honours or postgraduate qualifications)
b) All modules which are prescribed for the degree and for which a student is registered are taken into consideration. (NDP modules are not considered).
c) The student shall have registered for a full load, excluding NDP modules, in the semester. A full load is specific to each qualification.
d) A student must have obtained a credit-weighted average of 75% in the semester, with no mark of less than 60% in any one module included for the Commendation.

EB7 Award of Class of Bachelors Degree
a) The Bachelors degree mark is the credit-weighted average mark of all attempts at professional modules at the third year level for the three-year degrees, or at the third and fourth year for the four-year degrees. The Faculty approved list of such professional modules is available in the Faculty Office.

The class of degree
b) A degree of Bachelors may be conferred *cum laude* provided that the student has:
(i) obtained a degree mark of at least 75%; and
(ii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and
(iii) completed the degree in the prescribed minimum time.
c) A degree of Bachelors may be conferred *summa cum laude* provided that the student has:
(i) obtained a degree mark of at least 80%; and
(ii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and

(iii) completed the degree in the prescribed minimum time.

d) A degree of Bachelors may be conferred *first class* provided that the student has obtained a degree mark of at least 75%.

e) A degree of Bachelors may be conferred *upper second class* provided that the student has obtained a degree mark of between 70 and 74% inclusive.

f) A degree of Bachelors may be conferred *lower second class* provided that the student has obtained a degree mark of between 60 and 69% inclusive.

g) A degree of Bachelors may be conferred *third class* provided that the student has obtained a degree mark of between 50 and 59% inclusive.

h) A degree mark of less than 50% is not classified.

EB8 Vacation Work Requirements

Candidates shall undertake and perform such vacation work as may be assigned by their Head of School and shall submit an acceptable report thereon to their Head of School within six weeks of the start of the semester following completion of each period of such work.

a) BScEng candidates are normally required to complete a minimum period of 14 weeks practical work for degree purposes, which could include one or more workshop training modules.

EB9 Bachelor of Science in Engineering Curriculum

Candidates shall obtain credit for the following modules:

A. Engineering Programmes on the Pietermaritzburg Campus

(i) First Year (Agricultural, Civil, Computer, Electrical, Electronic and Mechanical Engineering)

1st Semester			***Credits***
ENME1DR	P1	Engineering Drawing	8
ENAG1EN	P1	Engineering	8
MATH132	P1	Applied Mathematics 1A (Eng)	16
CHEM163	P1	Chemistry & Society 1	8
MATH131	P1	Mathematics 1A (Eng)	16
PHYS110	P1	Mechanics, Optics and Thermal Physics	16
2nd Semester			***Credits***
ENAG1DE	P2	Engineering Design	8
ENAG1MT	P2	Introduction to Engineering Materials	8
CHEM173	P2	Chemistry & Society 2	8
MATH142	P2	Applied Mathematics 1B (Eng)	16
MATH141	P2	Mathematics 1B (Eng)	16
PHYS120	P2	Electromagnetism, Waves & Modern Physics	16
ENCV1CW	H2	Communications Workshop (1 week f-t in July Vacation in Durban) (Agricultural and Civil Engineering students only)	DP

(ii) First Year (Chemical Engineering)

1st Semester			**Credits**
ENCH1EA	P1	Chemical Engineering Principles 1	8
ENME1DR	P1	Engineering Drawing	8
CHEM110	P1	General Principles of Chemistry	16
MATH132	P1	Applied Mathematics 1A (Eng)	16
MATH131	P1	Mathematics 1A (Eng)	16
PHYS161	P1	Chemical Engineering Physics 1A	8
2nd Semester			**Credits**
ENCH1EA	P2	Chemical Engineering Principles 2	8
CHEM120	P2	Chemical Reactivity	16
MATH142	P2	Applied Mathematics 1B (Eng)	16
MATH141	P2	Mathematics 1B (Eng)	16
PHYS120	P2	Electromagnetism, Waves & Modern Physics	16

(iii) Third Year (Modified Agricultural Engineering Programme on Pietermaritzburg campus)

1st Semester			**Credits**
MATH212	P1	Advanced Calculus & Linear Algebra	16
ENAG4HY	P1	Environmental Hydrology#	16
ENAG3SA	P1	Structural Analysis & Design	8
ENAG3US	P1	Undergrad Seminar#	8
24 Credits selected from the following			24
ENAG3PT	P1	Power & Traction+# (8C)	
ENAG3EI	P1	Irrigation Engineering+# (16C)	
ENAG4BM	P1	Bio-Production Systems & Management+# (16C)	
ENAG4EC	P1	Environmental Control+# (8C)	
ENAG3FP	P1	Principles of Food Processing+ (8C)	
ENAG4EA	P1	Electrical Applications for Bio-Systems+# (8C)	
ENAG4FE	P1	Forest Engineering+# (8C)	
2nd Semester			**Credits**
MATH241	P2	Further Calculus and Differential Equations	16
COMP102	P2	Computer Programming	16
ENAG4EH	P2	Engineering Hydrology#	16
STAT101	P2	Basic Statistics	8
16 Credits selected from the following			16
HYDR312	P2	Dam Design (8C)	
ENAG4SW	P2	Soil & Water Conservation Eng+# (8C)	
ENAG3FE	P2	Food Engineering Unit Operations+# (8C)	
HYDR322	P2	Environmental Water Quality (8C)	
ENAG4AP	P2	Advanced Power and Traction +# (8C)	

* Or as approved by Head of School

\+ Modules offered in alternative years

\# National Quality Framework (NQF) level=7

NOTE: A total of at least 120 credits must be taken at NQF level 7

(iv) Fourth Year (Agricultural Engineering on Pietermaritzburg campus in 2008)

1st Semester			**Credits**
ENAG4BD	PY	Design Project	-
ENAG4HY	P1	Environmental Hydrology	16
ENAG4IE	P1	Irrigation Engineering	8
ENAG4PT	P1	Power and Traction for Agricultural Machines	16
ENAG4US	P1	Undergraduate Seminar	8
ENAG4WS	PC	Workshop Course	DP
ENAG4EP	PY	ECSA Outcomes Portfolio	DP
Elective modules			16
2nd Semester			**Credits**
ENAG4BD	PY	Design Project	24
ENAG4EC	P2	Environmental Control for Biological Commodities	8
ENAG4EH	P2	Engineering Hydrology	16
ENAG4MM	P2	Machinery Mechanisms and Management	16
ENAG4VW	PC	Vacation Work	DP
Elective module			16
and at least 32 credits for the year from the following elective modules selected in consultation with and approved by the Head of School			
ENAG4ST	PC	Selected Topics in Bioresources Engineering	8
AGPS305	P1	Field Crop Management	16
AGEC240	P2	Applied Farm Financial Management	8
HYDR312	P2	Dam Design	8
SSCI212	P1	Introduction to Soil Science	8
SSCI230	P2	Pedology	16

(iv) Fourth Year (Modified Agricultural Engineering Programme on Pietermaritzburg campus from 2009 only)

1st Semester			**Credits**
ENAG4BD	PY	Design Project[#]	8
CTEC733	P1	Business Management	8
32 Credits selected from the following			32
ENAG3PT	P1	Power & Traction[+#] (8C)	
ENAG3EI	P1	Irrigation Engineering[+#] (16C)	
ENAG4BM	P1	Bio-Production Systems & Management[+#] (16C)	
ENAG4EC	P1	Environmental Control[+#] (8C)	
ENAG3FP	P1	Principles of Food Processing[+] (8C)	
ENAG4EA	P1	Electrical Applications for Bio-Systems[+#] (8C)	
ENAG4FE	P1	Forest Engineering[+#] (8C)	
24 Credits selected from the following:*			24
ENAG4ST	PC	Selected Topics in Bioresources Engineering[#] (8C)	
ENVS221	P1	Environmental Assessment (8C)	

AGPS305	P1	Field Crop Management (16C)	
HYDR710	P1	Current Issues in Hydrology (16C)	
SSCI217	P1	Introduction to Soils & the Environment (16C)	
AGPS307	P1	Orchard Management (16C)	
ENAG4WS	P1	Workshop Course	DP
ENAG4VW	PC	Vacation Work	DP
ENAG4EP	PY	ECSA Outcomes Portfolio	DP
2nd Semester			**Credits**
AGEC240	P2	Farm Financial Management	8
ENAG4BD	PY	Design Project#	16
Elective (Complementary studies)			16
16 Credits selected from the following			16
HYDR312	P2	Dam Design (8C)	
ENAG4SW	P2	Soil & Water Conservation Eng+# (8C)	
ENAG4FE	P2	Food Engineering Unit Operations+# (8C)	
HYDR322	P2	Environmental Water Quality+ (8C)	
ENAG4AP	P2	Advanced Power and Traction +# (8C)	
16 Credits selected from the following:*			16
ENAG4ST	PC	Selected Topics in Bioresources Engineering# (8C)	
SSCI1230	P2	Pedology (16C)	
HYDR720	P2	Integrated Water Resources Management (16C)	
HYDR725	P2	Advanced Hydrological Processes (16C)	
AGSP304	P2	Greenhouse Management (8C)	
AGPS724	P2	Post Harvest Technology (8C)	
ENVS211	P2	Geographic Information Systems (16C)	

* Or as approved by Head of School

\+ Modules offered in alternative years

\# National Quality Framework (NQF) level=7

NOTE: A total of at least 120 credits must be taken at NQF level 7

B. Agricultural Engineering Programme on Howard College Campus

First Year

1st Semester			**Credits**
ENME1DR	H1	Engineering Drawing	8
ENSV1EN	H1	Engineering	8
CHEM181	H1	Chemistry for Engineers IA	8
MATH132	H1	Applied Mathematics 1A (Eng)	16
MATH131	H1	Mathematics 1A (Eng)	16
PHYS151	H1	Engineering Physics 1A	16

2nd Semester			Credits
ENCV1ED	H2	Civil Engineering Design 1	8
ENME1EM	H2	Introduction to Engineering Materials	8
CHEM191	H2	Chemistry for Engineers IB	8
MATH142	H2	Applied Mathematics 1B (Eng)	16
MATH141	H2	Mathematics 1B (Eng)	16
PHYS152	H2	Engineering Physics 1B	16

Second Year (Modified Agricultural Engineering Programme)

1st Semester			Credits
ENEL2EE	H1	Electrical and Electronic Eng	16
ENCV2SA	H1	Structures 1	16
ENCV2GA	H1	Geo Tech Eng 1	8
ENSV2SA	H1	Surveying (Eng) 1	8
ENME2DY	H1	Dynamics	8
ENPD3PP	H1	Project Planning & Management Control	8
ENME2TH	H1	Thermodynamics 1	8
2nd Semester			Credits
ENCV2DE	H2	Design (Civil)	16
ENCV2FL	H2	Fluids 1	8
ENCV2GB	H2	Geo Tech Eng 2	8
ENCV2SB	H2	Structures 2	16
ENSV2SB	H2	Surveying (Eng) 2	8
ENME3TH	H2	Thermodynamics 2	8
ENEL2EN	H2	Environmental Engineering	8

C. Chemical Engineering Programme

First Year

1st Semester			Credits
ENCH1EA	H1	Chemical Engineering Principles 1	8
ENME1DR	H1	Engineering Drawing	8
CHEM161	H1	Chemical Engineering Chemistry 1	16
MATH132	H1	Applied Mathematics 1A (Eng)	16
MATH131	H1	Mathematics 1A (Eng)	16
PHYS161	H1	Chemical Engineering Physics 1A	8

2nd Semester			Credits
ENCH1EB	H2	Chemical Engineering Principles 2	8
CHEM171	H2	Chemical Engineering Chemistry 2	16
MATH142	H2	Applied Mathematics 1B (Eng)	16
MATH141	H2	Mathematics 1B(Eng)	16
PHYS162	H2	Chemical Engineering Physics 1B	16

Second Year

1st Semester	**Credits**
ENCH2MB H1 Mass and Energy Balances	8
ENEL2EE H1 Electrical & Electronic Engineering	16
ENEL2CM H1 Applied Computer Methods	8
ENCH2OM H1 Oil & Mineral Processing	8
CHEM241 H1 Applied Organic Chemistry for Chemical Engineers	8
MATH238 H1 Mathematics 2A (Eng)	16
ENCH2BE H1 Biochemical & Environmental Engineering	8
2nd Semester	**Credits**
ENCH2CP H2 Chemical Engineering Practicals 1	8
ENCH2EF H2 Chemical Engineering Fundamentals	16
ENCH2MS H2 Materials of Construction	8
ENCH2TD H2 Thermodynamics 1	8
CHEM251 H2 Applied Physical Chemistry for Chemical Engineers	8
MATH248 H2 Mathematics 2B (Eng)	16
ENCH2IT H2 Instrument Technology	8
ENCH2WS H2 Workshop Training (2 weeks)	DP

Third Year

1st Semester	**Credits**
ENCH3FM H1 Fluid Mechanics	8
ENCH3FD H1 Fluid Mechanics Design	8
ENCH3HE H1 Heat Transfer	16
ENCH3TH H1 Thermodynamics 2	8
ENCH3SL H1 Safety & Loss Prevention	8
CHEM261 H1 Applied Inorganic Chemistry for Chemical Engineers	8
MATH354 H1 Mathematics 3A (Eng)	8
STAT370 H1 Engineering Statistics	8
2nd Semester	**Credits**
ENCH3EC H2 Chemical Engineering Design	8
ENCH3MT H2 Mass Transfer	16
ENCH3PO H2 Process Modelling & Optimization	16
ENCH3RT H2 Reactor Technology Fundamentals	16
ENCH3UO H2 Unit Operations	16

Fourth Year

1st Semester	**Credits**
ENCH4DC H1 Process Dynamics and Control	16
ENCH4LA H1 Laboratory/Industry Project 1	16
ENCH4MT H1 Advanced Mass Transfer	8

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 Faculty 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 faculty may prescribe ancillary modules in any curriculum.
b) A faculty 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 Head of the School in which they have studied that module 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 Board of the Faculty 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 Faculty Handbook and in any other manner deemed appropriate by the Faculty.
e) Save as may otherwise be provided by the Faculty, for each module a list of those students refused DP certification shall be published, in a manner deemed appropriate by the Faculty, 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 in the relevant Faculty Office, in the prescribed manner, within three (3) University working days of 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) On application and/or on the recommendation of the Head of School, with the approval of the Senate, 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 in the relevant Faculty Office, in the prescribed manner, within ten (10) University working days of the release of supplementary 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, Masters 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 Faculty Rules, as approved by the Senate.

GR23 Special examinations

a) A student who has not been able to attempt or 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, normally during the next applicable supplementary examination session.

b) An application for a special examination shall be made on the prescribed form, accompanied by all relevant documentation, and lodged in the relevant Faculty Office within five (5) working days of the date of the examination concerned.

c) 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 faculty requirements have been met; and
c) all monies due to the University have been paid.

GR29 Classification of results

a) The result of any assessment shall be classified as follows:
   75% upward = 1st Class; 70 – 74%. = 2nd Class, Upper Division;
   60 – 69% = Second Class, Lower Division; 50 – 59% = 3rd Class;
   less than 50% = Fail.
b) A module may be passed with such distinctions as may be prescribed by the Senate on the recommendation of the Board of the Faculty concerned.
c) A qualification may be conferred or awarded with such distinctions as may be prescribed by the Senate on the recommendation of the Board of the Faculty concerned.

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 Faculty 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 in the Faculty of registration, in the prescribed manner, within ten (10) University working days of the release of final 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 the right to reproduce it in whole or in part for any person or institution who states that it is for study and research but not for commercial gain; provided that the University may waive this right if the work in question has been or is being published in a manner satisfactory to the University.

b) 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 the Matriculation Certificate of the Matriculation Board, or satisfied the conditions prescribed by the Board for exemption from the Matriculation Examination and obtained the Board's certificate to that effect, or obtained a certificate of conditional exemption issued by the 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 faculty 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 Faculty.

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 faculty 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 or eight semesters; 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
   (ii) 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 Supplementary examinations

Provided that the rules of any faculty, as approved by the Senate, 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 Senate, a student who has failed a module with a mark of less than 40% may be awarded a supplementary examination.

BR6 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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, the student has:
   (i) obtained a credit-weighted average of at least 75% in those modules specified by the Faculty; 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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, the student has:
(i) obtained a credit-weighted average of at least 80% in those modules specified by the Faculty; 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.

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 degree of Honours in any faculty provided that they have:
(i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty may prescribe further minimum criteria for admission to study.

HR3 Attendance

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

b) Save by permission of the Senate, all modules shall be completed at the University.

HR4 Curriculum

Save by permission of the Senate, the curriculum for a degree of Honours shall include a prescribed project as one of the modules.

HR5 Supplementary examinations

Provided that the rules of a faculty, as approved by the Senate, do not prohibit this for a particular module:

a) a student who fails a module other than the 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 Senate, a student who has failed a module other than the prescribed 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 faculty, as approved by the Senate, permit this, a prescribed project that is failed may be referred back once for revision and resubmission before the close of the applicable supplementary examination session.

HR7 Failed modules

Failed modules may not be repeated, except with the permission of the Senate.

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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, 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 Faculty, as approved by the Senate, provided that, subject to exceptions as approved by the Council, 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 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 in any faculty unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty 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 in any faculty 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) at least 75% of the total number of credits required for the degree are at Masters level and the remainder at Honours level or above; and
c) 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 in any faculty 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.

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 faculty, 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 Senate, and comply with such other conditions as may be prescribed by the Senate and the rules of the Faculty concerned.
b) The dissertation module shall comprise 25% to 50% of the total credits for the degree.

CR7 Proposed research topic

a) The Senate 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 un-satisfactory.
b) Ethical approval in terms of Rule GR32 is required where applicable.

CR8 Supervision

The Board of the Faculty 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 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 as the Senate may direct.

CR9 Supplementary examinations

Provided that the rules of a faculty, as approved by the Senate, 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 Senate, 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 Senate.

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, to the Dean of the faculty concerned of the 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 Faculty; 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 Board of the relevant Faculty, accompanied by introductory and concluding material.

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 Senate shall appoint for each dissertation two examiners, at least one of whom shall be responsible for external examination.
b) Except with the permission of the Senate, a supervisor or co-supervisor shall not be appointed as an examiner.

CR16 Re-examination of dissertation

a) A failed dissertation may not be re-examined.
b) On the advice of the Board of the Faculty, the Senate may invite a student to re-submit a dissertation in a revised or extended form.

CR17 Award of degree cum laude and summa cum laude

On the recommendation of the examiners of the dissertation, and in accordance with rules of the relevant faculty, the degree of Master by coursework may be awarded *cum laude* or *summa cum laude*.

a) For *cum laude* the student should obtain a weighted average of 75% or more in the coursework component of the degree at the first attempt and without recourse to supplementary examinations.
b) For *summa cum laude* the student should obtain a weighted average of 80% or more in the coursework component of the degree at the first attempt and without recourse to supplementary examinations.

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 in any faculty unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty may prescribe further minimum criteria for admission to study.

MR3 Periods of registration

A student registered for the degree of Master by research in any faculty 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 Faculty concerned.

MR5 Proposed subject of study

a) Before registration, an applicant for the degree of Master by research in any faculty shall submit for the approval of the Senate 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.

MR6 Supervision

The Board of the Faculty 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 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 as the Senate may direct.

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, to the Dean of the faculty concerned of the 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 Faculty; 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 Board of the relevant Faculty, accompanied by introductory and concluding material.

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 Senate shall appoint for each dissertation two examiners, at least one of whom shall be responsible for external examination.
b) Except with the permission of the Senate, a supervisor or co-supervisor shall not be appointed as an examiner.

MR12 Re-examination of dissertation

a) A failed dissertation may not be re-examined.
b) On the advice of the Board of the Faculty, the Senate may invite a student to re-submit a dissertation in a revised or extended form.

MR13 Award of degree cum laude

On the recommendation of the examiners, and in accordance with rules of the relevant faculty, the degree of Master by research may be awarded *cum laude* or *summa cum laude*.

RULES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY and SUPERVISED DOCTORAL DEGREES BY RESEARCH

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

DR1 Applicability

Except as may be prescribed by the Senate in the rules of any particular faculty, the following rules, DR2 to DR13 inclusive, shall be applicable to every candidate for the degree of Doctor of Philosophy / a supervised Doctoral degree by research.

DR2 Criteria for admission to study

a) An applicant shall not be registered for the degree of Doctor of Philosophy / a supervised Doctoral degree by research in any faculty unless the applicant has:
   (i) satisfied the requirements for a relevant prerequisite degree as specified in the Faculty 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 faculty may prescribe further minimum criteria for admission to study.

DR3 Periods of registration

A student registered for the degree of Doctor of Philosophy / a supervised Doctoral degree by research in any faculty 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 the degree of Doctor of Philosophy / a supervised Doctoral degree 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) 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 Faculty concerned.

DR5 Proposed subject of study

a) Before registration, an applicant for the degree of Doctor of Philosophy / a supervised Doctoral degree by research shall submit for the approval of the Senate 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 Board of the Faculty 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 as the Senate may direct.

DR7 Progression

A student who, after eight semesters as a full-time student or twelve 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.

DR8 Submission of thesis

a) Every student for the degree of Doctor of Philosophy / a supervised Doctoral degree by research shall be required to submit a thesis embodying the results of their research.

b) At least three months before the thesis is to be submitted for examination, a student shall give notice, in writing, to the Dean of the faculty concerned of the 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 Faculty; 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 Board of the relevant Faculty, accompanied by introductory and concluding integrative material.

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 Senate 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 Senate, at least one of the external examiners shall be based external to the country.
c) Except with the permission of the Senate, a supervisor or co-supervisor shall not be appointed as an examiner.

DR12 Re-examination of thesis

a) A failed thesis may not be re-examined.
b) On the advice of the Board of the Faculty, the Senate may invite a student to re-submit a thesis in a revised or extended form.

DR13 Defence of thesis

The Senate may require a student to defend a thesis.

RULES FOR SENIOR (UNSUPERVISED) DOCTORAL DEGREES

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

DS1 Applicability

a) Except as may be prescribed by the Senate in the rules of any particular faculty, the preceding rules DR2 to DR13 shall also be applicable where relevant to every candidate for a senior (unsupervised) Doctoral degree.
b) Additional rules governing the requirements for senior Doctoral degrees in particular faculties may be prescribed by the Senate and the Council.

RULES FOR CERTIFICATES AND DIPLOMAS

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

CD1 Applicability

The rules governing certificates and diplomas in any faculty shall be as prescribed by the Senate and the Council in the Handbook of the applicable faculty.

ENGINEERING FACULTY RULES FOR DEGREES, DIPLOMAS AND CERTIFICATES

Students are expected to attend all lectures, tutorials, practicals and must meet all DP requirements.

Note: *The inclusion of any programme, course of study or module in this Handbook does not imply that the Faculty of Engineering is compelled to offer it.*

Definition of Terms

The following definitions apply to programmes offered by Schools in the Faculty of Engineering.

(a) Module: any separate course of study for which credits may be obtained. 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 7 (Honours or fourth year), level 8 (Masters) and level 9 (Doctoral). The level of a module may be read from its module code. It is given by the first numeric character in that code. Modules may be further subdivided as follows:

Corequisite module: 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.

Prerequisite module: a module which must have been passed, with at least the minimum mark required by the Faculty, before registration of the proposed module is permitted.

Core module: these are modules that are common over more than one campus and core (compulsory) to a major or a programme.

Elective module: modules from which a student selects according to preference. The selection may have to be from a restricted list and credit for an elective may not be obtained more than once.

(b) Assessment: means the evaluation and grading of work, supervised or unsupervised, carried out by a student in satisfying the requirements of a module. This includes examinations.

(c) Credit: the value assigned to ten notional hours of learning and assessment.

(d) Credit-weighted average: the average mark of a set of modules weighted in proportion to the credit value of the modules concerned.

(e) Curriculum: consists of the set of modules which together comprise the programme of study leading to a qualification.

(f) Subject: related module material which may spread over several modules at one or more levels of study.

(g) Examination: means a formal assessment, conducted within an officially designated examination session, usually invigilated, and bound by time constraints.

(h) Notional study hours: the learning time that it is conceived it would take to meet the defined outcomes for the module by an average undergraduate learner.

(i) Programme: a structured curriculum in an area of specialisation leading to a qualification such that at least 50 per cent of the credits are prescribed by the programme.

(j) Year of Study: the level at which undergraduate students are registered academically.

(1) Foundation year: applies to students who are registered for the University of Kwazulu-Natal Intensive Tuition for Engineers programme, known as UNITE, or the University's science foundation programme (SFP),

(2) First year of study: applies to students who have not yet obtained at least 96 credits points.

(3) Second year of study:

(i) in three-year programmes this applies to students who have obtained at least 96 credits points, 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 credit points, but have not yet obtained 50% of the credit points needed for the qualification

(4) 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 degree.

(ii) in four-year programmes this applies to students who have obtained 50% of the credit points needed for the qualification, but who have not yet registered for such modules as will, if passed, lead to the completion of the degree

(5) 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 degree.

(k) Faculty Board: the Faculty Board shall mean the Board of the Faculty of Engineering of the University.

General Rules

EG1 Applicability of Rules

a) The General Academic Rules of UKZN apply to all students in the Faculty of Engineering. Their effect cannot be avoided by any interpretation of the Faculty Rules.

b) Admission to modules offered in other Faculties shall be subject to the approval of those Faculties.

c) The time at which examinations are written in modules offered in other Faculties shall be determined by those Faculties.

EG2 Qualification Offerings

The following degrees are conferred, and certificates and diplomas awarded

a) In Construction Management, Quantity Surveying and Construction Project Management

Bachelor of Science in Property Development	BScPropDev
Bachelor of Science in Property Development Honours (Construction Management)	BScPropDevHons(CM)
Bachelor of Science in Property Development Honours (Quantity Surveying)	BScPropDevHons(QS)
Master of Science (Construction Project Management)	MSc(ConstProjMan)
Master of Science in Construction Management	MScConstMan
Master of Science in Quantity Surveying	MScQS
Doctor of Philosophy	PhD
Doctor of Science in Construction Management	DScConstMan
Doctor of Science in Quantity Surveying	DScQS

b) In Engineering

Bachelor of Science in Engineering	BScEng
(Candidates may take the Bachelor's degree in Agricultural, Chemical, Civil, Computer, Electrical, Electronic or Mechanical Engineering)	
Master of Science in Engineering	MScEng
Doctor of Philosophy	PhD
Doctor of Science in Engineering	DScEng

c) In Land Surveying

Bachelor of Science in Land Surveying	BScSur
Master of Science in Land Surveying	MScSur
Doctor of Philosophy	PhD
Doctor of Science in Land Surveying	DScSur

EG3 General Module Assessment Rule

a) In the Faculty of Engineering, a credit-earning module mark is the weighted average of the continuous assessment mark (also called class mark) and the examination mark, as approved by the Faculty. The weights are included in each module's syllabus in this handbook.
b) Completion of a non-credit-earning module requires a DP certificate only.
c) DP certification shall be refused when a student fails to meet the Faculty approved DP requirements, which are included in each module's syllabus in this handbook.
d) Lack of DP certification results in an examination mark of 0. Absence from a scheduled examination has the same effect.

EG4 Award of Certificates of Merit

The following criteria apply for the award of a Merit Certificate:

a) subject to the limitations of b), c), and d) below, a maximum of three awards per module per campus may be made. The size of the class would not limit or increase the number of awards.
b) the student must achieve a minimum of 75% for the module to be eligible for the award.
c) awards may be made in all modules of 8 credits or more at the Bachelors and Honours degree levels and all taught Coursework Masters modules; i.e. all modules at levels 5, 6 and 7 and taught modules at level-8 would be considered.
d) where a module has 2 or more components the award could be made either for individual components (each component should have a code) OR for the module as a whole but not for both. Faculties should make the decision.
e) all students registered for the module including those registered NDP are eligible for merit awards.

Alternative Access Programme

Unite Programme

The UNITE Programme offers a Preparatory Certificate in Engineering for candidates who have had a disadvantaged educational background. Candidates shall obtain credit for the following modules in the course of one academic year.

Preparatory Certificate in Engineering

1st Semester

ENUN0ID H1 Introduction to Engineering Drawing	8
ENUN0MA H1 Supplementary Mathematics A	16
MATH131 H1 Mathematics 1A (Eng)	16
ENUN0CY H1 Chemistry A	8
ENUN0EC H1 Engineering Communication A	8
ENUN0ME H1 Mechanics A	8
ENUN0PY H1 Physics A	8

2nd Semester

ENUN1ED H2 Engineering Drawing	8
ENUN1MA H2 Supplementary Mathematics B	16
MATH141 H2 Mathematics 1B (Eng)	16
ENUN1CY H2 Chemistry B	8
ENUN1PY H2 Physics B	8
ENUN1EC H2 Engineering Communication B	8
ENUN1ME H2 Mechanics B	8

EU1 Progression in the UNITE Programme

To proceed to *semester 2*, students must obtain at least 40% for the following first semester modules: ENUN01DIntroduction to Engineering Drawing, ENUN0PYPhysics, ENUN0CYChemistry, ENUN0MEMechanics, ENUN0EC Engineering Communications, ENUN0MASupplementary Mathematics. Furthermore, they must pass MATH131Maths 1A and have a credit weighted average of 50%. All students who do not qualify to proceed to second semester *will be excluded* at the end of the first semester.

EU2 Admission to the BScEng Degree

Students will qualify to enrol in the Faculty of Engineering at the first year level if they pass all second semester modules (50%) and obtain a credit weighted average of not less than 60% in those modules. Students wanting to study Chemical Engineering must obtain a credit weighted average of at least 65% in those modules. No modules may be repeated.

EU3 Conditions for Award of Preparatory Certificate in Engineering

In order to qualify for a 'Preparatory Certificate in Engineering' a candidate and they must pass all second semester modules (50%). This certificate will be granted only to students who cannot or do not enrol in the Faculty.

EU4 Conditions for the Award of Supplementary Examinations

A student who fails MATH131 Mathematics 1A (Eng) or MATH141 Mathematics 1B (Eng) with a mark between 40% and 49% incl., will be allowed to write a supplementary examination. No other supplementary examinations will be granted.

Bachelors Degrees

This section refers to the following degrees:

a) Bachelor of Science in Engineering - BScEng
b) Bachelor of Science in Land Surveying - BScSur
c) Bachelor of Science in Property Development - BScPropDev

EB1 Undergraduate Bachelors Degrees Admission Requirements

(a) In order to register in the degree programmes for BScEng and BScSur applicants must have passed Matriculation or the equivalent examination with Mathematics and Physical Science on the Higher Grade. Normally a mark of at least 60 percent in these subjects is considered necessary for admission. Only a Standard Grade result of more than 90% will be considered for admission purposes.

(b) In order to register in the degree programme for BScPropDev applicants must have passed Matriculation or the equivalent examination with Mathematics. Normally a mark of at least 50 percent on the Higher Grade or 70 percent on the Standard Grade in Mathematics is considered necessary for admission.
The number of applicants admitted will be dependent on the number of places available.

(c) In order to gain entry to Engineering from the Centre of Science Access, an aggregate of 70% & 70% for each of Engineering Mathematics, Chemistry and Physics, plus 60% for Additional Maths and no failed modules, is required.
Students can gain entry to Engineering if they do not take the Engineering stream but they would require 70% for Mathematics in addition to 70% aggregate and 70% for Chemistry and Physics.

EB2 Bachelors Degrees Progression Rule

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

b) Subject to c), student may register for modules at the level no higher than two above the lowest which is incomplete.

c) Students may not register any modules for which all prerequisite requirements are not met. Students may register for modules in time table clashes only with adequate concessions for previously attended modules. It is the responsibility of the students to apply for deregistration from clashing modules.

d) Students are expected to register for and complete 72 credits in a semester, except when a different load is authorised by the Dean.

e) Registration for an elective module shall require the approval by the Dean of the Faculty of Engineering, and if the module is offered in another Faculty, also by the Dean of the Faculty concerned. The consequences of the elective module selection resulting in examination time-table clashes must be borne by the student concerned.

f) Students may apply for a change of curriculum, based on post-registration change in relevant facts that relate to timetable, prerequisites, or module completion. This change may not be unreasonably withheld.

g) Only in exceptional circumstances of a student and based on a strong motivation from the relevant Head of School, the Dean may relax the progression rule for this student.

EB3 Bachelors Degrees Exclusion

a) The academic progress of a student in a semester is slow when
(i) the student fails to accumulate credits for the registered degree according to the minimum progression requirement in the table below, or

(ii) the student has not completed the degree in the indicated maximum time (12 semesters for a 4-year qualification and 9 semesters for a 3-year qualification).

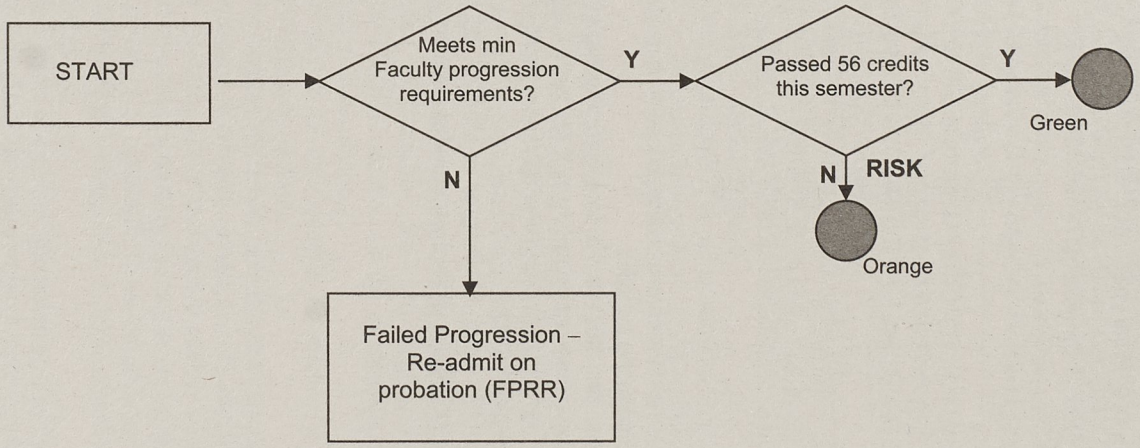
Number of semesters registered	Minimum progression requirement	Normal progression
1	48	72
2	96	144
3	144	216
4	192	288
5	240	360
6	288	**432** (3-year degree)
7	336	504
8	384	**576** (4-year degree)
9	**432**	
10	480	
11	528	
12	**576**	

Credits exempted and the corresponding periods of study are included in this calculation, but the foundation year is excluded.

b) All slowly progressing students will be given a warning of slow academic progress. A student who has progressed slowly in two successive registered semesters, shall be excluded from the Faculty of Engineering. The warning and exclusion decision shall remain in the student's record.

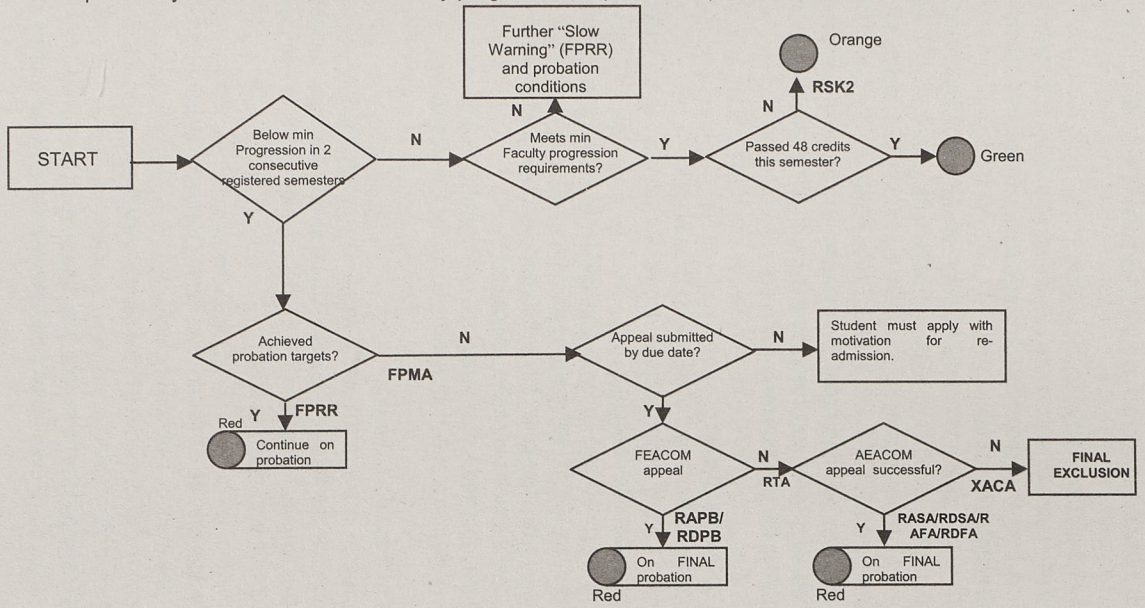
c) A student that has been admitted, or re-admitted, subject to conditions, shall be excluded from the Faculty of Engineering without warning, if any such condition is not satisfied.

Undergraduate Progression Flowchart
Students current status is:
Was never previously below the minimum Faculty progression requirement



Students current status is:

Was previously below the minimum Faculty progression requirement. (FPRR, FPRD, FPMA, SLOW, XEB3 etc.)



Standard probation conditions of "Must pass 56 credits in next semester" should be applied where probation is required. Note: Students who are granted Supplementary exams are considered to have failed the exam. Term decisions may be rescinded after successful supplementary exams.

EB4 Minor Substitutions in Curriculum
The Board may permit minor substitutions in the modules prescribed for any degree.

EB5 Bachelor Degrees Supplementary Examinations
a) Subject to c), 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) Subject to c), where a student has failed a module with a mark of 30% or more and has failed not more than one other module for which the mark is 40% or more a supplementary exam may be awarded if it enables the student to complete the academic semester as defined in EB9, EB10, EB11, EH7, EH8, or EM7.
c) Certain modules, which are dominated by project-work, do not have supplementary examinations. This information, approved by the Faculty, is available from the Faculty Office and recorded in the Syllabus section.

EB6 Award of Dean's Commendation
The following criteria apply for the award of a Dean's Commendation:
a) Students registered for any undergraduate degree are eligible for the award. (i.e. not Honours or postgraduate qualifications)
b) All modules which are prescribed for the degree and for which a student is registered are taken into consideration. (NDP modules are not considered).
c) The student shall have registered for a full load, excluding NDP modules, in the semester. A full load is specific to each qualification.
d) A student must have obtained a credit-weighted average of 75% in the semester, with no mark of less than 60% in any one module included for the Commendation.

EB7 Award of Class of Bachelors Degree
a) The Bachelors degree mark is the credit-weighted average mark of all attempts at professional modules at the third year level for the three-year degrees, or at the third and fourth year for the four-year degrees. The Faculty approved list of such professional modules is available in the Faculty Office.

The class of degree
b) A degree of Bachelors may be conferred *cum laude* provided that the student has:
(i) obtained a degree mark of at least 75%; and
(ii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and
(iii) completed the degree in the prescribed minimum time.
c) A degree of Bachelors may be conferred *summa cum laude* provided that the student has:
(i) obtained a degree mark of at least 80%; and
(ii) successfully completed all modules in the curriculum without recourse to supplementary examinations; and

(iii) completed the degree in the prescribed minimum time.

d) A degree of Bachelors may be conferred *first class* provided that the student has obtained a degree mark of at least 75%.

e) A degree of Bachelors may be conferred *upper second class* provided that the student has obtained a degree mark of between 70 and 74% inclusive.

f) A degree of Bachelors may be conferred *lower second class* provided that the student has obtained a degree mark of between 60 and 69% inclusive.

g) A degree of Bachelors may be conferred *third class* provided that the student has obtained a degree mark of between 50 and 59% inclusive.

h) A degree mark of less than 50% is not classified.

EB8 Vacation Work Requirements

Candidates shall undertake and perform such vacation work as may be assigned by their Head of School and shall submit an acceptable report thereon to their Head of School within six weeks of the start of the semester following completion of each period of such work.

a) BScEng candidates are normally required to complete a minimum period of 14 weeks practical work for degree purposes, which could include one or more workshop training modules.

EB9 Bachelor of Science in Engineering Curriculum

Candidates shall obtain credit for the following modules:

A. Engineering Programmes on the Pietermaritzburg Campus

(i) First Year (Agricultural, Civil, Computer, Electrical, Electronic and Mechanical Engineering)

1st Semester			***Credits***
ENME1DR	P1	Engineering Drawing	8
ENAG1EN	P1	Engineering	8
MATH132	P1	Applied Mathematics 1A (Eng)	16
CHEM163	P1	Chemistry & Society 1	8
MATH131	P1	Mathematics 1A (Eng)	16
PHYS110	P1	Mechanics, Optics and Thermal Physics	16
2nd Semester			***Credits***
ENAG1DE	P2	Engineering Design	8
ENAG1MT	P2	Introduction to Engineering Materials	8
CHEM173	P2	Chemistry & Society 2	8
MATH142	P2	Applied Mathematics 1B (Eng)	16
MATH141	P2	Mathematics 1B (Eng)	16
PHYS120	P2	Electromagnetism, Waves & Modern Physics	16
ENCV1CW	H2	Communications Workshop (1 week f-t in July Vacation in Durban) (Agricultural and Civil Engineering students only)	DP

(ii) First Year (Chemical Engineering)

1st Semester			**Credits**
ENCH1EA	P1	Chemical Engineering Principles 1	8
ENME1DR	P1	Engineering Drawing	8
CHEM110	P1	General Principles of Chemistry	16
MATH132	P1	Applied Mathematics 1A (Eng)	16
MATH131	P1	Mathematics 1A (Eng)	16
PHYS161	P1	Chemical Engineering Physics 1A	8
2nd Semester			**Credits**
ENCH1EA	P2	Chemical Engineering Principles 2	8
CHEM120	P2	Chemical Reactivity	16
MATH142	P2	Applied Mathematics 1B (Eng)	16
MATH141	P2	Mathematics 1B (Eng)	16
PHYS120	P2	Electromagnetism, Waves & Modern Physics	16

(iii) Third Year (Modified Agricultural Engineering Programme on Pietermaritzburg campus)

1st Semester			**Credits**
MATH212	P1	Advanced Calculus & Linear Algebra	16
ENAG4HY	P1	Environmental Hydrology#	16
ENAG3SA	P1	Structural Analysis & Design	8
ENAG3US	P1	Undergrad Seminar#	8
24 Credits selected from the following			24
ENAG3PT	P1	Power & Traction+# (8C)	
ENAG3EI	P1	Irrigation Engineering+# (16C)	
ENAG4BM	P1	Bio-Production Systems & Management+# (16C)	
ENAG4EC	P1	Environmental Control+# (8C)	
ENAG3FP	P1	Principles of Food Processing+ (8C)	
ENAG4EA	P1	Electrical Applications for Bio-Systems+# (8C)	
ENAG4FE	P1	Forest Engineering+# (8C)	
2nd Semester			**Credits**
MATH241	P2	Further Calculus and Differential Equations	16
COMP102	P2	Computer Programming	16
ENAG4EH	P2	Engineering Hydrology#	16
STAT101	P2	Basic Statistics	8
16 Credits selected from the following			16
HYDR312	P2	Dam Design (8C)	
ENAG4SW	P2	Soil & Water Conservation Eng+# (8C)	
ENAG3FE	P2	Food Engineering Unit Operations+# (8C)	
HYDR322	P2	Environmental Water Quality (8C)	
ENAG4AP	P2	Advanced Power and Traction +# (8C)	

* Or as approved by Head of School

\+ Modules offered in alternative years

\# National Quality Framework (NQF) level=7

NOTE: A total of at least 120 credits must be taken at NQF level 7

(iv) Fourth Year (Agricultural Engineering on Pietermaritzburg campus in 2008)

1st Semester			**Credits**
ENAG4BD	PY	Design Project	-
ENAG4HY	P1	Environmental Hydrology	16
ENAG4IE	P1	Irrigation Engineering	8
ENAG4PT	P1	Power and Traction for Agricultural Machines	16
ENAG4US	P1	Undergraduate Seminar	8
ENAG4WS	PC	Workshop Course	DP
ENAG4EP	PY	ECSA Outcomes Portfolio	DP
Elective modules			16
2nd Semester			**Credits**
ENAG4BD	PY	Design Project	24
ENAG4EC	P2	Environmental Control for Biological Commodities	8
ENAG4EH	P2	Engineering Hydrology	16
ENAG4MM	P2	Machinery Mechanisms and Management	16
ENAG4VW	PC	Vacation Work	DP
Elective module			16
and at least 32 credits for the year from the following elective modules selected in consultation with and approved by the Head of School			
ENAG4ST	PC	Selected Topics in Bioresources Engineering	8
AGPS305	P1	Field Crop Management	16
AGEC240	P2	Applied Farm Financial Management	8
HYDR312	P2	Dam Design	8
SSCI212	P1	Introduction to Soil Science	8
SSCI230	P2	Pedology	16

(iv) Fourth Year (Modified Agricultural Engineering Programme on Pietermaritzburg campus from 2009 only)

1st Semester			**Credits**
ENAG4BD	PY	Design Project#	8
CTEC733	P1	Business Management	8
32 Credits selected from the following			32
ENAG3PT	P1	Power & Traction+# (8C)	
ENAG3EI	P1	Irrigation Engineering+# (16C)	
ENAG4BM	P1	Bio-Production Systems & Management+# (16C)	
ENAG4EC	P1	Environmental Control+# (8C)	
ENAG3FP	P1	Principles of Food Processing+ (8C)	
ENAG4EA	P1	Electrical Applications for Bio-Systems+# (8C)	
ENAG4FE	P1	Forest Engineering+# (8C)	
24 Credits selected from the following:*			24
ENAG4ST	PC	Selected Topics in Bioresources Engineering# (8C)	
ENVS221	P1	Environmental Assessment (8C)	

AGPS305	P1	Field Crop Management (16C)	
HYDR710	P1	Current Issues in Hydrology (16C)	
SSCI217	P1	Introduction to Soils & the Environment (16C)	
AGPS307	P1	Orchard Management (16C)	
ENAG4WS	P1	Workshop Course	DP
ENAG4VW	PC	Vacation Work	DP
ENAG4EP	PY	ECSA Outcomes Portfolio	DP

2nd Semester			**Credits**
AGEC240	P2	Farm Financial Management	8
ENAG4BD	PY	Design Project#	16
Elective (Complementary studies)			16
16 Credits selected from the following			16
HYDR312	P2	Dam Design (8C)	
ENAG4SW	P2	Soil & Water Conservation Eng+# (8C)	
ENAG4FE	P2	Food Engineering Unit Operations+# (8C)	
HYDR322	P2	Environmental Water Quality+ (8C)	
ENAG4AP	P2	Advanced Power and Traction +# (8C)	
16 Credits selected from the following:*			16
ENAG4ST	PC	Selected Topics in Bioresources Engineering# (8C)	
SSCI1230	P2	Pedology (16C)	
HYDR720	P2	Integrated Water Resources Management (16C)	
HYDR725	P2	Advanced Hydrological Processes (16C)	
AGSP304	P2	Greenhouse Management (8C)	
AGPS724	P2	Post Harvest Technology (8C)	
ENVS211	P2	Geographic Information Systems (16C)	

* Or as approved by Head of School
\+ Modules offered in alternative years
\# National Quality Framework (NQF) level=7
NOTE: A total of at least 120 credits must be taken at NQF level 7

B. Agricultural Engineering Programme on Howard College Campus

First Year

1st Semester			**Credits**
ENME1DR	H1	Engineering Drawing	8
ENSV1EN	H1	Engineering	8
CHEM181	H1	Chemistry for Engineers IA	8
MATH132	H1	Applied Mathematics 1A (Eng)	16
MATH131	H1	Mathematics 1A (Eng)	16
PHYS151	H1	Engineering Physics 1A	16

2nd Semester			Credits
ENCV1ED	H2	Civil Engineering Design 1	8
ENME1EM	H2	Introduction to Engineering Materials	8
CHEM191	H2	Chemistry for Engineers IB	8
MATH142	H2	Applied Mathematics 1B (Eng)	16
MATH141	H2	Mathematics 1B (Eng)	16
PHYS152	H2	Engineering Physics 1B	16

Second Year (Modified Agricultural Engineering Programme)

1st Semester			Credits
ENEL2EE	H1	Electrical and Electronic Eng	16
ENCV2SA	H1	Structures 1	16
ENCV2GA	H1	Geo Tech Eng 1	8
ENSV2SA	H1	Surveying (Eng) 1	8
ENME2DY	H1	Dynamics	8
ENPD3PP	H1	Project Planning & Management Control	8
ENME2TH	H1	Thermodynamics 1	8
2nd Semester			Credits
ENCV2DE	H2	Design (Civil)	16
ENCV2FL	H2	Fluids 1	8
ENCV2GB	H2	Geo Tech Eng 2	8
ENCV2SB	H2	Structures 2	16
ENSV2SB	H2	Surveying (Eng) 2	8
ENME3TH	H2	Thermodynamics 2	8
ENEL2EN	H2	Environmental Engineering	8

C. Chemical Engineering Programme

First Year

1st Semester			Credits
ENCH1EA	H1	Chemical Engineering Principles 1	8
ENME1DR	H1	Engineering Drawing	8
CHEM161	H1	Chemical Engineering Chemistry 1	16
MATH132	H1	Applied Mathematics 1A (Eng)	16
MATH131	H1	Mathematics 1A (Eng)	16
PHYS161	H1	Chemical Engineering Physics 1A	8

2nd Semester			Credits
ENCH1EB	H2	Chemical Engineering Principles 2	8
CHEM171	H2	Chemical Engineering Chemistry 2	16
MATH142	H2	Applied Mathematics 1B (Eng)	16
MATH141	H2	Mathematics 1B(Eng)	16
PHYS162	H2	Chemical Engineering Physics 1B	16

Second Year

1st Semester	**Credits**
ENCH2MB H1 Mass and Energy Balances	8
ENEL2EE H1 Electrical & Electronic Engineering	16
ENEL2CM H1 Applied Computer Methods	8
ENCH2OM H1 Oil & Mineral Processing	8
CHEM241 H1 Applied Organic Chemistry for Chemical Engineers	8
MATH238 H1 Mathematics 2A (Eng)	16
ENCH2BE H1 Biochemical & Environmental Engineering	8
2nd Semester	**Credits**
ENCH2CP H2 Chemical Engineering Practicals 1	8
ENCH2EF H2 Chemical Engineering Fundamentals	16
ENCH2MS H2 Materials of Construction	8
ENCH2TD H2 Thermodynamics 1	8
CHEM251 H2 Applied Physical Chemistry for Chemical Engineers	8
MATH248 H2 Mathematics 2B (Eng)	16
ENCH2IT H2 Instrument Technology	8
ENCH2WS H2 Workshop Training (2 weeks)	DP

Third Year

1st Semester	**Credits**
ENCH3FM H1 Fluid Mechanics	8
ENCH3FD H1 Fluid Mechanics Design	8
ENCH3HE H1 Heat Transfer	16
ENCH3TH H1 Thermodynamics 2	8
ENCH3SL H1 Safety & Loss Prevention	8
CHEM261 H1 Applied Inorganic Chemistry for Chemical Engineers	8
MATH354 H1 Mathematics 3A (Eng)	8
STAT370 H1 Engineering Statistics	8
2nd Semester	**Credits**
ENCH3EC H2 Chemical Engineering Design	8
ENCH3MT H2 Mass Transfer	16
ENCH3PO H2 Process Modelling & Optimization	16
ENCH3RT H2 Reactor Technology Fundamentals	16
ENCH3UO H2 Unit Operations	16

Fourth Year

1st Semester	**Credits**
ENCH4DC H1 Process Dynamics and Control	16
ENCH4LA H1 Laboratory/Industry Project 1	16
ENCH4MT H1 Advanced Mass Transfer	8

Dissertation
ENAG8DI PC (0L-0T-0P-0S-720H-0R-0F-0G-0A-26W-72C)
Corequisite: Completion of Coursework Portion (72 credits) of Programme
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: As per faculty guidelines for evaluation of dissertations.
DP Requirement: As per faculty rules.

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.
Content: Research theory and methodology, Research proposal structure and content, Topic selection, Problem statements, creation and assessment, Literature survey techniques and resources, Research ethics, Data collection and analysis, Scientific writing, Oral presentation skills.
Assessment: Written Report (70%), Presentations (30%)
DP Requirement: 80% attendance of class sessions.

Hydrology

Offered in the School of Bioresources Engineering & Environmental Hydrology

Dam Design
HYDR312 P2 (12L-0T-16P-0S-50H-0R-0F-0G-2A-13W-8C)
Prerequisite: HYDR310.
Aim: To present the hydrological aspects of the design of a small farm irrigation dam & investigate the relationships between catchment water yield, dam capacity, irrigation strategy, irrigated area & risk.
Content: Planning for water resources, legal aspects of dam design, safety evaluation, 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; application of reservoir yield analyses to optimise dam & irrigable area capacity.
Practicals: Design flood estimation, including a field trip, flood routing & spillway design.
Assessment: 2 class tests (30%), Dam design project (70%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.
Offered in Semester 2. Students will be required to contribute to cost of field trip.

Environmental Water Quality
HYDR322 P2 (15L-4T-18P-0S-30H-8R-0F-0G-5A-13W-8C)
Prerequisite: 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: 2 class tests (20%), 2 h exam (60%), class tutorials & pracs (20%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.
Offered in Semester 2.

Current Issues in Hydrology

HYDR710 P1 (16L-16T-0P-8S-95H-20R-0F-0G-5A-13W-16C)

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
Offered in Semester 1.

Integrated Water Resources Management

HYDR720 P2 (24L-18T-8P-0S-85H-20R-0F-0G-5A-13W-16C)

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
Offered in Semester 2.

Advanced Hydrological Processes

HYDR725 P2 (16L-16T-8P-8S-87H-20R-0F-0G-5A-13W-16C)

Aim: This module is designed to provide honours level students with an in depth understanding of fundamental hydrological processes.
Content: After successful completion this module students should have an in-depth understanding of specific hydrological processes. These include: 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
Offered in Semester 2.

School of Chemical Engineering

Offered in the School of Chemical 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 in chemical engineering, conservation of mass and energy, single unit material balances, stoichiometry and reactive material balances, , Fundamentals (P, T), forms of energy and the first 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%), 3hr exam (75%).
DP Requirement: 80% attendance at tutorials and completion of project.

Chemical Engineering Principles 2

ENCH1EB H1 (20L-11T-0P-0S-32H-8R-3F-0G-6A-13W-8C)

Prerequisite: 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. These are basic skills required in various chemical engineering courses which will be taken in subsequent years of study. The concepts taught in this module are of major importance to the process design modules which are part of the Chemical engineering curriculum..
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%), 2hr exam (70%).
DP Requirement: 80% attendance at tutorials and completion of project.

Biochemical & Environ Engineering

ENCH2BE H1 (20L-0T-3P-0S-28H-18R-4F-0G-7A-13W-8C)

Prerequisite: 40% or more in CHEM161 & CHEM171
Aim: To give insight to biochemical and microbiological systems and their role in bioreactors, and to introduce engineering aspects relevant to abatement of water, land and noise pollution.
Content: Biochemistry: chemicals of life, DNA replication, enzymes, metabolic pathways and bioenergetics. Microbiology: morphological and physiological characteristics of viruses, bacteria and fungi. Bioreactors: Aeration, batch and continuous operation, aseptic design, downstream processing. Environmental engineering: Wastewater characteristics and treatment. Air pollution and the greenhouse effect. Land pollution and solid waste disposal. Noise and other sources of pollution.
Practicals: One 3hr experiment
Assessment: Two tests, two quizzes, practical, 2-hr exam.
DP Requirement: 80% attendance at tutorials and completion of practical.

Chemicals Engineering Practicals 1

ENCH2CP H2 (4L-0T-15P-0S-40H-14R-0F-0G-7A-13W-8C)

Prerequisite: 40% or more in ENCH2MB
Corequisite: ENCH2TD or ENCH2EF
Aim: To equip the learner with skills to analysis and interpret experimental data, in addition to, being able to undertake experimental studies. To enable the learner to work as part of a team in conducting and reporting on tasks scheduled. To equip the learner to communicate effectively both orally and in written format.
Content: There will be 5 formal lectures given in the module that will emphasize oral and written communication styles and standards. There will also be emphasis on data reporting, treatment of experimental data, including statistical analysis. Five practical experiments will be undertaken in the module, viz. 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: Students will undertake a pre-practical and post-practical for each of the 5 experiments that comprise the module. A pre-practical will undertaken before each experiment and will contribute 1% per experiment towards the final marks, with the post-practical being a single interview of the students on all practicals undertaken and contributing 25% towards the final mark. The students will have to write two formal reports which will contribute 30% (2 x 15%) towards the final mark. There will be a single 2 hour examination at the end of the semester which will contribute 40% towards the final mark for the module
DP Requirement: Completion of all post-practical interviews and submission of formal reports.

Chemical Engineering Fundamentals

ENCH2EF H2 (39L-10T-0P-0S-65H-40R-0F-0G-6A-13W-16C)
Prerequisite: 40% or more in ENCH1EB
Aim: 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.
Practicals: Two
Assessment: Tests, two quizzes, (total 25%), 3-hr exam (75%).
DP Requirement: 80% attendance at tutorials.

Instrument Technology

ENCH2IT H2 (20L-3T-6P-0S-30H-18R-0F-0G-3A-13W-8C)
Prerequisite: 40% or more 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
Practicals: Two 3hr experiments: zeroing, spanning and calibration of input and output devices
Assessment: Practicals, tests, one assignment (continuously assessed, no examination)
DP Requirement: 80% attendance at tutorials and completion of practicals and assignment.

Mass and Energy Balances

ENCH2MB H1 (20L-14T-0P-0S-24H-15R-0F-0G-7A-13W-8C)
Prerequisite: 40% or more in ENCH1EB
Aim: To equip the learner 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 learner with a range of mathematical tools which can be used to determine solution methods for complex material and energy balance problems.
Content: State variables, P-V-T properties of fluids, vapour-liquid equilibria, single component, multi-phase systems and phase diagrams, residual properties. The principles of degree of freedom analyses for material and energy balancing, underspecification and over-specification of problems. Problem Solving using degrees of freedom information, determining an optimal problem solving sequence, use of matrix inversion to solve sets of simultaneous equations. Determining dependence or independence of chemical reactions in reactors with multiple simultaneous chemical reactions. Material and Energy balancing for multiple component, multi-phase systems. Simultaneous energy and mass balances –psychrometry, use of charts, humidification, drying and cooling towers (mass and heat exchange). Mass balances in real systems with uncertainties in measurements. Solution of implicit Mass and Energy Balance problems using computers.
Assessment: Tests (30%), 2hr Exam (70%)
DP Requirement: 80% attendance at tutorials

Materials of Construction

ENCH2MS H2 (20L-5T-0P-0S-30H-20R-0F-0G-5A-13W-8C)

Prerequisite: 40% or more in ENCH1EA

Aim: Introduction to materials available for use in engineering applications. The relationship between the properties of a material and its applications. Choosing the correct material for specific engineering applications.

Content: Phase diagrams. Mechanical properties of materials. Corrosion. Ceramics and refractories. Composite materials. Polymers. Stainless steels. Design Codes and Safety Codes.

Assessment: Two tests (25%) and one two-hour exam (70%).

DP Requirement: 80% attendance at tutorials.

Oil & Mineral Processes

ENCH2OM H1 (20L-5T-0P-0S-22H-25R-0F-0G-8A-13W-8C)

Prerequisite: 40% or more 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; 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 (total 25%), one two-hour exam (75%)

DP Requirement: 80% attendance at tutorials and completion of assignment.

Thermodynamics 1

ENCH2TD H1 (20L-6T-3P-0S-30H-15R-0F-0G-6A-13W-8C)

Prerequisite: 40% or more in ENCH2MB or ENCH2ME

Aim: The purpose of the course to is enable the candidates to be competent in the following areas of thermodynamics: Solution Thermodynamics; Gas Compression; Liquefaction of gases and refrigeration; Chemical Reaction Equilibria

Content: Properties of Solutions: Partial molal properties; chemical potential; ideal solutions; non-ideal solutions; calculations of fugacities; activity coefficients; Gibbs-Duhem equations and derivations. Chemical Reactions Equilibria: Homogeneous and heterogeneous reactions; prediction of equilibrium constant and free energies and heats of reaction; multiple simultaneous reaction equilibria; multi-stage reactions. Gas Compressions: Single and multistage compressors; work requirements; capacity with non-zero clearance volume; volumetric efficiency. Liquefaction of Gases and Refrigeration: Joule-Thomson expansion; liquefaction of gases by various processes; refrigeration cycles with isenthalpic or isentropic expansion; various refrigeration cycles; use of pressure-enthalpy diagrams.

Assessment: Two tests (20%), one assignment (5%), one two-hr exam (75%)

DP Requirement: 80% attendance at tutorials and completion of assignment.

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: This is a Duly Performed requirement. Practical workshop instruction and experience includes methods of measurement, jointing & welding, material forming, heat treatment, precision drilling, shaping, turning, etc., with fitting (assembly/dissembly). 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 Design

ENCH3EC H2 (6L-14T-0P-0S-56H-0R-0F-0G-0A-13W-8C)

Prerequisite: Passes in ENCH1EB and ENCH2MB, or ENCH2ME, pass in ENCH2EF and 40% in ENCH3FD, ENCH3HE, ENCH3SL & ENCH2MS

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 techniques are utilised.

Practicals: None.

Assessment: One report. (100%) marked according to criteria listed in ECSA Exit Level Outcome 1.

DP Requirement: none

No supplementary examination. This module is an ECSA Exit Level Outcome I final assessment point.

Fluid Mechanics Design

ENCH3FD H1 (0L-23T-0P-0S-47H-0R-0F-0G-10A-13W-8C)

Prerequisite: 40% in ENCH2EF

Corequisite: ENCH3FM

Aim: To introduce the learner to the basic considerations involved in the design of pipe systems and pumps, including the technical principles relating to 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: 80% attendance at tutorials.

No supplementary examination.

Fluid Mechanics

ENCH3FM H1 (20L-9T-3P-0S-23H-20R-0F-0G-5A-13W-8C)

Prerequisite: 40% in ENCH2EF

Corequisite: ENCH3FD

Aim: To give the student a thorough understanding of fluid flows and develop sound techniques for solving fluid flow problems encountered in chemical engineering. 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.

Content: 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.

Practicals: One.

Assessment: Tests (15%), Practicals (10%), one 2-hr exam (75%).

DP Requirement: 80% attendance at tutorials and completion of practical.

Heat Transfer

ENCH3HE H1 (39L-12T-6P-0S-61H-36R-0F-0G-6A-13W-16C)

Prerequisite: 40% in ENCH2MB or ENCH2ME & 40% in ENCH2EF

Aim: To enable candidates to design heat-exchange units for a given application and to understand problems in thermal management.

Content: Conduction: Solving two-dimensional steady and unsteady state problems using graphical and numerical procedures. Convection: Dimensional analysis; boundary-layer methods; turbulent flow; boundary layer analogies; natural convection and forced convection correlations. Heat transfer with phase change: condensation; boiling. Radiation: view factors. Design: Design of heat exchangers using LMTD and NTU concepts. Humidification and Cooling towers: Designing water-cooling towers. Pinch analysis: Basic concepts; designing for MER.
Practicals: Two
Assessment: Two tests, quizzes, practicals (total 30%), one 3-hr exam (70%).
DP Requirement: 80% attendance at tutorials and completion of practicals.

Mass Transfer

ENCH3MT H2 (37L-12T-5P-0S-58H-35R-0F-0G-13A-13W-16C)

Prerequisite: Passes in ENCH2MB or ENCH2ME, and ENCH2EF and 40% in ENCH3TD.
Aim: Design capability 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.
Practicals: Two
Assessment: Two tests, two practicals, (total 30%), one three-hour exam (70%).
DP Requirement: 80% attendance at tutorials and completion of practicals.

Process Modelling & Optimisation

ENCH3PO H2 (39L-12T-0P-0S-61H-42R-0F-0G-6A-13W-16C)

Prerequisite: At least 50% in ENCH3HE, ENCH3FM
Corequisite: One of the following: ENCH3MT, 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. The mathematical problem should be then solved either analytically or numerically, depending on the complexity of the model. Finally, the significance of the solution should be interpreted. The student should appreciate the value of both an approximate, quick solution and a more detailed solution. Also 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 and its importance in analysis; derivation of models for lumped and distributed parameter systems; numerical solving of nonlinear algebraic equations; analytical and numerical solution techniques for ordinary differential equations (ODEs); linearization of nonlinear ODEs, stability analysis;two-point boundary-value problems and methods of their numerical solution, 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 (total 30%), one three-hour exam (70%).
DP Requirement: 80% attendance at tutorials and completion of assignment.
This module is an ECSA Exit Level Outcome 1 final assessment point.

Reactor Technology Fundamentals

ENCH3RT H2 (39L-12T-6P-0S-58H-40R-0F-0G-7A-13W-16C)

Prerequisite: Passes in 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, nonideal reactors, and catalytic systems.
Content: Reaction stoichiometry, kinetics and thermodynamics. Isothermal ideal (batch, semibatch, mixed- and plug-flow) reactors - design equations. Multireaction systems. Variable-volume reactions. Nonisothermal reactors. Nonideal flow reactors and RTD analysis. Kinetics of catalytic reactions (catalyst characterization, physical and chemical adsorption, intrinsic kinetics, intraparticle diffusion, deactivation). Multiphase reactors.

Practicals: Two.
Assessment: Two tests, two practicals (total 30%), one three-hour exam (70%)
DP Requirement: 80% attendance at tutorials and completion of practicals.

Safety and Loss Prevention

ENCH3SL H1 (20L-14T-0P-0S-30H-10R-0F-0G-6A-13W-8C)

Prerequisite: Passes in ENCH2MS & ENCH1EB or ENCH2ME
Aim: Safe practices in design and operation of chemical engineering processes in all stages of chemical engineering design. Risk assesment, methods of hazard evaluation (both qualitative and quantitative), risk associated with toxic, flammable and explosive materials. Impact of engineering activity on the social, industrial and physical environment (the impact of technology on society and environment , occupational and public health and safety).
Content: Hazard evaluation procedures: HAZOP, FMEA, What if analysis, What if/Checklist, Relative ranking, Fault tree analysis, Event tree analysis, Cause-Consequence analysis, Quantification of risk, Interactive matrix. Chemical reaction hazard: Explosibility screening, Oxygen balance, Heat of decomposition, "Y" criterion, Explosive chemicals, Spontaneous combustion, dust explosions, Oxidisers, Pyrophoric materials, Properties of hazardous chemicals. Toxicology: Chronic and acute toxicity, combined toxic effects of chemicals, Irritants, Sensitizers, Asphyxiants, Respiratory fibrogens, Carcinogens, Hygienic standards (TLV, OEL, IDLH). Quantification of toxicity. The main environmental problems we are facing today: globally (ozone depletion, climate change), locally (e.g. water and soil issues). Safety in process design: Process risk management categories and strategies, Plant layout, Layers of protection.
Assessment: 2 tests during the semester, 4 quizzes (30%) 2-hr exam (70%)
DP Requirement: 80% assignment submitted and attendance at tutorials.
This module is an ECSA Level Outcome 7 final assessment point.

Thermodynamics 2

ENCH3TH H1 (20L-6T-3P-0S-30H-15R-0F-0G-6A-13W-8C)

Prerequisite: 40% in ENCH2TD
Aim: The purpose of the course 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.
Practicals: One 3-hour practical
Assessment: Two tests, practical, one assignment (30%), one two-hour examination. (70%)
DP Requirement: 80% attendance at tutorials and completion of practical and assignment.

Unit Operations

ENCH3UO H2 (39L-10T-6P-0S-60H-32R-0F-0G-13A-13W-16C)

Prerequisite: Passes in ENCH2ME or ENCH2MS & pass in ENCH2EF
Aim: To equip the learner with skills to apply chemical engineering principles to the design and operation of several kinds of unit operations.
Content: The unit operations of fluidisation of solids, sedimentation and thickening, filtration, drying, evaporation and crystallization are studied.
Practicals: Two.
Assessment: Tests 18%, practicals 12%, one three hour examination 70%.
DP Requirement: 80% attendance at tutorials and completion of practicals.

Applied Biochemical Engineering

ENCH4AB H2 (10L-3T-24P-10S-14H-13R-0F-0G-6A-13W-8C)

Prerequisite: ENCH2BE
Aim: Specialised skills in the application of biochemical engineering techniques.

Content: The concepts introduced in Biochemical Engineering will be expanded and applied to industrial processes. Topics to be studied in detail will include: Microbe/microbe interaction; microbe/environment interaction; anaerobic digestion; activated sludge process; brewing; commercial amino acid production; bio-mineral processing. Independent Learning Section: Learners will be required to research case studies. These are assessed through the assignment and in the final examination
Practicals: Three.
Assessment: One test, one quiz, three practicals (total 30%) one two-hour exam (70%).
DP Requirement: 80% attendance at tutorials and completion of practicals.
This module is an ECSA Exit Level Outcome 9 final assessment point

Chemical Engineering Topics 1

ENCH4CA H1 (10L-6T-0P-10S-28H-20R-0F-0G-6A-13W-8C)

Prerequisite: Will depend upon subject.
Aim: An optional subject to provide students with specialised knowledge that is not in the syllabus. This module also 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.
Practicals: Not normally required.
Assessment: One test, assignment and one 2 or 3 hr exam (weighting dependent upon subject).
DP Requirement: 80% attendance at tutorials and completion of assignment.
This module is an ECSA Exit Level Outcome 9 final assessment point

Chemical Engineering Topics 2

ENCH4CB H2 (10L-6T-0P-10S-28H-20R-0F-0G-6A-13W-8C)

Prerequisite: Will depend upon subject.
Aim: An optional subject to provide students with specialised knowledge that is not in the syllabus. This module also 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.
Practicals: Not normally required.
Assessment: One test, assignment and one 2 or 3 hr exam (weighting dependent upon subject).
DP Requirement: 80% attendance at tutorials and completion of assignment.
This module is an ECSA Exit Level Outcome 9 final assessment point

Coal Technology & Gasification

ENCH4CG H1 (10L-6T-3P-10S-20H-26R-0F-0G-5A-13W-8C)

Prerequisite: 50% or more in ENCH2OM
Aim: To communicate the importance, origin, types, properties, handling/storage and the cleaning of coal. Major coal processes (combustion and its products, gasification and its products). The environmental impact from coal – fired furnaces and the explosion hazard associated with coal storage. This module also assesses independent learning ability.
Content: Coal and its constituents: macro- and micro-components, inorganic constituents, chemical constituents, action of heat, chemicals and solvents. Composition and classification of coal: moisture-mineral matter, ash-elementary composition, coal porosity, plasticity, physical properties, lignites, bituminous coals and anthracites. Treatment and storage of coal: briquettes, coal-oil suspensions. Cleaning of coal. Combustion of coal, types of boiler furnace, gas turbines, fuel cells. Carbonization of coal, coal gasification, water gas, Lurgi gasifier, coal and coke analysis, coal tar and tar fuels, hydrogenation of coal. Independent learning section: Students are required to investigate case studies for new developments in briquetting, coal carbonization, hydrogenation, fuel cell and cleaning of flue gases during the self – study section. These are assessed through the assignment and in the final examination.
Practicals: Froth flotation of coal and ash analysis of coal.
Assessment: Test (20%), assignment (15%) (Based on self study) and practical (5%) (total 40%), 2-hour exam (based on self study and materials covered in the lectures) (60%).

DP Requirement: 80% attendance at tutorials, completion of the self - study assignment (with a 50% pass) and completion of the practical.
This module is an ECSA Exit Level Outcome 9 final assessment point

Process Dynamics & Control

ENCH4DC H1 (39L-9T-12P-0S-54H-40R-0F-0G-6A-13W-16C)

Prerequisite: 40% or more in all of ENCH3FM, ENCH3HE & ENCH3RT
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%) one 3-hr examination (70%).
DP Requirement: 80% attendance at tutorials and completion of practicals.

Design Project

ENCH4DP H2 (0L-36T-0P-0S-260H-20R-4F-0G-0A-13W-32C)

Prerequisite: 50% or more in ENCH4RT, ENCH4MT, ENCH4DC
Corequisite: ENCH4PE
Aim: 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 (flowsheet, P&I, plan, elevation, isometric, equipment detail); specification sheets; materials of construction; standards; Occupational Health & Safety Act; hazardous areas classification. Project management: Precedence network; critical path; team structure; cost and modification control. Economics: Capital expenditure estimation; cost indices; escalation; operating cost estimation; tax allowances; discounted cash flow; return on investment.
Practicals: None.
Assessment: Individual technical memorandum at mid-term; Final Design Report at end (continuous assessment, no examination); marked according to criteria listed in ECSA Exit Level Outcome 3.
DP Requirement: As per faculty rules.
No supplementary exam. Provided a pass mark would otherwise be achieved for the module, a report not meeting the module outcomes will be returned for attention before board consideration. If accepted, the module will be passed at 50%, else failed at 48%.

Environmental Impact Assessment

ENCH4EI H2 (10L-6T-0P-10S-20H-20R-8F-0G-6A-13W-8C)

Prerequisite: Pass in ENCH3SL
Aim: The aim of this course is to provide students with an understanding of the issues concerning environmental impact assessment for the land-use planning required for major developments.
Content: Introduction, Provision of resources and services including economic benefits; Putting a financial value on ecosystems; How we deal with adverse environmental impacts; EIA legislation in South Africa; EIA tools and 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 and conduct environmental audits on a range of South African case studies during the self – study section. These are assessed through the assignment and in the final examination
Assessment: 2 assignments, 1 test (30%), 1 x 2-hr exam (70%)
DP Requirement: Attendance of field trip and passes in assignments.
This module is an ECSA Exit Level Outcome 9 final assessment point

Extractive Metallurgy

ENCH4EM H2 (10L-6T-3P-10S-20H-20R-5F-0G-6A-13W-8C)

Prerequisite: 50% or more in ENCH2ME or ENCH2MB, CHEM251

Aim: To provide students with an understanding of methods used to extract and purify metals, and to estimate extraction efficiency. This module also assesses independent learning ability.

Content: Hydrometallurgical processes: leaching, precipitation, ion exchange, solvent extraction and electro-refining. Pyrometallurgy: Use of the Ellingham Diagram. Mass balance calculations. Plant equipment. Slags and refractories. Independent learning section: Students are required to investigate case studies for the extraction of gold, copper, aluminium and steel during the self-study section. These are assessed through the assignment and in the final examination.

Practicals: Copper solvent extraction practical. Cato Ridge ferromanganese plant visit.

Assessment: Test, quiz, assignment and practical (total 40%), 2-hr exam (60%).

DP Requirement: 80% attendance at tutorials and completion of practicals and assignment.

This module is an ECSA Exit Level Outcome 9 final assessment point

Laboratory/Industry Project 1

ENCH4LA H1 (0L-0T-4P-0S-156H-0R-0F-0G-0A-13W-16C)

Prerequisite: Students must be in a position to complete the degree within the year.

Aim: To give students experience in planning and executing current research testwork.

Content: Students work in groups of two. Students will state preferences for subjects which will normally reflect on-going research in the School or an industrial problem. Certain projects can be motivated by students, but must be supported by a lecturer.

Practicals: Generally testwork must be done and written up as a formal report.

Assessment: Students will need to complete a research proposal (team effort) prior to beginning testwork. Further assessment will be a final written report (individual reports) and a project oral presentation and poster design (continuous assessment, no examination). The communications aspects (Outcome 6) and the Investigations, Experimentation and Data Analysis (Outcome 4) must be achieved at the level stipulated in the ECSA Outcomes. 50% for project proposal and investigations, experimentation and analysis aspects and 50% for communication aspects.

DP Requirement: 50% or more in mid term presentation.

No Supplementary examination Failure to meet either of the ECSA outcomes will require upgrading of the assessments which can only achieve a mark of 50% for any of the assessments. This module is an ECSA Exit Level Outcome 4 and 6 final assessment po

Laboratory/Industry Project 2

ENCH4LB H2 (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Prerequisite: Students must be in a position to complete the degree within the year.

Aim: To give students experience in planning and executing current research testwork.

Content: Students will state preferences for subjects which will normally reflect on-going research in the School or an industrial problem. Certain projects can be motivated by students, but must be supported by a lecturer.

Practicals: Generally testwork must be done and written up as a formal report.

Assessment: A written report, project presentation and/or poster design (continuous assessment, no examination).

DP Requirement: 40% or more in mid term presentation.

No supplementary examination

Engineering Management & Labour Relations

ENCH4ML H1 (20L-2T-0P-0S-30H-23R-0F-0G-5A-13W-8C)

Prerequisite: none

Aim: To provide students with the managerial and legal knowledge and skills they will require in their early professional years.

Content: Functions of a manager. Managerial and quality systems such as the OHS-Act and ISO. Strategic planning and the implementation of recommendations. Principles of decision-making. The motivation and guidance of staff. Effective time management. Power, authority, responsibility & accountability. Leadership style. Conflict resolution.

Ethics in the workplace. Understanding sexual harassment policies. Labour relations, Union organization. The legal obligations of management and the workforce. Negotiations, strikes and settlements. Continuous professional development.
Practicals: None. Assignment: Project relating to plant operation or design which will require input from different disciplines.
Assessment: Assignment and two tests (30%), One 2-hour examination (70%).
DP Requirement: 80% attendance of tutorials, pass in assignment and writing tests
This module is an ECSA Exit Level Outcome 8 final assessment point

Mineral Processing
ENCH4MP H1 (10L-6T-6P-10S-20H-20R-8F-0G-6A-13W-9C)
Prerequisite: 50% or more in ENCH2OM
Aim: To provide students with an understanding of the methods used to concentrate minerals and an ability to assess and optimise plant performance. This module also assesses independent learning ability.
Content: Chemistry of froth flotation and analysis of collection efficiency. Simulation of flotation circuits. Examples of flotation circuits. Sampling theory. Washability tests and prediction of dense medium separation efficiency. Coal industry in South Africa,gravity concentration techniques and theory. Introduction to magnetic and electrostatic separators. Independent learning section: Students are required to investigate case studies for the processing of coal and platinum group metals during the self-study section. These are assessed through the assignment and in the final examination.
Practicals: Batch flotation practical.
Assessment: One test, one quiz, assignment, practical (total 40%), 2-hr exam (60%).
DP Requirement: 80% attendance at tutorials and completion of practical and pass in assignment.
This module is an ECSA Exit Level Outcome 9 final assessment point

Advanced Mass Transfer
ENCH4MT H1 (20L-7T-1P-0S-12H-34R-0F-0G-6A-13W-8C)
Prerequisite: At least 50% in ENCH3MT
Aim: Candidates will analyze, model and design advanced mass transfer operations with special reference to conceptualization and computer simulation of unit operations.
Content: Multicomponent phase equilibria; isothermal and adiabatic flash; bubble and dew points; equation-tearing procedures for multicomponent distillation column analysis and simulation; short-cut techniques; enhanced distillation; multicomponent batch distillation; membrane separation; adsorption; ion exchange; chromatography.
Practicals: One.
Assessment: Two tests, one open-ended assignment (total 30%), one two-hour exam (70%).
DP Requirement: 80% attendance at tutorials and completion of assignment.
This module is an ECSA Exit Level Outcome 2 final assessment point

Projects & the Environment
ENCH4PE H2 (20L-2T-0P-0S-33H-20R-0F-0G-5A-13W-8C)
Prerequisite: none
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, hazops, brainstorming, hazardous area classifications, operational safety. Air and water pollution. The financial evaluation of the project, the generation of sensitivities and the financial optimization of the project. The proposal to the Board. The erection and commissioning of the plant. The post-investment audit.
Practicals: The full financial analysis of a project.
Assessment: Two tests and analysis (total 30%) and one two-hour examination (70%).
DP Requirement: 80% attendance at tutorials and completion of analysis.

Paper Making Technology

ENCH4PM H2 (10L-6T-0P-10S-20H-20R-8F-0G-6A-13W-8C)

Prerequisite: none

Aim: To introduce candidates to papermaking science & technology. Exposure to the relative size and importance of the industry in South Africa. Understanding of the raw material properties and how these effect papermaking. Papermaking terminology and theoretical and scientific principles. Process flow and unit operations. Basic chemistry of papermaking. Exposure to the environmental and economic issues facing paper makers. This module also asseses 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 course. These are assessed through assignments and in the final examination.

Practicals: None.

Assessment: One one-hour test (15%), three written assignments (5% each) and one 2-hr exam (70%)

DP Requirement: 80% attendance at tutorials and a pass mark obtained for all assignments.

This module is an ECSA Exit Level Outcome 9 final assessment point

Petroleum & Synthetic Fuel Processing

ENCH4PP H2 (10L-6T-3P-10S-20H-25R-0F-0G-6A-13W-8C)

Prerequisite: 50% or more in ENCH2OM

Aim: 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. These are assessed through the assignment and in the final examination.

Practicals: One.

Assessment: Two tests, one practical (total 30%), one 2-hour exam (70%).

DP Requirement: 80% attendance at tutorials and completion of practical.

This module is an ECSA Exit Level Outcome 9 final assessment point

Applied Reactor Technology

ENCH4RT H1 (20L-6T-3P-0S-24H-20R-0F-0G-7A-13W-8C)

Prerequisite: 50% or more in 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 (SO2oxidation, NH3 synthesis, phthalic anhydride production in a tubular reactor, batch polymerization of vinyl chloride, fluidised bed catalytic reactor, pressure effect and risk in Ammonia synthesis as an example for dealing with uncertainty and risk in real industrial installations, biotechnology reactor design). Techniques are developed for the modelling of these systems.

Practicals: One

Assessment: Two tests, one practical (total 30%), one 2-hour exam (70%).

DP Requirement: 80% attendance at tutorials and completion of practical.

This module is an ECSA Exit Level Outcome 2 final assessment point

Technical Report Writing

ENCH4TR H1 (0L-3T-0P-0S-0H-0R-0F-0G-16A-0W-0C)

Corequisite: ENCH4IP

Aim: This module provides assistance to final year students who are preparing laboratory project and design project reports through library tutorials, and assesses the ability of students to write technical laboratory reports throughout the years of the degree programme. Technical report writing ability is an ECSA outcome and as such this module is included to ensure that the structure, writing style and grammar of students is of a sufficient level.

Content: Using the library, searching for literature, writing literature reviews, writing laboratory and industrial reports.

Assessment: Completion of laboratory reports.

DP Requirement: 70% minimum in four laboratory reports throughout the degree programme, successful completion of library tutorial.

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 Duly Performed requirement for the BSc Eng (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 vac work reports.

Wood Pulping Technology

ENCH4WP H1 (10L-6T-0P-10S-20H-20R-8F-0G-6A-13W-8C)

Prerequisite: none

Aim: To introduce candidates to wood pulping science and technology. Exposure to the relative size and importance of the industry in South Africa. Understanding of the raw materials properties and how these affect pulping. Pulping terminology and theoretical and scientific principles. Process flow and unit operations. Basic chemistry of pulping. This module also assesses independent learning ability

Content: Overview of the pulp and 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 and analyse case studies and literature on some of these components of the course. These are assessed through assignments and in the final examination

Practicals: None.

Assessment: One one-hr test (15%), three written assignments (5% each) and one 2-hr exam (70%)

DP Requirement: Pass mark obtained for all assignments.

This module is an ECSA Exit Level Outcome 9 final assessment point

Nuclear Plant Technology

ENCH820 W1 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Nuclear technology cannot be ignored as a supply side option. Modern nuclear plant technology is safe and more environmental friendly than many other options. The module will start with the fundamentals of nuclear technology and various aspects such as nuclear power plant design and operation will be studied in detail. New nuclear technologies such as the Pebble Bed Modular Reactor (PBMR) will also be covered.

Assessment: Class mark 25% Exam mark 75%

DP Requirement: Class mark of 40%.

Renewable Energy and Technology

ENCH821 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: With the global focus on renewable energy technologies, this module will focus mainly on solar, wind and biomass technologies, but the newer renewable options such as ocean current and tidal will also be covered. The module will enable students to assess technologies which are suitable for the resources available in a given region.
Assessment: Class mark 25% Exam mark 75%.
DP Requirement: Class mark of 40%.

Future Energy Technologies

ENCH822 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: There are many energy technologies that are in various stages of development, from near commercial to embryonic. These include (near) zero-emissions fossil fuel plant with carbon dioxide sequestration, the hydrogen economy, magneto-hydrodynamics, combined nuclear/coal, solar/coal, biomass/coal and fuel cells.
Assessment: Class mark 25% Exam mark 25%
DP Requirement: Class mark of 40%.

Applied Aquatic Chemistry

ENCH8AA HC (30L-0T-63P-0S-40H-24R-0F-0G-3A-13W-16C)

Prerequisite: CHEM171
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.
Practicals: None.
Assessment: One assignment, one test, one three-hour exam. (weighting subject to assignment).
DP Requirement: 40% on test, satisfactory completion of assignment.

Advanced Pulping Technology

ENCH8AP HC (30L-20T-0P-0S-78H-29R-0F-0G-3A-13W-16C)

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%) One 3-hr exam (60%)
DP Requirement: Class mark of 40%.

Advanced Chemical Engineering Topics

ENCH8AT HC (24L-4T-0P-0S-100H-29R-0F-0G-3A-13W-16C)

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%) and one 2- or 3-hr exam (70%)
DP Requirement: Class mark of 40%.

Biological Effluent Treat Processes

ENCH8BP HC (30L-20T-12P-0S-65H-30R-0F-0G-3A-0W-16C)

Aim: Candidates will be able to perform calculations and make decisions concerning the operation of biological effluent treatment processes.

Content: Biological Systems: Biochemistry; microbiology; metabolic pathways, energetics; enzyme kinetics. Aerobic Processes: Fixed-film reactors, suspended media reactors; nutrient removal reactors. Anaerobic Processes: Conventional digestion; high-rate digestion. Sludge Handling: Process intensification; dewatering; incineration; disposal. Bioremediation: Land farming; in situ remediation. Process Integration.
Assessment: One assignment, one test, one three-hour 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, one 3-hr exam (weighting subject to assignment).
DP Requirement: 40% average on tests.

Environmental Engineering Process Principles

ENCH8EP HC (40L-30T-3P-0S-70H-10R-0F-0G-3A-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 modeling, mathematical solution procedures.
Practicals: One
Assessment: Two midterm tests 20%, one practical report 10%, one three-hour 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, one 3-hr 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%) One 3-hr 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 following topics will be covered: 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%) One 3-hr exam (60%)
DP Requirement: Class mark of 40%.

Advanced Papermaking Technology
ENCH8PT HC (30L-20T-0P-0S-78H-29R-0F-0G-3A-13W-16C)
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%) One 3-hr exam (60%)
DP Requirement: Class mark of 40%.

Wood Chemistry
ENCH8WC HC (30L-20T-0P-0S-17H-10R-0F-0G-3A-13W-8C)
Prerequisite: DSC2PE1, DSC2OE2, DSC2AE1, DSC2IE1
Aim: Candidates will have an understanding of the structure and chemical composition of wood and how the processes of chemical delignification occur.
Content: The following topics will be covered: the structure of wood, the chemical composition of wood; the chemistry of Kraft Pulping, sulphite pulping, oxygen delignification and bleaching chemistry.
Assessment: Assignments (40%) One 3-hr exam (60%)
DP Requirement: Class mark of 40%.

School of Civil Engineering, Surveying & Construction

Civil Engineering

Offered in the School of Civil Engineering, Surveying & Construction

Communications Workshop
ENCV1CW H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)
Aim: Development of communication skills.
Content: One week Workshop in the mid-year vacation covering: Oral, written and graphical communications and presentations.
Practicals: Oral presentation and group project.
Assessment: 100% attendance and on successful completion of the assignments, students will be awarded a certificate of proficiency.
DP Requirement: Certificate of proficiency.

Introduction to Civil Design

ENCV1ED H2 (10L-39T-0P-0S-31H-0R-0F-0G-4A-13W-8C)

Aim: To introduce students to design, of simple structures in particular, and with the emphasis on graphical methods.
Content: Graphics, analysis of beams, trusses, earthworks, structural steel & reinforced concrete, detailing, dam.
Practicals: Ballista construction
Assessment: Class mark (10%), 4-hr exam (90%).
DP Requirement: 40% average class mark.

Civil Engineering Design 1

ENCV2DE H2 (42L-10T-0P-0S-44H-48R-6F-0G-5A-13W-16C)

Prerequisite: 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.
Practicals: Practicals relating to rc beams and steel.
Assessment: Class mark (20%), 3-hr exam (80%).
DP Requirement: 40% average Class Mark

Fluids 1

ENCV2FL H2 (20L-8T-9P-0S-28H-12R-0F-0G-3A-13W-8C)

Aim: To introduce fundamental concepts of fluid dynamics/hydraulics and develop foundational knowledge for subsequent courses 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 (20%), 2-hr exam (80%).
DP Requirement: 40% average Class Mark.

Geotechnical Engineering 1

ENCV2GA H1 (20L-8T-9P-0S-28H-12R-0F-0G-3A-13W-8C)

Aim: Introduction to fundamental concepts of Soils Mechanics, basic characteristics and physical properties of soils. Behaviour of soils in the presence of static and dynamic water.
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.
Practicals: Execution and analysis of laboratory tests on permeability of soils, seepage of water in a porous medium, compaction of soils.
Assessment: Class mark including test(s), tutorials, and practical reports (20%), one 2hr exam (80%).
DP Requirement: 40% average Class Mark.

Geotechnical Engineering 2

ENCV2GB H2 (20L-8T-9P-0S-28H-12R-0F-0G-3A-13W-8C)

Prerequisite: ENCV2GA (40%)
Aim: The module will introduce the students to the fundamental concepts of soils behaviour with reference to consolidation and compression of the soil mass.
Content: 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 laboratory tests on consolidation settlement of clays and shear strength.
Assessment: Class mark including test(s), tutorials and practical reports (20%), one 2hr exam (80%).
DP Requirement: 40% average Class Mark.

Civil Engineering Materials

ENCV2MT H1 (21L-5T-9P-0S-26H-16R-0F-0G-3A-13W-8C)

Prerequisite: 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 (20%), one 2hr exam (80%).
DP Requirement: 40% average Class Mark.

Materials Workshop Course

ENCV2MW H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Prerequisite: 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: Certificate of proficiency.

Structures 1

ENCV2SA H1 (39L-9T-9P-0S-74H-20R-0F-0G-9A-13W-16C)

Prerequisite: ENCV1ED (40%)
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 (15%), one 3-hour exam (85%).
DP Requirement: 40% average Class Mark.

Structures 2

ENCV2SB H2 (39L-9T-9P-0S-74H-26R-0F-0G-3A-13W-16C)

Prerequisite: 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 (15%), one 3 hour exam (85%).
DP Requirement: 40% average Class Mark.

Civil CADD Workshop

ENCV3CW H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Prerequisite: DP for ENCV3ST and ENCV3DA
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 a certificate of proficiency.
DP Requirement: Certificate of proficiency

Civil Engineering Design 2

ENCV3DA H1 (21L-5T-0P-0S-22H-24R-3F-0G-5A-13W-8C)

Prerequisite: ENCV2SA, ENCV2SB (40%), ENCV2DE (40%)
Aim: To provide students with the concepts of structural steelwork design of plate girders and columns, frame action and connections and lattice members. To provide students with the concepts of plastic behaviour of steel beams.
Content: Continuation of structural steelwork design from second year. Design of plate girders, columns with bending, frames, beam to column connections, lattice girders and trusses. Introduction to plastic design of beams.
Practicals: Mini steelwork design project.
Assessment: Class mark including test(s), tutorials and project (20%), one 3 hr exam (80%).
DP Requirement: 40% average Class Mark.

Civil Engineering Design 3

ENCV3DB H2 (21L-5T-0P-0S-22H-24R-3F-0G-5A-13W-8C)

Prerequisite: ENCV2SA, ENCV2SB, ENCV2DE, ENCV3DA (40%)
Aim: To provide students with the concepts of reinforced concrete design of slabs, columns and foundations.
Content: Continuation of reinforced concrete design from second year. Design of beam/slab systems and flat slabs, columns with bending. Design of spot, combined, strip and strapped foundations.
Practicals: Mini reinforced concrete project.
Assessment: Class mark including test(s), tutorials and project (20%), one 3 hr exam (80%).
DP Requirement: 40% average Class Mark.

Fluids 2

ENCV3FA H1 (40L-24T-16P-0S-51H-24R-0F-0G-5A-13W-16C)

Prerequisite: ENCV2FL (40%)
Aim: Develop the fundamental theory & applications of fluid dynamics/hydraulics in civil & environmental engineering.
Content: Physical similarity and dimensional analysis. Steady flow in pipes – series, parallel & branched. Pipe distribution networks. Pumping systems. Unsteady effects in pipelines. Boundary layer theory & applications (separation; skin-friction & form drag); Potential flows. Other selected topics e.g. groundwater, water waves.
Practicals: 3 lab experiments demonstrating the fundamental principles of fluid flow systems e.g. energetics, boundary layers and separation.
Assessment: Class mark (20%), 3-hr exam (80%).
DP Requirement: 40% average class mark.

Fluids 3

ENCV3FB H2 (39L-10T-9P-0S-77H-20R-0F-0G-5A-13W-16C)

Prerequisite: ENCV2FL, ENCV3FA (40%)
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). Flood hydrology. Reservoir and channel routing. Dams & hydraulic structures (weirs, flumes, spillways, culverts, etc). River & canal engineering. Other selected topics & applications e.g. 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: Mid-term tests (20%). 3-hr Examination (80%)
DP Requirement: 40% average class mark.

Geotechnical Engineering AE

ENCV3GE H2 (20L-9T-8P-0S-28H-12R-0F-0G-3A-0W-8C)

Prerequisite: ENCV2GA and ENCV2GB (40%)
Aim: To provide students with basic information and skills in the analysis of physical and geotechnical properties of soils in relation with the stability of slopes and in the estimation of settlement of structures on sands and clays.
Content: 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: Reinforce understanding of concepts by practical work done in groups to develop teamwork experience, report writing experience and to introduce the students to experimental and research work.
Assessment: Class mark including test(s), tutorials, and practical reports 15%. Examination (2 hrs) 85%.
DP Requirement: 40% average Class Mark.

Geotechnical Engineering 3

ENCV3GT H2 (39L-9T-20P-0S-70H-20R-1F-0G-3A-13W-16C)

Prerequisite: ENCV2GA and ENCV2GB (40%)
Aim: To provide students with 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: Geotechnical investigation. 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: 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 (30%). 3-hr exam (70%).
DP Requirement: 40% average Class Mark.

Mathematical Systems

ENCV3MS H2 (20L-17T-0P-0S-26H-12R-0F-0G-5A-13W-8C)

Prerequisite: MATH238/248, STAT370 (40%).
Aim: To develop skills in the formulation and numerical solution (primarily using spreadsheet software) of simple mathematical models.
Content: Mathematical modeling and numerical techniques. Curve and surface fitting to discrete data by least squares. Numerical integration and differentiation. Numerical optimization - applications in production, transportation and construction. Finite difference solutions of Laplace, Poisson, heat and wave equations - applications to fluid flows, torsion, heat flow.
Practicals: Computer laboratory practice in the application of spreadsheets in advanced mathematical modelling and numerical solution.
Assessment: Class mark (20%), 3-hr exam (80%).
DP Requirement: 40% average class mark.

Structures AE

ENCV3SS H1 (20L-5T-0P-0S-42H-10R-0F-0G-3A-0W-8C)

Prerequisite: ENCV2SA, ENCV2SB (40%).
Aim: To introduce the compatibility method of analysing indeterminate structures.
Content: Analysis of indeterminate structures by compatibility methods: strain energy, virtual work, moment area. Symmetry, skew-symmetry, closed structures. Arches. Influence lines. Model analysis.
Assessment: Class mark - 15%, written examination - 85%.
DP Requirement: 40% average class mark.

Structures 3
ENCV3ST H1 (40L-20T-18P-0S-50H-26R-0F-0G-6A-13W-16C)
Prerequisite: ENCV2SA, 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: Use of computer packages for structural analysis.
Assessment: Class mark (20%), one 3- hr examination 80%.
DP Requirement: 40% average class mark.

Transport IA
ENCV3TA H1 (20L-5T-0P-0S-37H-16R-0F-0G-2A-13W-8C)
Prerequisite: 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.
Content: General introduction to transportation engineering including such aspects as: historical development, system and network characteristics, and transport vehicle and user characteristics.
Assessment: Class mark (20%), 2-hour examination(80%)
DP Requirement: Complete all tutorials . 40% class mark

Transport 1B
ENCV3TB H2 (20L-5T-0P-0S-37H-16R-0F-0G-2A-13W-8C)
Prerequisite: ENCV3TA (40%)
Aim: To develop students' appreciation and understanding of the underlying theory and principles of transport - particularly insofar as these relate to the planning/design of basic transport network.
Content: General introduction to transportation engineering including such aspects as: traffic engineering and analytical transportation planning theory and application.
Assessment: Class mark (20%), 2-hour examination (80%)
DP Requirement: Complete all tutorials. 40% class mark

Transport 2
ENCV3TP H2 (20L-5T-9P-0S-26H-16R-0F-0G-3A-13W-8C)
Prerequisite: ENCV2GA, ENCV2GB (40%) ENCV3TA (40%).
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 (20%), 2-hr exam (80%)
DP Requirement: 40% class mark.

Civil Engineering Design Project
ENCV4DE H2 (0L-0T-0P-0S-236H-0R-0F-0G-4A-13W-24C)
Prerequisite: Passed all 3rd year modules; 40% in ENCV4WE, ENCV4TE and ENCV4GS with 50% for the module in the discipline covered in the student's Design Project.
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. Students are required to show competence in each ECSA outcome relevant to this module as specified in the course 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 (0L-0T-0P-0S-236H-0R-0F-0G-4A-13W-24C)
Prerequisite: 50% in all 3rd year modules; 40% ENCV4WE, ENCV4TE and ENCV4GS with 50% for the module in the discipline covered in the student's Dissertation.
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: Based on a written dissertation and oral presentation/examination. Students are required to show competence in each ECSA outcome relevant to this module as specified in the course 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.

Environmental Management (Civil Engineering)

ENCV4EM H1 (20L-5T-0P-0S-35H-17R-0F-0G-3A-13W-8C)
Prerequisite: Must be in 4th year of study.
Aim: Introduction to environmental management, concepts of holistic planning, and environmental awareness and legal requirements
Content: Ecosystem characteristics, structure and processes, and response of systems to resource developments and engineering interventions. Integrated environmental management, the legal framework, Environmental impact assessment: definitions, methodologies and techniques, limitations. Planning, design, implementation, operation and decommissioning stages.
Assessment: Assignment (30%) and one 2-hr exams (70%).
DP Requirement: 40% average class mark

Ground and Structural Engineering

ENCV4GS H1 (39L-18T-0P-0S-51H-40R-7F-0G-5A-13W-16C)
Prerequisite: ENCV2GA, ENCV2GB, 40% in ENCV3GT, ENCV3DA, ENCV3DB and 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: Class mark incl tests, assignments and tutorials: 20%. One 3-hr exam (80%).
DP Requirement: 40% average class mark.

Geotechnical Engineering 4

ENCV4SL H1 (20L-5T-0P-0S-29H-16R-7F-0G-3A-13W-8C)
Prerequisite: ENCV2GA, ENCV2GB, ENCV3GT (40%)
Aim: To introduce advanced concepts and techniques in Geotechnical Engineering , using a major project.
Content: Bearing capacity analysis, retaining structures, selected advanced geotechnical topics.
Assessment: Class mark (30%) and one 2-hr exam (70%).
DP Requirement: 40% average class mark.

Structures 4
ENCV4ST H1 (20L-5T-0P-0S-34H-16R-0F-0G-5A-13W-8C)
Prerequisite: 40% in ENCV3GT, ENCV3DA, ENCV3DB, ENCV3ST
Aim: To introduce advanced concepts and techniques in Structural Engineering , using a major project.
Content: Limit State Design using Partial Factors, retaining structures, prestressed concrete, selected advanced structures topics such as yield line analysis, plastic analysis of frames.
Assessment: Class mark (30%) and one 3-hr exam (70%).
DP Requirement: 40% average class mark.

Transport and Environmental Management
ENCV4TE H1 (39L-11T-0P-0S-73H-32R-2F-0G-3A-13W-16C)
Prerequisite: 40% in ENCV3TA and ENCV3TB
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 fulfill all requirements.
Assessment: Assignment (30%) and two 2-hr exams (70%).
DP Requirement: 40% average class mark.

Transportation
ENCV4TP H1 (21L-8T-0P-0S-32H-16R-0F-0G-3A-13W-8C)
Prerequisite: ENCV3TA, ENCV3TB (40%), ENCV3TP(40%)
Aim: To introduce the students to the application of the principles embodied in the compulsory courses to the solution of selected design or analytical problems.
Content: Content: More detailed study of the management and design of transport infrastructure systems
Practicals: None
Assessment: Class work (30%), one 2 hour examination (70%).
DP Requirement: 40% average class mark.

Water and Environmental Engineering
ENCV4WE H1 (39L-10T-0P-0S-86H-20R-0F-0G-5A-13W-16C)
Prerequisite: ENCV2FL, ENCV3FA, ENCV3FB (40%)
Aim: The module will introduce the students to the fundamentals of water and environmental engineering, with particular focus on control, management and treatment of polluting emissions into the environment.. Basic hydrological concepts will find a practical application in the assessment of pollution dispersion mechanisms in water systems, design of wastewater treatment systems (municipal wastewater, landfill leachate and mine effluents) and solid waste management.
Content: Fundamentals of environmental and hydrological engineering, qualitative characterisation of wastewaters (domestic and industrial), pollution dispersion in water systems, basic design and management of potable and waste water treatment plants, introduction to solid waste management.
Assessment: Class mark: One project report (20%), one mid-term test (10%) and one 3-hr exam (70%).
DP Requirement: 40% average class mark.

Environmental Management (Civil Engineering)
ENCV7EM H1 (20L-5T-0P-0S-35H-17R-0F-0G-3A-13W-8C)
Prerequisite: Must be in 4th year of study.
Aim: Introduction to environmental management, concepts of holistic planning, and environmental awareness and legal requirements.

Content: Ecosystem characteristics, structure and processes, and response of systems to resource developments and engineering interventions. Integrated environmental management, the legal framework. Environmental impact assessment: definitions, methodologies and techniques, limitations. Planning, design, implementation, operation and decommissioning stages.
Assessment: (30%) and one 2-hr exams (70%).
DP Requirement: 40% average class mark

Research Methodology

ENCV800 HC (10L-39T-10P-0S-98H-0R-0F-0G-3A-13W-16C)

Aim: The objective of this course is to train students in the proper design of research projects and seminar presentation. Theories of research scientific knowledge, Conceptual frameworks and analysis of research problems; Stages in research; Research objectives and hypotheses; Research strategy and choice of methods; Operationalization and measurement; Data collection methods; Sampling techniques; Data analysis and presentation; Significance testing; Models; Report writing. The student will be required to develop his/her own draft research proposal (as an input to the dissertation part of the programme).
DP Requirement: Not applicable.

Dissertation

ENCV801 HC (0L-0T-0P-0S-720H-0R-0F-0G-0A-26W-72C)

Content: Objectives: At the end of this course, the student should: 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. 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.

Unit Operations & Process

ENCV803 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Aim: At the end of the course, the student should be able to: 1. Understand the principles and functional utilities of individual units; 2. Design the individual units for the desired treatment results.
Content: Physical, Chemical and Biological Processes. Unit Operations and Processes as Applied in Water, Wastewater and Sludge Treatment. Physical Processes: Physical Processes related to the design of water and wastewater treatment systems, aeration and gas transfer, filtration, screening, floatation,. Sludge dewatering, evaporation and drying. Osmosis and electrodialysis. Chemical Processes: Unit Operations involving precipitation, coagulation and flocculation. Oxidationreduction, neutralization, absorption and ion-exchange reactions, chemical changes in gas transfer reactions, desalination, disinfection. Biological Processes: Theory of biological slurry and film reactors. Application to the design of aerated lagoons, oxidation ditches, biofilters and activated sludge systems. Nitrification and denitrification. Sludge treatment and disposal, composting. Design, construction and performance of waste stabilization ponds (aerobic, maturation, and high rate).
Assessment: One two hour exam 100%
DP Requirement: Class mark of 40%.

Water Resources planning & management

ENCV804 HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Aim: At the end of the course, the student should be able to: 1. Identify the phases in planning and the management of various water developments including the major sources and uses of water; 2. Estimate water demands for various water uses; 3. Be exposed to the use of modelling and 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: One two hour exam 100%
DP Requirement: Class mark of 40%.

Industrial Water & Wastewater Management

ENCV815 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Aim: At the end of the course, the student should be able to: 1. Appreciate the industrial requirements of water and the level of contamination dumped in these water; 2. Suggest appropriate measures to reduce these contamination before discharging out of the industrial complex.
Content: : Basic Industrial Water Supply and Management Systems: Open, Closed Recirculation and In-series Systems with Multiple Water Reuse. Specific Water Treatment Processes for Boiler, Cooling Systems and Other Industrial Supply. Distillation, Ion-exchange, Aeration and Degasification. Decontamination of Steam. Corrosion of Metals and its Control in High-pressure Boilers and other Industrial Water Uses. Design and Operation of a Water Cooling Tower. Sources and Characteristics of Industrial Wastewaters. Effects of Industrial Wastewater on Domestic Sewage Treatment Plants. Treatment of Specific Industrial Wastes including Textile, Tannery, Food Processing, Pulp and Paper, etc.
Assessment: Assessment: One two hour exam 100%
DP Requirement: Class mark of 40%.

Environmental Pollution and Control

ENCV817 HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Aim: At the end of the course, 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.
Content: Water Pollution: Sources and Characteristics of Water Pollutants. Effects of Pollutants on Physical, Chemical and Biological Properties and Ecology of Receiving Water. Natural Self-purification of Streams and Oxygen, Nitrogen and Phosphorous Balance in Streams. Eutrophication Process. Determination of Required Degree of Wastewater Treatment and Self-purification Potential of River. Air Pollution: Composition of Air. Sources of Atmospheric Pollution. Measurement of Air Pollution and Effects on Human Health. Principles, Processes and Systems of Air Pollution Control. Solid Wastes: Principles and Practices of Collection, Treatment and Disposal of Solid Wastes from Domestic, Industrial and Agricultural Sources. Agricultural and Industrial Utilization of Solid Wastes. Solid Wastes-Communicable Disease Relationship. Hazardous Waste Management. Soil Conservation: Soil Science. Introduction to Irrigation and Drainage Engineering. Problems of Soil Pollution and Run-off. Soil conservation Practices.
Assessment: One two hour exam 100%
DP Requirement: Class mark of 40%.

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 and to develop the skills to apply this knowledge to the analysis and prediction of environmental flows
Content: Turbulence in fluids and its role in mass, heat and momentum transfer in environmental flows. Introductory meteorology. Structure of the atmospheric boundary layer. Dispersion and mixing in the atmosphere/oceans/rivers – air quality modelling, coastal water quality. Density driven flows – katabatic winds, sea breeze fronts. Environmental hydrology – modelling rainfall, streamflow, and groundwater flow. River modelling. Coastal processes – waves, currents, sediment transport, beach morphology. Experimental methods.
Assessment: Assignments, practical reports and one 3-hr exam.
DP Requirement: Class mark of 40%.

Environmental Impact Assessment

ENCV8EI HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-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 course 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: One two hour exam 100%

DP Requirement: Class mark of 40%

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: 2 assignments, one test (30%) and one 3-hr exam (70%).

DP Requirement: Class mark of 40%.

Landfill Design and Management

ENCV8LD HC (40L-32T-0P-0S-70H-14R-0F-0G-4A-13W-16C)

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 management strategies.

Assessment: one test and one 2-hr exam.

DP Requirement: Class mark of 40%.

Public Transport

ENCV8PT HC (40L-10T-0P-0S-60H-50R-0F-0G-3A-13W-16C)

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: Class/assignment (30%), one three hour exam (70%)

DP Requirement: As per Faculty Rules.

Transport Control

ENCV8TC HC (39L-10T-0P-0S-75H-33R-0F-0G-3A-13W-16C)

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 eg Traffic System Management (TSM) techniques whilst most emphasis is placed on the behaviour (eg gap acceptance), service performance and control of traffic at intersections/junctions – including the principles of traffic signal timing and coordination.
Assessment: Classwork/assignment (30%), one three hour exam (70%)
DP Requirement: As per Faculty Rules.

Transport Development

ENCV8TD HC (39L-10T-0P-0S-70H-40R-0F-0G-3A-13W-16C)

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: Classwork/assignment (30%), one three hour exam (70%)
DP Requirement: As per Faculty Rules.

Transportation Planning

ENCV8TP HC (40L-10T-0P-0S-70H-40R-0F-0G-3A-13W-16C)

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: Classwork/assignment (30%), one three hour exam (70%)
DP Requirement: As per Faculty Rules.

Urban Hydrology

ENCV8UH HC (20L-0T-0P-0S-40H-16R-0F-0G-4A-13W-8C)

Aim: After completing the course, 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 stormwater and approaches for minimizing their impacts.
Content: Methods of flood peak estimation, flood hydrograph estimation methods, the HEC model, design floods, stormwater 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 stormwater.
Assessment: One two hour exam 100%
DP Requirement: Class mark of 40%.

Principles of Water Quality & Legislation

ENCV8WQ HC (20L-0T-0P-0S-40H-16R-0F-0G-4A-13W-8C)

Aim: At the end of the course, 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.
Content: Physical, Chemical and Biological Properties of Natural Surface Water and Groundwater. Organic and Inorganic Pollutants in Water and Wastewater. Their Structure, Transformation in Water Environment and Methods of Analysis. Water Quality Criteria for Different Usage: Drinking, Municipal, Industrial, Agricultural, Recreational, Wildlife and Aquatic Organisms. Specific Refractory Substances in Water and their Effects on Water Usage. Effluent Discharge Standards. Pollution control strategies for surface and groundwater. Water legislation in South Africa, and other countries. Enforcement and assessment of water quality standards. Selected case studies to reinforce the key concepts and issues.
Assessment: One two hour exam 100%.
DP Requirement: Class mark of 40%.

Design of Water/Wastewater Treatment Plants

ENCV8WT HC (40L-25T-0P-0S-64H-20R-4F-0G-7A-13W-16C)

Aim: The module will introduce the students to the fundamentals of the design of potable water and waste waters treatment (municipal wastewaters) systems. It will give the students 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: 3 assignments, one project, one test and one 3-hr exam.

DP Requirement: Class mark of 40%.

Property Development

Offered in the School of Civil Engineering, Surveying & Construction

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.

Practicals: Interaction with architectural students and presentation of assignments in open forums.

Assessment: Assignments, tests (30%), one 3-hr exam (70%)

DP Requirement: 35% class mark.

Intro to Design Appraisal & Measurement

ENPD1DM H2 (35L-10T-17P-0S-62H-35R-0F-0G-5A-13W-16C)

Prerequisite: 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%), one 4-hr exam (60%)

DP Requirement: 35% Class Mark

Construction Drawing

ENPD1DW H1 (11L-0T-32P-0S-37H-0R-0F-0G-0A-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%) and one test under exam conditions (50%)

DP Requirement: 35% Class Mark

No supplementary examination.

Construction Technology & Processes 1A

ENPD1TA H1 (35L-17T-0P-0S-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%), one 3-hr exam (60%)

DP Requirement: 35% Class Mark

Construction Technology & Processes 1B

ENPD1TB H2 (35L-0T-17P-0S-62H-15R-26F-0G-5A-13W-16C)

Prerequisite: ENPD1TA (40%)

Aim: This module follows 'Construction Technology & Processes 1A' continuing with the provision of a basic understanding and knowledge of the processes of construction involved in the erection of a simple, single storey dwelling.

Content: Topics covered: (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%) one 3-hr exam (60%)

DP Requirement: 35% Class Mark

Design Appraisal & Measurement 2A

ENPD2DA H1 (32L-0T-21P-0S-91H-12R-0F-0G-4A-13W-16C)

Prerequisite: ENPD1DM (50%)

Aim: To enable students to produce Bills of Quantities 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 a particular building project using a combination of manual methods of 'taking off' abstracting and billing.

Assessment: Assignments & tests (40%), one 4-hr exam (60%)

DP Requirement: 35% Class Mark.

Design Appraisal & Measurement 2B

ENPD2DB H2 (26L-9T-17P-0S-91H-7R-6F-0G-4A-13W-16C)

Prerequisite: ENPD2DA (40%)

Aim: To enable students to produce Bills of Quantities, 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 a particular building project using a combination of manual methods of 'taking off' abstracting and billing.

Assessment: Assignments & tests (40%), one 4-hr exam (60%)

DP Requirement: 35% class mark.

Construction Economics & Management 2A

ENPD2EA H1 (35L-12T-0P-10S-65H-33R-0F-0G-5A-13W-16C)

Prerequisite: 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%), one 3-hr exam (60%)

DP Requirement: 35% class mark.

Construction Economics & Management 2B

ENPD2EB H2 (35L-12T-0P-10S-62H-32R-0F-0G-5A-13W-16C)

Aim: To provide an understanding of management principles pertaining to the construction industry.

Content: Codes of Practice and ethics relevant to construction management. Organisational theory and structures. Project specifications and preliminaries. Business and scenario planning. Decision making. Human resource management. Modern management approaches and preparation of a work plan..

Practicals: None.

Assessment: Assignments & tests (40%), one 3-hr exam (60%)

DP Requirement: 35% class mark.

Construction Technology & Processes 2A

ENPD2TA H1 (35L-0T-13P-0S-74H-20R-13F-0G-5A-13W-16C)

Prerequisite: ENPD1TB (50%)

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%), one 3-hr exam (60%)

DP Requirement: 35% class mark.

Construction Technology & Processes 2B

ENPD2TB H2 (35L-0T-13P-0S-74H-20R-13F-0G-5A-13W-16C)

Prerequisite: 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%), one 3-hr exam (60%)
DP Requirement: 35% class mark.

Construction Contracts
ENPD3CC H2 (20L-6T-6P-0S-31H-6R-6F-0G-5A-13W-8C)
Prerequisite: LAWF1CM (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%), one 3-hr exam (70%)
DP Requirement: 35% class mark.

Design Appraisal & Measurement 3A
ENPD3DA H1 (26L-9T-17P-0S-65H-6R-32F-0G-5A-13W-16C)
Prerequisite: ENPD2DB (50%)
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%), one 4-hr exam (60%)
DP Requirement: 35% class marks.

Design Appraisal & Measurement 3B
ENPD3DB H2 (26L-15T-17P-0S-91H-6R-0F-0G-5A-13W-16C)
Prerequisite: 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%), one 4-hr exam (60%)
DP Requirement: 35% class mark.

Construction Economics & Management 3A
ENPD3EA H1 (47L-32T-0P-0S-34H-42R-0F-0G-5A-13W-16C)
Prerequisite: 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%), one 3-hr exam (60%)
DP Requirement: 35% class mark.

Project Planning
ENPD3PL H1 (48L-12T-0P-0S-80H-10R-0F-0G-10A-13W-16C)

Prerequisite: 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.
Content: Course content of ENPD3PP supplemented by: Investigation of alternative information systems and the choice thereof. Using technology for project documentation sharing and interoperability. Setting up projects. Data structures for management and control purposes. Time analysis. Networks. Resources and resource smoothing. Project documentation. Soft Logic. Customising planning software for special purposes. Sharing project information with a web based application.
Assessment: Assignments & tests (40%) one 3-hr exam (60%)
DP Requirement: 35% class mark.

Project Management
ENPD3PM H2 (36L-6T-16P-0S-164H-15R-0F-0G-5A-13W-24C)

Prerequisite: Students must be registered at least in the 3rd year of study.
Aim: To provide a conceptual framework for the discipline of project management. Management of construction projects. 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%), one 3-hr exam (60%)
DP Requirement: 35% Class Mark

Project Planning & Management Control
ENPD3PP H1 (26L-12T-0P-0S-32H-5R-0F-0G-5A-13W-8C)

Prerequisite: Students must be registered in at least the 3rd year of study
Aim: Analyse projects to model alternative methods in order to plan and then control sizeable projects, and to make strategic and tactical planning decisions. Apply operations research techniques to project management problems.
Content: Principles of production management. Development of planning techniques: Gantt charts. Critical Path Analysis. Network development and construction. Time-analysis applicability and dangers. Project expediting. Resource analysis. Human and practical problems of development and implementation. Line of balance. Precedence networks. Forecasting techniques: concept of data as information and noise; overview: scatter diagrams. Control methods: Progress recording.
Assessment: Test and assignment (30%), one 3-hr exam (70%)
DP Requirement: 35% class mark.

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%), one 3-hr exam (60%)
DP Requirement: 35% class mark.

Property Studies

ENPD3PS H1 (36L-9T-0P-9S-84H-17R-0F-0G-5A-13W-16C)

Prerequisite: Students must be registered at least in the 3rdyear 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.

Content: Basic principles on the functioning of the property market. Differing land uses and the influence of the external environment. Economics of real property. Land tenure and forms of ownership. Mathematics of finance. Investment in real property. Principles of property development. Introduction to property finance. Introduction to viability studies. Laws pertaining to property.

Assessment: Tests & assignment (30%), one 3-hr exam (70%)

DP Requirement: 35% class mark.

Construction Technology & Processes 3A

ENPD3TA H1 (17L-0T-17P-0S-13H-15R-13F-0G-5A-13W-8C)

Prerequisite: ENPD2TB (50%)

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%), one 3-hr exam (60%)

DP Requirement: 35% class mark.

Law of Building Contracts

ENPD7BC H2 (36L-18T-0P-0S-95H-6R-0F-0G-5A-13W-16C)

Prerequisite: LAWS1AS (50%)

Aim: To introduce students to 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.

Practicals: Present seminars.

Assessment: Assignments & tests (40%), one 3-hr exam (60%)

DP Requirement: 40% class mark.

Cost Engineering

ENPD7CE H1 (36L-10T-17P-0S-230H-20R-0F-0G-5A-32W-32C)

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-hr exams (60%)

DP Requirement: 40% class mark.

Applied Construction Management

ENPD7CM H2 (39L-12T-0P-0S-144H-0R-45F-0G-2A-0W-24C)

Prerequisite: ENPD7CT (50%)

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: Continuous assessment for DP purposes. Major assignment and presentation (100%)

DP Requirement: 40% class mark.

Advanced Construction Technology

ENPD7CT H2 (26L-6T-12P-0S-19H-6R-6F-0G-5A-0W-8C)

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%), one 3-hr exam (60%)

DP Requirement: 40% class mark.

Advanced Design Appraisal & Measurement

ENPD7DA H1 (26L-9T-17P-0S-17H-6R-0F-0G-5A-0W-8C)

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%), one 3-hr exam (60%)

DP Requirement: 40% class mark.

Project Administration

ENPD7PA H1 (36L-12T-17P-0S-234H-16R-0F-0G-5A-13W-32C)

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-hour exams (60%)

DP Requirement: 40% class mark.

Property Development Economics

ENPD7PE H1 (36L-6T-6P-0S-95H-5R-6F-0G-5A-0W-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%), one 3-hr exam (60%)

DP Requirement: 40% class mark.

Professional Practice

ENPD7PP H2 (26L-6T-6P-0S-31H-6R-0F-0G-5A-13W-8C)

Prerequisite: Only students registered at least 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 a specific objective of preparing them for the establishment and development of a quantity surveying 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; Conflict resolution
Assessment: Assignments (40%), one 3-hr exam (60%)
DP Requirement: 40% class mark.

Property Valuations

ENPD7PV H2 (26L-0T-6P-0S-31H-6R-6F-0G-5A-0W-8C)

Aim: Advanced applications of economic and mathematical theory to real estate to develop a comprehensive understanding of property valuation and investment principles. To 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%), one 3-hr exam (70%)
DP Requirement: 40% class mark.

Research Methodology

ENPD7RM H1 (36L-6T-6P-0S-105H-0R-0F-0G-8A-13W-16C)

Aim: The aim of this course is 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: Test (50%), Research report and presentation (50%)
DP Requirement: 40% for test.
No supplementary examination.

Research Report

ENPD7RR H2 (0L-12T-0P-0S-230H-0R-0F-0G-0A-0W-24C)

Aim: To study a defined topic, appropriate to honours level, 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 course flows directly from Research Methodology (ENPD7RM) and registration for the course can only be confirmed 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: Continuous assessment for DP purposes. Major assignment and presentation (100%)
DP Requirement: Report of satisfactory progress by supervisor.
No supplementary examination.

Simulated Office Project

ENPD7SO H2 (26L-9T-0P-0S-125H-0R-0F-0G-0A-13W-16C)

Prerequisite: ENPD7CE (50%)

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: Continuous assessment for DP purposes. Major assignment and presentation (100%)

DP Requirement: 40% class mark.

Advanced Research Methodology

ENPD8RM HC (12L-0T-0P-0S-68H-0R-0F-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 course covers qualitative versus quantitative approaches to: Data acquisition; planning the research project; literature searching; gathering and analysing data; presentation of the research findings.

Practicals: Submission of a detailed research proposal.

Assessment: Research proposal

DP Requirement: As per Faculty Rules.

Surveying

Offered in the School of Civil Engineering Surveying & Construction

Engineering

ENSV1EN H1 P1 (20L-20T-0P-0S-25H-12R-0F-0G-3A-13W-8C)

Aim: To provide students with an insight into the scope of engineering as a whole, the role of core mathematics and physics and the place of his own discipline. To provide practical computing skills.

Content: Introduction to computer facilities, an operating system, a spreadsheet and a word processing programme. Introduction to Engineering. Some examples of the problems solved in Geomatics, Agricultural, Civil, Mechanical, Electrical and Electronic Engineering.

Practicals: Computer tutorials and proficiency tests.

Assessment: 7 Computer assignments 15%, one test 15%, one two-hour exam 70%.

DP Requirement: 40% average class mark.

Geomatics I

ENSV1GA H1 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)

Aim: To provide students with an ability to choose an appropriate data-gathering technology for a particular Geomatics based spatial information problem, and assess the quality of that data.

Content: An overview of the concepts of Geomatics; the nature and representation of spatial data; co-ordinate systems and map projection systems used in South Africa (WGS84, Gauss conformal); overview of the methods of acquiring spatial data; processing and analysis, representation and display of data; introduction to statistical analysis, GIS, remote sensing imagery, aerial photographs and map interpretation.

Practicals: Field work on data acquisition and presentation.
Assessment: Tutorial/Practical Assignments and one test (30%), one 3-hour examination (70%)
DP Requirement: 40% average class mark.

Geomatics 2

ENSV1GB H2 (28L-10T-19P-0S-68H-30R-0F-0G-5A-0W-16C)

Prerequisite: 40% in ENSV1GA
Aim: To provide students with an ability to plan and carry out basic surveying routines for simple mapping problems; the use of total stations, levels and navigational GPS receivers. Explain how GPS and GIS work together in data gathering and analysis.
Content: The principles of angle measurement, methods of position fixing and their computation; principles of triangulation, trilateration and traversing. The acquisition of spatial data; site and field surveying using electronic theodolites; simple introduction to the Global Positioning System (GPS); GPS for use in Geographic Information Systems (GIS).
Practicals: Field work on data acquisition and presentation.
Assessment: Tutorial/Practical Assignments and one test (30%), one 3-hour examination (70%)
DP Requirement: 40% class mark.

Statistics & Adjustments

ENSV1SA H2 (40L-10T-0P-0S-80H-25R-0F-0G-5A-13W-16C)

Aim: To show students 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. Use of application software.
Content: The mathematical model; The nature of data; Estimation; Hypothesis tests; Confidence limits; Multivariate continuous distributions. Error propagation. An introduction to least squares adjustments; adjustment of indirect observations; numerical considerations in adjustments; áposteriori statistical analysis; applications.
Practicals: Assignments using real and simulated survey data.
Assessment: Tutorial Assignments and one test (30%), one 3-hour examination (70%)
DP Requirement: 40% class mark.

Survey Camp 1

ENSV1SC H2 (0L-0T-0P-0S-0H-0R-80F-0G-0A-2W-8C)

Prerequisite: 40% in ENSV1GA
Aim: To introduce students to a data gathering field exercise. Downloading field-data to software and carry out post-processing, Management of data storage, integrity and long-term accessibility of field data. Preparing graphic output of field data
Content: Completion of assigned tasks that vary from year to year. These generally do not take the candidate beyond what was learned formally in the Geomatics I module 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.
No supplementary examination.

Cadastral Surveying 1

ENSV2CS H2 (20L-10T-40P-0S-70H-15R-0F-0G-5A-13W-16C)

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%), one three-hour exam (70%)
DP Requirement: 40% class mark.

Geomatics 3

ENSV2GO H1 (28L-10T-19P-0S-62H-36R-0F-0G-5A-13W-16C)

Prerequisite: 40% in ENSV1GB
Aim: To provide students with an ability to plan and carry out the survey of a complex engineering control and mapping project, selecting the right methodology, equipment and software. Operate gyrotheodolites, precise optical plummets, GPS and commercial surveying software, total stations and data loggers.
Content: Similarity and affine co-ordinate transformations; triangulation, trilateration and traversing; trigonometrical levelling; theory of electronic distance measurement; electronic theodolites and levels and their data processing; theory and application of the gyrotheodolite.
Practicals: Field work on advanced surveying techniques.
Assessment: Tutorial/Practical Assignments, project and one test (30%), one 3-hour examination.(70%)
DP Requirement: 40% class mark.
Only suitable for Land Surveying students.

Remote Sensing

ENSV2RS H2 (28L-10T-40P-0S-62H-15R-0F-0G-5A-13W-16C)

Prerequisite: None
Aim: To introduce students to the principles of remote sensing and its application in mapping.
Content: Introduction to remote sensing, sensor platforms and systems, image interpretation, rectification and enhancement, image manipulation techniques; image classification, accuracy assessment. GIS data integration, modelling techniques.
Practicals: Processing of remotely sensed satellite images for mapping purposes
Assessment: Tutorial/Practical Assignments and one test (30%), one 3-hour examination.(70%)
DP Requirement: 40% class mark.

Surveying (Engineering) 1

ENSV2SA H1 (20L-10T-19P-0S-15H-10R-0F-0G-5A-13W-8C)

Aim: Introduction to observing, recording, reduction and presentation of survey measurements.
Content: Geomatics, historical development, introduction to spatial data and its accuracy; co-ordinate systems and standard map projections used in South Africa; overview of modern surveying instruments for spatial data acquisition; methods of acquiring, computing, analysing, presenting and displaying horizontal and vertical control data; terrain modelling; interpretation of aerial survey maps and photographs; introduction to Geographical Introduction Systems (GIS).
Practicals: Field work involving various survey techniques and processing of survey measurements in the office.
Assessment: Tutorial/Practical Assignments and test(s) (30%), one 3-hour examination.(70%)
DP Requirement: 40% class mark.

Surveying (Engineering) 2

ENSV2SB H2 (20L-10T-19P-0S-15H-10R-0F-0G-5A-13W-8C)

Prerequisite: ENSV2SA / ENSV1GB
Aim: To give skills in setting out of engineering works including roads and precise engineering structures. It also introduces the wide range of engineering surveying applications in which GPS is used and provides engineers with essential understanding of spatial information concerning land ownership as this affects engineering projects.
Content: Introduction to the Global Position System(GPS); introduction to cadastral surveys; civil engineering applications including areas, volumes, mass haul diagrams, circular and transition curves, vertical curves, setting-out, precise engineering surveys.
Practicals: Hands-on experience with GPS.
Assessment: Tutorial/Practical Assignments and test(s) (30%), one 3-hour examination.(70%)
DP Requirement: 40% class mark.

Survey Camp 2

ENSV2SC H2 (0L-0T-0P-0S-0H-0R-80F-0G-0A-2W-8C)

Prerequisite: ENSV1SC

Aim: To introduce students to the establishment of low order control for use by more junior candidates undertaking DNS1SC2. Advise more junior candidates on techniques, data management and graphics.

Content: The topic 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.

No supplementary examination.

Theory of Adjustments

ENSV2TH H2 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)

Prerequisite: ENSV1SA

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.

Practicals: Assignments using real and simulated problems in geomatics.

Assessment: Tutorial Assignments and one test (30%), one three-hour exam (70%).

DP Requirement: 40% class mark.

Co-ordinate Systems & Geodetic Projections

ENSV3CG H2 (40L-0T-20P-0S-60H-35R-0F-0G-5A-13W-16C)

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%), one three-hour exam (70%).

DP Requirement: 40% class mark.

Cadastral Surveying 2

ENSV3CS H1 (40L-0T-20P-0S-60H-35R-0F-0G-5A-13W-16C)

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%, one 3-hour exam 70%.

DP Requirement: 40% class mark.

Hydrographic Surveying

ENSV3HS H1 (20L-3T-5P-0S-29H-19R-0F-0G-4A-13W-8C)

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.
Practicals: methods used in hydrographic surveying.
Assessment: Practical/tutorial assignment 15%, one 3-hour examination 85%.
DP Requirement: 40% class mark.

Photogrammetry

ENSV3PO H1 (28L-10T-19P-0S-83H-15R-0F-0G-5A-13W-16C)

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%), one 3-hour examination. (70%)
DP Requirement: 40% class mark.

Survey Camp 3

ENSV3SC H2 (0L-0T-0P-0S-0H-0R-80F-0G-0A-2W-8C)

Prerequisite: 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 topic 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.
No supplementary examination.Daily assessment of performance in the field, alternatively a portfolio presentation.

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.
Content: Satellite co-ordinate systems and satellite orbits, principles of position location using satellites. The Global Position System; navigation and surveying using GPS.
Practicals: Perform GPS surveys.
Assessment: Tutorial/Practical assignments and one test (30%), one 3-hour examination. (70%)
DP Requirement: 40% class mark.

Geographic Information Systems

ENSV4GI H2 (28L-10T-19P-0S-67H-31R-0F-0G-5A-13W-16C)

Aim: To introduce students to the principles of developing a geographic information system (GIS) or Land information system (LIS) and the associated concepts.

Content: Introduction to GIS; parcel based land information systems (PBLIS); spatial database concepts; data acquisition and data quality; data management and database management systems, data manipulation and analysis; error modelling and data uncertainty; presentation and visualisation of spatial analysis results; system planning and implementation. The role of information in society.
Practicals: Spatial data collection, processing and applications in the real World
Assessment: Practical/tutorial reports and test (s) (30%) and 3-hour examination (70%).
DP Requirement: Minimum of 75% submission of all tutorial assignments and Practical Reports plus full attendance of all module tests.

Geodetic Surveying

ENSV4GS H2 (20L-10T-0P-0S-35H-10R-0F-0G-5A-13W-8C)

Aim: 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: Design a control system for a specific geodetic task. 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%), one three-hour exam (70%).
DP Requirement: 40% class mark.

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.
Assessment: Tutorial assignments and one test (30%), one three-hour exam (70%).
DP Requirement: 40% class mark.

Land Tenure

ENSV4LT H1 (20L-10T-10P-0S-25H-10R-0F-0G-5A-13W-8C)

Aim: To enable the student to summarise information from relevant literature, to write an essay, word-processed, from the relevant literature, analyse and draw conclusions about the role of the land surveyor in the wider society, design preliminary approaches to solve cadastral and land management problems.
Content: The origins and development of land tenure; tribal systems; systems through the world; modern systems compared; proposals for Southern Africa.
Practicals: Design preliminary approaches to solve cadastral and land management problems.
Assessment: Essay assignments and one seminar (30%), one three-hour exam (70%).
DP Requirement: 40% class mark.

Professional Practice

ENSV4PP H2 (20L-10T-10P-0S-25H-10R-0F-0G-5A-13W-8C)

Aim: To introduce the student to the full range of ethical, business, planning, marketing and administrative skills involved in professional practice.
Content: Professional and business ethics, duties to clients, colleagues service to community. Project management;. Structuring a practice; incorporated companies, partnerships, companies, close corporations, tax impacts, staff contracts, IR principles, allocation of shares. Accounting; costing, tendering, quoting, managing debt. Laws relating to business. Staff management; job descriptions, performance appraisal, motivational techniques, elements of organisational structures. Marketing and networking.
Assessment: Tutorial assignments (30%), one three-hour exam (70%.)
DP Requirement: 40% class mark.

Precision Engineering Surveying

ENSV4PS H2 (28L-10T-19P-0S-62H-36R-0F-0G-5A-13W-16C)

Prerequisite: ENSV2TH

Aim: To enable students to: calibrate a precise measuring instrument, design an appropriate measuring scheme for a specific problem, to subject real observations to an appropriate analysis and transformation to suit a particular problem in the engineering field.

Content: Instrumentation used in precise engineering surveying; testing and laboratory calibration of instruments; precision surveying methods for construction projects, including methods of precision alignment; deformation surveys; analytical methods associated with precision engineering surveys, including pre-and post-analyses of accuracy.

Practicals: Calibration of measuring instruments, testing, construction project surveying.

Assessment: Tutorial Assignments, one test (30%), one three-hour exam (70%).

DP Requirement: 40% class mark.

Research Methodology

ENSV4RM H1 (14L-9T-0P-0S-57H-0R-0F-0G-0A-13W-8C)

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 the Surveying and Mapping Project module. 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.

No supplementary examination.

Surveying & Mapping Project

ENSV4SP H2 (10L-40T-0P-0S-270H-0R-0F-0G-0A-13W-32C)

Prerequisite: 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: Submission of project report.

No supplementary examination.

School of Electrical, Electronic & Computer Engineering

Offered in the School of Electric, Electronic & Computer 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

Content: Philosophy of design. Introduction to Matlab. Communication skills. Engineering theory, practical design and assignment. Math Works : The Candidate Edition of MATLAB, Version 4 for Microsoft Windows, Prentice-Hall, 1995

Practicals: Practical design of an electrical/electronic instrument.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practicals and assignments, and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Computer Methods 1

ENEL2CA H1 (20L-10T-10P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: ENSV1EN, & 40% in ENEL1ED

Aim: Present structured and documented solutions to selected data processing problems. Deploy solutions in Visual Basic. Create and utilise user-defined code objects. Represent and manipulate data.

Content: Algorithms, programs and computers. Visual Basic programming. Program design, debugging and verification. Data representation. Solution to several numerical and non-numerical problems.

Practicals: Microsoft windows software design.

Assessment: Coursework and Tests 25%, Examination 75% .

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Computer Methods 2

ENEL2CB H2 (20L-10T-10P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: ENEL1ED, 40% in ENEL2CA

Aim: Present solutions to selected data processing problems. Deploy such solutions in the AWK scripting language and/or the ANSI-C programming language. Understand and use the Linux operating system, the File Transfer Protocol (ftp) and vi text editor. Represent and manipulate data and data files.

Content: Linux operating system. AWK script programming. C language programming. Programme design, debugging and verification. Software system design. Solution to several numerical and non-numerical problems.

Practicals: ANSI-C software design.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Applied Computer Methods

ENEL2CM H1 (20L-10T-10P-0S-26H-10R-0F-0G-4A-13W-8C)

Aim: To provide an introduction into 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.

Practicals: Practical work to exercise knowledge.
Assessment: Coursework and Tests (25%), Examination (75%)
DP Requirement: Achieve an average mark of at least 30% in the tests.

Data Structures & Algorithms

ENEL2DS H2 (20L-10T-10P-0S-26H-10R-0F-0G-4A-13W-8C)

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 25%, Examination 75%.
DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests.

Electrical Principles 1

ENEL2EA H1 (39L-11T-12P-0S-74H-18R-0F-0G-6A-13W-16C)

Prerequisite: 40% in PHYS152
Aim: Solution of simple electrical circuits using circuit theorems and analysis techniques; application of the theory of the magnetic field to the analysis of fundamental electrical devices.
Content: Ideal linear circuit elements. Mesh and nodal analysis and network theorems. Application of phasors to the analysis of AC circuits. Transient response of simple circuits. Average and RMS. Impedance, admittance and power in AC circuits. Introduction to three-phase circuits and frequency response. Magnetic field produced by current carrying wires. Equivalent circuit model of the transformer and DC machine. Introduction to the induction motor.
Practicals: Four 3-hr laboratory practicals.
Assessment: Laboratory work, Test (25%) Examination marks (75%).
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electrical Principles 2

ENEL2EB H2 (39L-11T-12P-0S-74H-18R-0F-0G-6A-13W-16C)

Prerequisite: 40% in 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.
Content: Electronic Systems: Block diagram description of analogue and digital systems. Sinusoidal & Periodic Signals: Frequency response, Bode plot and the decibel. Outline of Fourier analysis.Analogue Building Blocks: The ideal operational amplifier, linear and non-linear circuits and their applications. Practical operational amplifiers and their limitations. Differential amplifiers and common-mode rejection. Diodes, transistors, bias circuits and their 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.
Practicals: Four 3-hr laboratory practicals.
Assessment: Coursework and Test (25%), Examination (75%).
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electronic Engineering

ENEL2EC H2 (20L-5T-6P-0S-32H-11R-0F-0G-6A-13W-8C)

Prerequisite: 40% in ENEL2EA
Aim: 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.
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests

Electrical Design 2

ENEL2ED H2 (15L-10T-15P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: 40% in ENEL2EA
Corequisite: ENEL2EB
Aim: To introduce the learner to 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%), and one 3-hr exam (70%).
DP Requirement: Performed all assignments and achieve an average mark of at least 30% in the tests.

Electrical & Electronic Engineering

ENEL2EE H1 (39L-10T-12P-0S-68H-24R-0F-0G-7A-13W-16C)

Prerequisite: 40% PHYS152 or 40% PHYS162
Aim: To introduce electrical and electronic engineering. Principles of circuit theory, its application to model and analyse the performance of simple circuits under various steady state and transient operating conditions. The circuit models and analysis of transformers, and alternating current induction motors. An introduction to electronic systems, analogue and digital circuitry and instrumentation.
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.
Practicals: Four 3-hr laboratory practicals
Assessment: Coursework and Tests (25%), Exam (75%)
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electrical Engineering

ENEL2EL H1 (39L-10T-12P-0S-68H-24R-0F-0G-7A-13W-16C)

Prerequisite: 40% in PHYS152
Aim: Introductory course in Electrical Engineering
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.
Practicals: Four 3-hr laboratory practicals.
Assessment: Laboratory work, tests and one 3 hour examination.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Environmental Engineering

ENEL2EN H2 (20L-5T-0P-0S-40H-10R-0F-0G-5A-13W-8C)

Aim: Students will have cultivated an appreciation for the environment, will know environmental legislation; implement appropriate environmental management strategies and environmental impact assessment. Awareness 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.

Practicals: None.

Assessment: Tests (25%), and one 3 hour examination (75%).

DP Requirement: Performed all assignments and achieve an average mark of at least 30% in the tests.

Field Theory

ENEL2FT H2 (20L-5T-6P-0S-30H-14R-0F-0G-5A-13W-8C)

Prerequisite: 40% PHYS152 and MATH238

Corequisite: MATH248

Aim: Solve static E and V field problems relating to capacitance, resistance and charge. Analyse, solve simple H and B field problems relating to inductance and current. Understand force and charge causing E and B 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.

Practicals: Two 3-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Nuclear & Semiconductor Physics

ENEL2NP H2 (20L-5T-18P-0S-20H-12R-0F-0G-5A-13W-8C)

Prerequisite: PHYS151, PHYS152

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, radioactivity, 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: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Physical Electronics 1

ENEL2PA H1 (20L-5T-6P-0S-34H-10R-0F-0G-5A-13W-8C)

Prerequisite: CHEM181, 40% in CHEM191

Aim: To asses 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.

Content: The crystal structure of solids. Introduction to quantum mechanics and the quantum theory of solids. The semiconductor in equilibrium. Carrier transport phenomena. Carrier generation and recombination. The pn junction. The bipolar transistor:

Practicals: Two formal three hour practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Physical Electronics 2

ENEL2PB H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: 40% in ENEL2PA

Aim: Understand the working of semiconductor components, apply equivalent circuit models and asses frequency limitations. Characterise the operation and limitations of semiconductor devices.

Content: The bipolar transistor, equivalent circuit models, frequency limitaions. the schottky barrier diode and ohmic contacts. Junction field effecttransistors. MOSFET devices. Optical devices. The silcon controlled rectifier

Practicals: Two 3-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Software Engineering 1

ENEL2SE H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: 40% in ENEL2CA

Aim: To teach learners how to write properly structured computer software to a professional standard.

Content: Content: The activities that make up a typical software development lifecycle including requirements elicitation and analysis, system design and object design. Software development lifecycle modeling. Design and development methodologies. The use of UML in software development activities.

Assessment: Coursework and Tests (25%) Examination (75%)

DP Requirement: Submit 75 % of all hand-in assignments and achieve an average mark of at least 30 % in the tests.

Workshop Course

ENEL2WS H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Aim: Expose students to safety requirements and basic equipment they will use in design workshops and in preparation for their vacation work. To be for one week on a full-time basis.

Content: Electronic: Safety and Soldering techniques. Use of basic equipment in electrical workshops: power supply, function generator, oscilloscope, digital multi-meters, soldering iron, and a pedestal drill press. Mechanical: Safety, cutting, bending and drilling. Use of the pedestal drill press, guillotine, bending brake and the lathe Electrical: Safety, earth leakage, wiring up a basic circuit, test for continuity.

Practicals: All instruction takes place in laboratories & workshops.

Assessment: A duly performed certificate of competence.

DP Requirement: Attendance of Course

Analogue Electronics 2

ENEL3AE H2 (20L-5T-6P-0S-20H-20R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2EB, 40% in 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.

Content: Analogue electronics : Small-signal amplifiers. Frequency response analysis and multistage AC and DC coupled amplifiers. Feedback analysis: Generalised approach to feedback in two-port networks and its effect on gain, bandwidth, impedance level, distortion and stability. Oscillators and some applications of feedback in selected circuits.

Practicals: Two 3-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Computer Engineering Design 1

ENEL3CA H1 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

Prerequisite: ENEL2EA, 40% in ENEL2EB

Corequisite: ENEL3TA

Aim: To give students the opportunity to participate in the design of simple computer hardware and software.

Content: Design studies and seminars will be conducted on selected topics of interest to computer engineering students.
Assessment: Weekly presentations or reports per group. 20 % Continuous assessment and 80% Exam
DP Requirement: Performed all assignments and achieve an average mark of at least 30% in the tests. Sub-minimum: Pass the oral presentation component.
No supplementary exam.

Computer Engineering Design 2

ENEL3CB H2 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)
Prerequisite: ENEL2WS, 40% in ENEL3DA, ENEL3TA, ENEL3DS
Corequisite: ENEL3TB
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 Computer Engineering Design 1 module.
Content: Design studies and seminars will be conducted on selected topics of interest to computer engineering students.
Assessment: Report marks: 25% Presentation marks: 25% Examination marks 50%
DP Requirement: Pass the oral presentation component.

Communications

ENEL3CO H2 (39L-10T-12P-0S-84H-9R-0F-0G-6A-13W-16C)
Prerequisite: 40% in each of MATH354, STAT370, ENEL3SS
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.
Practicals: Four 3-hr laboratory practicals.
Assessment: Coursework and Tests (25%), Exam (75%)
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Control Systems 1

ENEL3CS H2 (20L-5T-6P-0S-31H-12R-0F-0G-6A-13W-8C)
Prerequisite: 40% in 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.
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electronic Design 1

ENEL3DA H1 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)
Prerequisite: ENEL2EA, 40% in ENEL2EB
Corequisite: ENEL3TA
Aim: Translate user requirements into specifications. Propose solutions to solve user requirements. Critically assess the workings of analogue and digital circuits. Build prototypes and then measure. Account for the broader implications of electronic design. Understand the environmental stresses. Work as part of a design team. Report verbally and in written form to a panel of peers and be able to defend their work against critical analysis.
Content: Design studies and seminars will be conducted on selected topics of interest.
Practicals: Build, test and characterise analogue and digital circuits.

Assessment: Weekly presentations or reports per group. 20 % Continuous assessment and 80% Exam. Sub-minimum: Pass the oral presentation component.
DP Requirement: Performed all assignments and achieve an average mark of at least 30% in the tests.
No supplementary examination.

Electronic Design 2

ENEL3DB H2 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)
Prerequisite: ENEL2WS & 40% in ENEL3DA, ENEL3TA, ENEL3DS
Corequisite: ENEL3TB, ENEL3CO
Aim: Translate user requirements into specifications and solutions for an electronic product. Undertake the design process. Demonstrate technical competence. Document the design. Build prototypes and measure performance. Account for the broader implications. Understand the environmental stresses and accommodate for these. Work as a design team. Report on work verbally and in written form.
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: 50% class mark (reports, presentations and lab work) & 50% exam (written report & oral presentation). Sub-minimum: pass the oral presentation component.
DP Requirement: Performed all assignments. A 50% average mark on practicals sub-minimum.
No supplementary examination.

Digital Electronics

ENEL3DE H2 (20L-5T-6P-0S-20H-20R-0F-0G-5A-13W-8C)
Prerequisite: 40% in ENEL3TA
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.
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Digital Systems

ENEL3DS H1 (40L-11T-12P-0S-60H-32R-0F-0G-5A-13W-16C)
Prerequisite: 40% in ENEL2EB, ENEL2CB
Aim: Design microprocessor based systems including peripheral hardware. Analyse a specific requirement and generate appropriate microcontoller 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, DSPs and other topics.
Practicals: Two laboratory sessions.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electrical Design 3

ENEL3EA H1 (10L-22T-5P-0S-35H-5R-0F-0G-3A-13W-8C)
Prerequisite: ENEL2EA, ENEL3CO, 40% in ENEL2EB
Corequisite: ENEL3MA, ENEL3TA
Aim: Model and analyse electromagnetic actuators using the Finite Element Method. Design and test a simple microprocessor system.

Content: Principles of finite element analysis of magnetostatic fields, modeling 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. Introduction to Intel 80c196 microprocessors for Real-Time Digital Embedded System Control.
Practicals: Design & testing of actuators and real-time digital embedded systems.
Assessment: Class mark 50%, Examination mark 50%. Sub-minimum: Pass the oral presentation component. Student must demonstrate competence to use appropriate engineering methods, skills and tools, to meet ECSA exit-level outcome 5.
DP Requirement: Performed all assignments. A 50% average mark on practicals sub-minimum.

Electrical Design 4

ENEL3EB H2 (10L-5T-5P-0S-52H-5R-0F-0G-3A-13W-8C)
Prerequisite: ENEL2WS & 40% in ENEL3EA, ENEL3TA, ENEL3DS
Corequisite: ENEL3TB, ENEL3PE
Aim: To understand electrical engineering applications of embedded mircrocontroller systems. To understand how to design and optimise selected machines and electromagnetic actuators.
Content: Simulation, design and real time control of an electrical drive using an embedded microcontroller system. Selection of materials and design of electrical machines and actuators using finite element techniques.
Practicals: Design & testing of power electronics circuits, machines & actuators.
Assessment: Project reports, design tutorials, mini design project, test. Sub-minimum: pass the oral presentation component.
DP Requirement: Performed all assignments.
No supplementary examination.

E-M Theory

ENEL3EM H2 (20L-5T-6P-0S-34H-10R-0F-0G-5A-13W-8C)
Prerequisite: 40% in ENEL2FT & MATH248
Aim: Analyse EM fields, transmission lines and matching problems. Understand EMI/EMC.
Content: PDE's in electromagnetism. Maxwell's equations, time periodic fields. Boundary conditions. Plane wave propagation. Poynting's theorem. Reflection of plane waves, surface resistivity, obliquely incident waves, reflection and refraction, transmission and reflection coefficients, total internal reflection and surface waves. Transmission lines, line equation and reflections. Input impedance, characteristic impedance. Smith chart, applications to matching. Transmission line time domain response. EMC/EMI basic definitions. Solving EMI problems. Testing for EMC.
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electrical Machines 1

ENEL3MA H1 (20L-5T-6P-0S-28H-16R-0F-0G-5A-13W-8C)
Prerequisite: 40% ENEL2EL or 40% 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.
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%. Students must demonstrate competence in the following ECSA-required, exit-level outcome as a sub-minimum requirement for a pass in the course: multidisciplinary work (Component of ECSA exit-level outcome 8).
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Electrical Machines 2

ENEL3MB H2 (20L-5T-6P-0S-28H-16R-0F-0G-5A-13W-8C)

Prerequisite: 40% in 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.

Practicals: Two 3-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Power Electronics 1

ENEL3PE H2 (20L-6T-6P-0S-31H-12R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2EA & 40% in ENEL2EB

Aim: Understand power electronics. Convert AC-to-DC. Design elementary alternating current industrial controllers. Understand DC-to-DC conversion. Design elementary DC-to-DC circuits. Predict the performance of basic power electronic industrial systems.

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.

Practicals: Two 3-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Power Systems 1

ENEL3PS H2 (40L-30T-10P-0S-40H-35R-0F-0G-5A-13W-16C)

Prerequisite: ENEL3MA

Corequisite: ENEL3MB, ENEL3EM

Aim: Introduction to the field of power systems, power system control, operation and economics. Generation, transmission and distribution of electrical power. Power flow in power system networks. Transmission line design. Tariffs. Power systems subject to symmetric faults.

Content: Elementary economics of power generation including pumped storage, power and frequency control. Power distribution and metering, tariffs, power factor correction and load control. Electrical and mechanical design of overhead transmission for power transfer. Electrical and thermal performance of underground cables. Symmetrical 3-phase short circuits and line drop.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests..

Software Engineering 2

ENEL3SF H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: 40% ENEL2CA

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 (25%) Examination (75%)

DP Requirement: Submit 75 % of all hand-in assignments and achieve an average mark of at least 30 % in the tests.

Systems & Simulation

ENEL3SS H1 (20L-5T-6P-0S-33H-12R-0F-0G-4A-13W-8C)

Prerequisite: MATH238 & 40% in MATH248, ENEL2EB 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
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests.

Analogue Electronics 1

ENEL3TA H1 (20L-5T-6P-0S-24H-20R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2EA, 40% in ENEL2EB
Aim: To introduce students to 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 MOSFETs. MOSFET biasing. MOSFET single-stage amplifier configurations. CMOS digital logic inverter and analogue switch.
Practicals: Two 3-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practical and achieved an average mark of at least 30% in the tests.

Design & Analysis of Algorithms

ENEL4AA H1 (14L-6T-12P-0S-29H-15R-0F-0G-4A-13W-8C)

Prerequisite: ENEL2DS and ENEL2CM
Aim: To presents 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: Laboratory Coursework and Tests 25%, Examination 75%.
DP Requirement: Perform all practicals and an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Acoustics

ENEL4AC H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3TA
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.
Practicals: Two 6-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Artificial Intelligence

ENEL4AI H2 (14L-6T-12P-0S-32H-12R-0F-0G-4A-9W-8C)
Prerequisite: 40% COMP312
Aim: Synthesize and present structured and documented solutions incorporating stuctured 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.
Content: This module follows the 1st semester module in Artificial Intelligence and afford candidates the opportunity of self-study in one or more topics in the field of Artificial Intelligence. Suitable topics are chosen by each candidate in consultation with the lecturer concerned at the start of the module.
Practicals: Two 6-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Automation

ENEL4AM H2 (14L-6T-12P-0S-26H-12R-4F-0G-6A-9W-8C)
Prerequisite: 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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Computer Engineering Design 3

ENEL4CA H1 (0L-10T-44P-7S-85H-11R-0F-0G-3A-13W-16C)
Aim: An understanding of the engineering design process from the initial proof-of-concept. To provide a high stress situation in which group participation and co-operation is an essential in order to foster group working. 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. Entrepreneurial abilities are emphasised in order to prepare for a probable life of self-employment.
Content: Design studies and seminars of interest to computer engineering students.
Assessment: Continuous assessment 25% and Exam 75%. Students must demonstrate competence in the following ECSA required exit-level outcomes as a sub-minimum required to pass the course: Problem Solving ability (ECSA Exit Level Outcome 1), Impact of Engineering Activity (ECSA Exit Level Outcome 7) and Individual, Team and Multidisciplinary working (ECSA Exit Level Outcome 8)
DP Requirement: Perform all assignments.

Computer Engineering Design Project

ENEL4CB H2 (0L-0T-126P-0S-194H-0R-0F-0G-0A-13W-32C)

Aim: The engineering design process from the initial proof-of-concept and determination of need, through the market analysis, product specification, prototype production and final prototype test and characterisation phases. To provide a high stress situation in which the student has to meet targets within a fixed period of time. To provide a situation where a presentation before experienced engineers will assess the standard of the project. To provide a situation where a presentation before experienced engineers will assess the standard of the project. To provide a course where entrepreneurial abilities are emphasised in order to prepare for a probable life of self-employment.

Content: Design project.

Assessment: Continuous assessment 25% and Examination 75%. Students must demonstrate competence in the following ECSA required exit-level outcomes as a sub-minimum required to pass the course: Engineering problem solving (ECSA exit-level outcome 1) Engineering Design (ECSA exit-level outcome 3) Professional and technical written communication (ECSA exit-level outcome 6) Professional and technical oral communication (ECSA exit-level outcome 6)

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 course.

No supplementary examination.

Distributed Computing Systems

ENEL4CC H2 (20L-6T-12P-0S-26H-10R-0F-0G-6A-13W-8C)

Prerequisite: 40% 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. GUIs, event handling, exceptions, manipulating images, and animations. Client-server systems, including networking with sockets and streams. Concurrency, including Multithreading. Parallel computing, including domain and functional partitioning, message passing and performance measurements. Collaborative systems, i. e., mobile agents, including security and reliability models.

Practicals: Project 1: Racetrack Project, six to seven weeks - multiple assignments to create an interactive racetrack program. Project 2: Matrix Multipl, four to five weeks and explores parallel computing

Assessment: Test 10% Projects 20% Final exam 70%

DP Requirement: Class mark of 40%. A 50% average mark on practicals sub-minimum.

E-Commerce Systems

ENEL4CM H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3CO, 40% in ENEL4DC

Aim: To teach learners 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 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Computer Architecture and Organisation

ENEL4CO H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Aim: To teach learners about the hardware used in computer systems.

Content: Computer architecture; processor hardware; memory systems; microprocessor systems; interfacing; data acquisition systems.

Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Control Systems 2

ENEL4CS H1 (20L-2T-12P-0S-30H-12R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3SS & 40% in 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.
Practicals: Two 6-hr laboratory practicals.
Assessment: Coursework and Tests (25%) and Exam (75%).
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Electronic Design 3

ENEL4DA H1 (0L-20T-46P-11S-70H-16R-0F-0G-0A-13W-16C)

Prerequisite: ENEL3DA, ENEL3DS, ENEL3TA, ENEL3SS & 40% in ENEL3EM, ENEL3DB, ENEL3TB, ENEL3PE, ENEL3CS
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: Three written and oral reports. Students must demonstrate competence in the following ECSA required exit-level outcomes as a sub-minimum required to pass the course: Problem Solving ability (ECSA Exit Level Outcome 1), Impact of Engineering Activity (ECSA Exit Level Outcome 7) and Individual, Team and Multidisciplinary working (ECSA Exit Level Outcome 8)
DP Requirement: Performed all assignments.
No supplementary examination.

Digital Communications

ENEL4DC H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: 40% in ENEL3C0
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 apace 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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Digital Control

ENEL4DO H2 (26L-12T-13P-0S-10H-15R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3SS & ENEL3CS

Content: Digital controller design and implementation; Digital state estimator design and implementation. Digital re-design and implementation of controllers designed using continuous time approaches. Digital signal effects in feedback loops and implementation issues: Quantisation and finite word-length effects, inter-sample behaviour, aliasing and reverse aliasing, pulse-width modulation. Discrete-time state space methods: Observers and state feedback controllers

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Class mark of 30%. A 50% average mark on practicals sub-minimum.

Digital Processes 1

ENEL4DP H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3DS & 40% in ENEL3DE

Aim: The student will be able to write VHDL descriptions for circuits to be implemented on FPGAs. 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.

Practicals: Two 6-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Digital Signal Processing

ENEL4DS H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3SS, ENEL3CO

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.

Practicals: Two 6-hr laboratory practicals.

Assessment: : Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Data Communications

ENEL4DT H1 (14L-6T-12P-0S-35H-9R-0F-0G-4A-9W-8C)

Aim: Classify communication networks. Analyse the performance of large-scale communcation 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.

Practicals: Laboratory work.

Assessment: Coursework and Tests 25%, Examination 75%..

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Electrical Design 5

ENEL4EA H1 (0L-0T-100P-0S-140H-0R-0F-0G-0A-13W-24C)

Prerequisite: ENEL3EA, ENEL3DS, ENEL3TA, ENEL3MA, ENEL3SS, ENEL3EB & 40% in ENEL3EM, ENEL3TB, ENEL3CS, ENEL3PS, ENEL3PE

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. Students must demonstrate competence in each of the following ECSA-required, exit-level outcomes as minimum requirements for a pass in the course: Problem Solving ECSA exit-level outcome1): Individual and Team Work (ECSA exit-level outcome 8).

DP Requirement: Performed all assignments

No supplementary examination.

Engineering Business

ENEL4EB H1H2 (20L-0T-0P-0S-40H-16R-0F-0G-4A-13W-8C)

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.

Content: An introduction to the concept of corporate business. Business in perspective. Measuring business performance. The market place. The marketing mix. Industrial relations. The future role of manpower in business. Goals and strategy revisited. Impact of Engineers in business. Codes of ethics, professionalism and professional development.

Practicals: None.

Assessment: Tests (25%) ; Examination (75%)

DP Requirement: Achieve an average of 30% in tests.

Sub-minimum: Professional Ethics Component.

Analogue Electronics 3

ENEL4EC H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3TA, ENEL3DA, ENEL3DB, ENEL3DS& 40% in ENEL3TB

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: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Electronic Design Project

ENEL4ED H2 (0L-0T-126P-0S-194H-0R-0F-0G-0A-13W-32C)

Prerequisite: 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%, Examination 75%. Students must demonstrate competence in the following ECSA required exit-level outcomes as a sub-minimum required to pass the course: Engineering problem solving (ECSA exit-level outcome 1) Engineering Design (ECSA exit-level outcome 3) Professional and technical written communication (ECSA exit-level outcome 6) Professional and technical oral communication (ECSA exit-level outcome 6)
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 course.
No supplementary examination.

Engineering Entrepreneurship

ENEL4EE H1H2 (20L-0T-0P-0S-40H-16R-0F-0G-4A-9W-8C)

Aim: To identify entrepreneurial characteristics and ability. To be aware of the various types of enterprises. To understand the need to set goals and 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.
Content: Overview of the business world and the niche of the entrepreneur. Selecting and funding a business. Vision mission and the business plan. Selling and marketing. Managing the people. Operational considerations and management. Financial management. Legal requirements affecting engineers. The role and impact of engineers in entrepreneurship.
Practicals: None.
Assessment: Examination 100%
DP Requirement: DP Requirement: Performed all assignments, attend all lectures and achieve an average class mark of at least 30%.

Electrical Design Project

ENEL4EP H2 (0L-0T-104P-29S-172H-0R-15F-0G-0A-13W-32C)

Prerequisite: 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% , Examination 75%. Students must demonstrate competence in each of the following ECSA-required exit-level outcomes as sub-minimum requirements for a pass in the course: Engineering problem solving (ECSA exit-level outcome 1); Engineering design (ECSA exit-level outcome 3); Professional and technical *written* communication (ECSA exit-level outcome 6); Professional and technical *oral* communication (ECSA exit-level outcome 6).
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 course.
No supplementary examination.

Embedded Systems

ENEL4ES H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: 40% ENEL3DS

Aim: To teach learners 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.

Practicals: Practical work to exercise knowledge.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

High Voltage Engineering 1

ENEL4HA H1 (20L-2T-18P-0S-25H-10R-0F-0G-5A-13W-8C)

Prerequisite: ENEL3SS, STAT370 & 40% in MATH354, ENEL3EM & 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: One 8 hour laboratory session plus report.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

High Voltage Engineering 2

ENEL4HB H2 (14L-6T-8P-0S-32H-15R-0F-0G-5A-9W-8C)

Prerequisite: 40% in 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: Coursework (50%), Examination (50%).

DP Requirement: Performed all laboratory practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Internet Engineering

ENEL4IE H2 (14L-8T-12P-0S-30H-10R-0F-0G-6A-13W-8C)

Prerequisite: ENEL3TA & ENEL3DS

Aim: To teach learners 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: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Illumination

ENEL4IL H2 (14L-6T-12P-0S-28H-12R-3F-0G-5A-9W-8C)

Aim: Understand the theory and application of illumination.

Content: Theory: Nature of light, radiation and visible spectrum. Absorption, transmission, reflection and refraction. Structure of the eye, defects of vision and visibility curves. Photometric concepts, definitions, laws and units. Intensity Diagrams and Calculations: Intensity distribution, polar curves, iso-candela diagrams and light flux calculations. Point line and surface sources and illumination diagrams. Light Sources: Incandescent, fluorescent, mercury, metal-halide and high-pressure sodium lamps. Lighting Design: Task analysis, design strategy, SABS standards, interior & exterior lighting and floodlighting.

Practicals: Two 6-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Instrumentation

ENEL4IN H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3TA, 40% in 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.

Content: Standards & units: Revision of basic ideas of traceability, accuracy, repeatability and bandwidth. Electronics for instrumentation: Amplification of small signals from strain gauges and thermocouples. Electromagnetic interference, shielding and grounding, EMC standards. Integrated circuit and micro machined sensors and actuators: Electronic nose, accelerometers. Process instrumentation: Substation instrumentation. Chemical Process instrumentation. Protocols and sensor/actuator integration. Soft sensing. Neural network and rule based interpretation of sensor data, sensor fusion

Practicals: Laboratory work.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all practical and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Image Processing

ENEL4IP H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Aim: To teach how digital images are acquired and processed to achieve objectives including image enhancement and data reduction.

Content: Human visual and imaging systems. 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, enhancement, restoration morphology, segmentation, feature extraction, image analysis, compression and quality assessment metrics. Image reproduction: hardware, digital printing process. Colour processing: colour science, appearance models, reproduction and characterisation. Dynamic image processing.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Electrical Machines 3

ENEL4MA H1 (20L-2T-12P-0S-31H-10R-0F-0G-5A-13W-8C)

Prerequisite: ENEL3MA 40% in 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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Electrical Machines 4

ENEL4MB H2 (18L-6T-12P-0S-24H-15R-0F-0G-5A-9W-8C)

Prerequisite: 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: One laboratory session.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all assignments

Microwave Systems

ENEL4MS H2 (14L-6T-12P-0S-36H-8R-0F-0G-4A-9W-8C)

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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all practicals and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

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.
Content: Operations Research phases of an O.R. project; methodology. Linear programming applications; problem formulation; graphical solutions; simplex method. Inventory control: basic EOQ model; quantity discounts; dynamic inventory systems and simulation. Network analysis: planning phase; arrow diagrams; analysis phase. P.E.R.T. and C.P.M.; resource scheduling. Precedence diagrams. Simulation: Use of random numbers; Monte Carlo Method. Forecasting: N-Period moving average; exponential smoothing. Queuing theory: Queue disciplines; arrivals and service patterns; single and multi server. Quality and Reliability Engineering. Statistical quality control: process capability; process control; acceptance sampling. Life characteristics: Weibull analysis; systems reliability; maintainability. Economic life tests; design analysis: reliability testing and prediction.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Perform all practicals and an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Operations Systems for Engineers

ENEL4OS H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: COMP312

Aim: The learner 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: Concurrent programming, synchronisation, deadlock, scheduling, memory management, security, UNIX.

Assessment: Test mark: Coursework and Tests 25%, Examination 75%.

DP Requirement: Students must obtain a minimum of 40% for the class mark. A 50% average mark on practicals sub-minimum.

Power Electronics 2

ENEL4PA H1 (20L-2T-12P-0S-29H-12R-0F-0G-5A-13W-8C)

Prerequisite: 40% 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.

Content: AC-to-DC conversion. DC-to-AC conversion. DC and AC variable speed drives and industrial applications. Soft starters. Synchronous Motor Drives Systems. Mains Harmonics. Direct Torque Control of Induction Motors. Field Orientation Control (FOC) of Induction Motors.

Practicals: Two 6-hr laboratory practicals.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Power Electronics 3

ENEL4PB H2 (14L-6T-12P-0S-32H-12R-0F-0G-4A-9W-8C)

Prerequisite: 40% in ENEL4PA

Aim: This is a self study module. The candidate will be able to: Understand basic Power Electronics Systems in practical applications. Design elementary conversion configurations. Design DC-to-DC conversion equipment. Design AC-to-DC conversion equipment. Design and predict the performance of basic Power Electronic industrial Systems.

Content: This module follows on the first semester Power Electronics module and affords each candidate the opportunity of self-study in one or more topics in the field of Power Electronics. Each candidate in consultation with the lecturer chooses a suitable topic.

Practicals: Two 6-hr laboratory practicals.

Assessment: Coursework and Tests 50%, Examination 50%. Student must demonstrate independent learning ability to meet ECSA exit-level outcome 9.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Power Plant & Alternative Energy

ENEL4PP H2 (14L-6T-12P-0S-26H-14R-4F-0G-4A-9W-8C)

Aim: To introduce to the students the principles involved in energy conversion in power plants and the various forms of power plants depending on the energy sources.

Content: Introduction: classification of energy sources, conversions into electrical energy.steam power plants: Laws of thermodynamics, carnot cycle, components of steam power plants. Gas power plants: Internal combustion engines and diesel power plants: Hydro power plants: water resources, types and components of hydro power stations, principles of planning and set up of hydro power stations. Nuclear power plants: Types and principles of operation, Pebble bed plants. MHD plants: Principle of operation.

Assessment: Coursework and Tests 25%, Examination 75%.

DP Requirement: Perform all practicals and an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

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%, Examination 50%. Students must demonstrate independent learning ability to meet ECSA exit-level outcome 9.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Selected Topics in Electrical Engineering 1

ENEL4SA H1 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

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 course covers topics selected from new and current disciplines in the field of electrical engineering. The seminars are directed towards increasing the students working knowledge of the latest technologies and analytical techniques in electrical engineering.

Practicals: Two 6-hr laboratory practicals.

Assessment: Coursework and Tests 50%, Examination 50%. Student must demonstrate independent learning ability to meet ECSA exit-level outcome 9.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Selected Topics in Electrical Engineering 2

ENEL4SB H2 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

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 course 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: Two 6-hr laboratory practicals.

Assessment: Coursework and Tests 50%, Examination 50%. Student must demonstrate independent learning ability to meet ECSA exit-level outcome 9.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Superconductivity

ENEL4SC H2 (14L-6T-12P-0S-37H-7R-0F-0G-4A-9W-8C)

Prerequisite: 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 course would also give an overview of the current development in the field and create awareness of the nonlinear behaviour of superconducting devices.

Content: Introduction to Characteristic Properties: normal metal vs superconductor, Meissner effect, type-I type-II superconductors, critical currents, flux quantization. Phenomenological Theory: London model, Thermodynamics and Superconducting State, Ginzburg Landau Theory, Surface and Interface Effects. Josephson Effects: Tunnel effects, DC Josephson effects. Effect of a magnetic field, AC Josephson effect, Josephson coupling, RCSJ Model and Weak link effect. Electrical and Electronic Applications: Superconducting type-II cables/tapes, DC SQUIDS, analogue flux-locked loops and superconducting electronics.

Practicals: Two 6-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all practical and achieved an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Security and Encryption

ENEL4SE H1 (20L-0T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Aim: To teach learners 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.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Class mark of 30%. A 50% average mark on practicals sub-minimum.

Switchgear & Protection

ENEL4SP H2 (14L-6T-12P-0S-29H-15R-0F-0G-4A-9W-8C)

Aim: To introduce the principles of design, operation and protection of fuses, circuit breakers and protective relays.
Content: Review of symmetrical faults on synchronous machines. Problem of switching, arcing and arc-interruption principles, recovery and re-striking voltages. Current and potential transformers review. Categories of switchgear: Types and characteristics of circuit breakers (oil, air-blast, vacuum, sulphur hexafluoride), Fuses : tests and specification/design to be undertaken Classification, construction and characteristics of protective relays: overvoltage, undervoltage, overcurrent, translay, directional, differential, distance/impedance relays both electromagnetic and solid state. Protection system: unit and non-unit protection. Protection of: distance, bus-bar, parallel and multi-ended feeders, generator, transformer, a.c .motor.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Perform all practicals and an average mark of at least 30% in the tests A 50% average mark on practicals sub-minimum

Power System Stability

ENEL4SS H2 (14L-6T-12P-0S-25H-15R-2F-0G-6A-9W-8C)

Prerequisite: ENEL3CS & 40% in ENEL4MA, ENEL4WA
Aim: Introduction to the Interconnected power systems and the factors that influence their operation. Typical stability problems in modern systems, causes and approaches. 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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Selected Topics in Computer Engineering 2

ENEL4ST H2 (14L-6T-12P-0S-32H-10R-0F-0G-6A-0W-8C)

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 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%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Communication Systems

ENEL4SY H2 (14L-6T-12P-0S-26H-14R-4F-0G-4A-9W-8C)

Aim: In this course the students will be able to see where the principles of communications are applied. The course will also serve 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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Laboratory work, Test and Practicals (25%), one 3 hour examination (75%). A 50% average mark on practicals sub-minimum.

Selected Topics in Electronic Engineering 1

ENEL4TA H1 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

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: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Selected Topics in Electronic Engineering 2

ENEL4TB H2 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

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: Coursework and Tests 50%, Examination 50%. Student must demonstrate independent learning ability to meet ECSA exit-level outcome 9.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

Selected Topics in Computer Engineering 1

ENEL4TC H1 (14L-6T-12P-0S-32H-10R-0F-0G-6A-9W-8C)

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 course 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%, Examination 75%.

DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. A 50% average mark on practicals sub-minimum.

VLSI Design

ENEL4VL H2 (14L-6T-12P-0S-32H-10R-0F-0G-6A-13W-8C)

Prerequisite: ENEL3TA Analogue Electronics 1 and ENEL3DS Digital Systems

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 behavioral-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 25%, Examination 75%..

DP Requirement: Class mark of 30%. A 50% average mark on practicals sub-minimum.

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.

Power Systems 2

ENEL4WA H1 (20L-2T-12P-0S-20H-20R-0F-0G-6A-13W-8C)

Prerequisite: 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.

Content: Steady state and transient stability of one and two machine systems. Asymmetrical faults and symmetrical component analysis. Electrical protection using relays and fuses. Surge and overvoltage protection. Load flow in simple networks. Analysis of large networks using Z and Y-bus matrices.

Practicals: Two 6-hr laboratory practicals.
Assessment: Coursework and Tests 25%, Examination 75%.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. 50% average mark in practicals sub-minimum.

Power Systems 3

ENEL4WB H2 (14L-6T-12P-0S-33H-10R-0F-0G-5A-9W-8C)

Prerequisite: 40% in 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: Coursework and Tests 50%, Examination 50%. Student must demonstrate independent learning ability to meet ECSA exit-level 9.
DP Requirement: Performed all laboratory practicals and achieve an average mark of at least 30% in the tests. 50% average mark in practicals sub-minimum.

Research Methodology

ENEL801 WC (20L-0T-0P-0S-137H-0R-0F-0G-3A-13W-16C)

Aim: The aim of this module is to introduce the learner to advanced engineering research skills. This will entail a thorough understanding of research proposals, literature scanning and feasibility studies, conceptualisation of research, research tools, data collection and analysis, modelling and simulation, design and construction, measurements and error analysis, principles of research report writing and dissemination.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Project Engineering & Utility management

ENEL802 WC (20L-0T-0P-0S-137H-0R-0F-0G-3A-13W-16C)

Aim: After completion of this module, the learner will have a thorough knowledge and understanding of project definition, project planning – planning techniques, risk assessment and analysis, project management and commissioning. Time, cost, performance and innovation will be discussed in detail as well as the trading off between these variables. Case studies from the electric utility industry will also form part of the coursework. This module also gives the learner an excellent overview of the Generation, Transmission and Distribution business issues. It looks into contemporary strategic trends in de-regulation, utility structures globally, demand side and supply side management, distributed generation, power trading and electricity markets. Where applicable, practical case studies will be discussed.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Advanced Software Engineering

ENEL803 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Modelling and Software Life Cycle. Software Project Management Development of Object Oriented software project using UML: Modelling with UML, UML-based software development process. In-depth view of using UML in the design of object oriented projects. Testing: Testing concept, Testing design techniques. Maintaining the system.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%

Intelligent Systems Engineering

ENEL804 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Expert Systems: characteristics, knowledge representation, inference techniques, rule-based expert systems, knowledge acquisition, applications. Fuzzy Logic: fuzzy set theory, fuzzy inference, fuzzy logic expert system, fuzzy control. Neural Networks: artificial neurons and neural networks, learning processes, Perceptron and multilayer perceptron, self-organising Kohonen networks, Hopfield neural networks, practical implementation and applications. Genetic Algorithms: adaptation and evolution, simple genetic algorithms.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%

School of Mechanical Engineering

Offered in the School of Mechanical Engineering

Engineering Drawing

ENME1DR H1 P1 (9L-30T-0P-0S-20H-12R-0F-0G-9A-13W-8C)

Aim: To provide students with 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.
Content: Geometrical constructions. Isometric projection (pictorial representation). 1st and 3rd Angle Orthographic Projection, including hidden detail, dimensioning, theory of sectional & auxilliary views, and conventional representations. Interpenetrations and developments. CAD (Computer Aided Drawing).
Practicals: The use of pencil/paper and CAD (Computer Aided Drawing) to produce: 1st & 3rd angle orthographic projection. Isometric (pictorial representation) projection. Interpenetrations and developments.
Assessment: Seven tuts :19%; three tests 31% (using pencil/paper - 6% and one CAD – 25%); one 3-hr exam 50%.
DP Requirement: 1. 50% for the CAD component of the course 2. 50% for the overall class mark component

Mechanical Engineering Design

ENME1ED H2 (20L-35T-3P-0S-1H-1R-12F-0G-8A-13W-8C)

Aim: To be able to configure an appropriate design process and select appropriate materials and manufacturing processes.
Content: The design process, characteristics and properties of materials, specific materials and alloys. Introduction to Strengths of Materials. Primary and Secondary Manufacturing processes. Advanced CAD (Computer Aided Drawing). Limits and Fits. The theory, design and construction of a micro steam car.
Practicals: Calculation of design configurations, selection of materials or manufacturing process. Construction of a working micro steam car. Industrial visits.
Assessment: 10 tuts – 5%, 1 prac – 5%; 3 tests – 15%, one 2 hr exam – 75%.
DP Requirement: 1. A minimum of 50% of the class mark component. 2. A working model of a steam car. 3. Four industrial visits.

Introduction to Engineering Materials

ENME1EM H2 (20L-13T-0P-0S-22H-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; 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.
Content: Introduction to Materials, Structure of Materials, Crystal Imperfections, Mechanical Behaviour of Materials, Alloys and Properties of Alloys, Equilibrium Phase Diagrams.

Practicals: None.
Assessment: 2 tests, 1 assignments/tutorials, 1 two hour exam Test: 25% Final Exam: 75%
DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests. Attendance at 60% of the lectures is also required.

Computer Fundamentals

ENME2CF H1 (20L-27T-0P-0S-18H-12R-0F-0G-3A-13W-8C)

Prerequisite: ENSV1EN
Aim: To provide students with an understanding of computer architecture and hardware, and 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. 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.
Practicals: None.
Assessment: 4 tuts, one test, one 3 hr exam Tuts: 20% Test : 10% Final exam: 70%
DP Requirement: Perform all tuts and achieve an average mark of at least 40% in the tests.

Design Methods

ENME2DM H2 (29L-24T-0P-0S-63H-36R-0F-0G-8A-13W-16C)

Prerequisite: 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.
Content: Structural and machine riveting, knuckle and cotter joints, keys, pins and splines. Threaded forms and standards, static screw stresses, screw efficiency. Tension and compression helical wound springs. Disk clutches, drums, disk and band brakes. Flat and V-belts, toothed belts and roller chains. Spur gear forces and static strength of spur gear teeth. Shaft dimensions, coupling and bearings.
Practicals: None.
Assessment: Tests: 12.5% Assignments: 12.5% Final Exam: 75%
DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests. Assignment(s) must be satisfactorily completed.

Dynamics

ENME2DY H1 (26L-13T-3P-0S-15H-18R-0F-0G-5A-13W-8C)

Prerequisite: MATH142
Aim: To develop in the student the ability to analyze problems in the area of engineering dynamics in a logical and deductive manner.
Content: General Motion of a Rigid Body. Motion in Moving Reference Frame. Planar Motion. Graphical Techniques. Instantaneous Centre of Rotation in Planar Motion. The Equations of Motion of a Rigid Body. Kinetic Energy. Principle of Work and Energy. Potential Energy. Fundamentals of Analytical Dynamics.
Practicals: Problem solving using MATLAB
Assessment: Two tests, assignments/tutorials, one 3-hr exam Class mark: 25% Final Exam 75%.
DP Requirement: Achieve 40% in class tests and 50% take home tutorials accepted.

Fluids Mechanics 1

ENME2FM H1 (20L-10T-3P-0S-25H-18R-0F-0G-4A-13W-8C)

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 floatation. 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: 2 tests; 2 practicals; 2 hour exam. Test: 25% Final exam: 75%
DP Requirement: Students are required to attend all class tests and pass the practicals. Students must attain a combined average of 40% for all tests.

Measurements & Experimental Methods

ENME2MM H2 (9L-0T-16P-0S-32H-20R-0F-0G-3A-13W-8C)

Aim: To provide students with an understanding of the concepts of measurements of engineering parameters, dimensional analysis, error calculations, SI units, accuracy, devices and 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: 8 pracs, 1 test, 2 hour exam. Pracs: 40% Test: 5% Final exam: 55%
DP Requirement: Perform all assignments and achieve an average mark of at least 40% in the pracs and test.

Materials Strength

ENME2MS H1 (20L-10T-0P-0S-28H-18R-0F-0G-4A-13W-8C)

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.
Practicals: None.
Assessment: 2 tests, one 2 hour exam. Test: 25% Final Exam: 75%
DP Requirement: Students are required to attend all tests and obtain a combined average of minimum 40%.

Fundamentals of Physical Metallurgy

ENME2PM H1 (19L-10T-0P-0S-22H-24R-0F-0G-5A-13W-8C)

Prerequisite: 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.
Practicals: None.
Assessment: 2 tests, 1 assignments/tutorials, 1 two hour exam Class-mark 25% Final Exam: 75%.
DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests, as well as submit an acceptable formal report.

Strength of Materials 1

ENME2SM H2 (30L-18T-0P-0S-67H-40R-0F-0G-5A-13W-16C)

Prerequisite: ENME1ED
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 both statically determinate and indeterminate structures, also form part of the syllabus.
Practicals: One assignment
Assessment: One assignment with formal report, three tests, one 3 hour exam. Tests: 15% Assignment: 10% Final exam: 75%
DP Requirement: Students are required to attend all tests and attain a combined average of 40% for these tests, as well as submit a satisfactory assignment. Attendance at 60% of the lectures is also required.

Thermofluids

ENME2TF H1 (20L-10T-0P-0S-28H-18R-0F-0G-4A-13W-8C)

Aim: Foundation principles in thermodynamics and fluid-dynamics, continuity and energy equations and their usage with Bernoulli's equation. To apply the 1st and 2nd laws of thermodynamics to the major heat engine cycles. Key concepts such as entropy, reversibility, and the use of steam tables. Rankine cycles and steam turbine plants. Commonly used measurement techniques.

Content: Systems, work and heat transfer. Zeroth, 1st and 2nd laws of thermodynamics. Conservation: of mass, energy and momentum, the Bernoulli equation. Entropy: reversibility, efficiency and steam tables. Elementary cycles: heat engine, reversed engine, Carnot cycle, Rankine cycle and steam turbines. Manometry: Use of manometers, Venturies to measure flow rates.

Assessment: Two tests, one 2hr exam, Test 25%, Final exam 75%

DP Requirement: Students are required to attend all tests and obtain a combined average of minimum 40%.

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 fluids needed for thermodynamic analysis of various engineering systems. To be able to apply conservation of energy and mass in closed and open systems which involve expansion and compression processes. To be able to use the steam tables in analysing the basic steam plant.

Content: Fundamental concepts such as system properties 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, Entropy and reversibility. Thermodynamic processes: isochoric, isobaric, isothermal. Thermodynamics of pure substances (Steam Tables and the simple steam plant)

Practicals: None

Assessment: Test 25% Exam 75%

DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these 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: This is a Duly Performed requirement. 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.

Design of Machine Elements

ENME3DM H1 (29L-24T-0P-0S-63H-36R-0F-0G-8A-13W-16C)

Prerequisite: ENME2DM, DP in ENME2SM

Aim: Expertise in safety and reliability for the design of engineering components and systems. Knowledge of impact forces and effects as well as fracture and fatigue.

Content: Selection of failure theories, safety factors and reliability prediction. Stress and deflection caused by bending and torsional impact loads. Stress intensity factors, high cyclic fatigue life prediction. Bolted joints subjected to static and fatigue loads. Welded joints under tri-axial loads. Spur, helical and bevel gear forces and static strength. Gear teeth surface fatigue strength analysis. Overall shaft design, material selection, fatigue considerations, coupling and bearings.

Practicals: None.

Assessment: Four tests, one design project assignment and report, one 3 hr exam. Assignments: 12.5% Tests: 12.5% Final exam: 75%

DP Requirement: Students are required to attend all tests and attain a combined average of 40% for these tests. Satisfactory completion of assignment(s).

Fluids Mechanics 2

ENME3FM H2 (39L-8T-9P-0S-60H-39R-0F-0G-5A-13W-16C)

Prerequisite: ENME2FM

Aim: Fluid mechanics concepts for flows that the engineer will encounter in industry. The ability to apply these concepts to engineering type flow problems and fluid flow design problems.

Content: The Navier-Stokes equations. Laminar flow in pipes, ducts and channels. Turbulent flow: structure of turbulence, universal velocity laws, friction laws, turbulent flow in pipes. Lubrication: tilting pad, journal and thrust bearings. Potential flow, stream function, vorticity. Boundary layer theory: laminar and turbulent boundary layers, the reduced Navier-Stokes equations, exact and approximate solutions, separation. Compressible flows: flow in ducts with area change, Fanno and Rayleigh flows, the normal shockwave. Fluid Machinery: centrifugal and axial flow pumps, the Pelton wheel, Francis and Kaplan turbines.

Assessment: Test 25% Exam 75%

DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests. Attendance at 60% of the lectures is also required.

Heat & Mass Transfer 1

ENME3HM H2 (29L-18T-6P-0S-62H-40R-0F-0G-5A-13W-16C)

Aim: To assess the magnitude of heat transfer by conduction, convection and radiation and in mixed environments; the performance of devices that rely on convective processes for heat gain or dissipation. To establish the heat loading experienced by objects in a radiative environment. To understand boiling and condensing processes as well as mass transfer via diffusion processes. Skill to design heat exchanges for a thermal specification or duty. Awareness of computational technique for solving heat transfer problems.

Content: Conduction: Conduction rate equation, Heat diffusion equation, Three-dimensional conduction with internal heat generation and unsteadiness in Cartesian, polar and spherical coordinates, Contact and convective resistances and the electrical analogue, One-dimensional conditions, Plane wall, Cylinder, Sphere, Heat transfer from extended surfaces, Two-dimensional conduction: Graphical and numerical methods. Radiation: Fundamental concepts, Radiation between surfaces, Radiation shape factors and radiant heat transfer. Convection: Laminar and turbulent convective heat flow, heat transfer correlations in convective processes which cover laminar, turbulent and mixed flow regimes. Reynolds analogy. Forced and free convection. Boiling and condensing flows, Ficks law, diffusion in gases and vapours. Fluid friction/heat transfer analogies. Mass transfer correlations. Shell and tube heat exchanger design.

Assessment: Three tests 25% Examination 3-hour paper (closed book) 75% of the final mark

DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests. Successful completion of all practicals required.

Manufacturing Technology

ENME3MT H2 (20L-9T-0P-0S-31H-16R-0F-0G-4A-13W-8C)

Aim: Engineering principles of manufacturing processes and machine tools: manufacturing, economics and optimisation problems.

Content: Manufacturing processes, production machines, and tooling and systems. Mechanics of material removal processes: metal machining, the Merchant equation, power and energy relationships. Cutting tool technology: tool wear, tool life and the Taylor equation, tool materials and geometry. Machining operations and machine tools. Selection of cutting conditions, and machining economics. Metal working processes. Bulk deformation in metalworking: rolling, forging, extrusion. Sheet metalworking: cutting operations, bending operations, drawing. Product design considerations.

Practicals: None.

Assessment: Two tests, one 2-hour exam Tests: 30% Final Exam: 70%

DP Requirement: Attendance of all class tests or the submission of a doctors certificate or similar.

Selection of Engineering Materials

ENME3SM H2 (18L-5T-12P-0S-20H-21R-0F-0G-4A-13W-8C)

Prerequisite: ENME2PM

Aim: Knowledge of engineering materials and 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.

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: 2 tests, 1 assignments/tutorials, 4 reports, 1 two hour exam. Class-mark 25% Final exam: 75%.

DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests.

Strength of Materials 2

ENME3ST H1 (30L-18T-9P-0S-65H-33R-0F-0G-5A-13W-16C)

Prerequisite: 40% in ENME2SM

Aim: Analysis for continuous beams, plates, shells, thick cylinders and disks. This includes 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.

Practicals: Three practicals on beams and columns.

Assessment: Two tests, 3 practical reports, one 3 hr exam. Tests: 30% Prac reports: 0% (Must be completed to a required standard) Final exam: 70%

DP Requirement: Complete the practicals satisfactorily and achieve an average of 30% or more in tests.

Thermodynamics 2

ENME3TH H2 (20L-10T-9P-0S-20H-16R-0F-0G-5A-13W-8C)

Prerequisite: ENME2TH

Aim: To establish a knowledge of the fundamental thermodynamic constraints present in Vapour and Gas Power Cycles and in refrigeration processes, and the ability to apply this understanding to the design of such machinery or plant.

Content: Vapour power cycles i.e. Carnot & Rankine cylcles. Gas Power Cycles i.e. the Otto & Diesel cycles (including topics such as performance and concepts such as abnormal combustion and knock). Gas Turbines. Efficiency of irreversible adiabatic compressors and expanders. Refrigeration cycles. Steam plant, diesel engine and computer simulation.

Practicals: Three

Assessment: Test 25%, exam 75%

DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests.

Theory of Machines

ENME3TM H2 (18L-8T-9P-0S-22H-18R-0F-0G-5A-13W-8C)

Prerequisite: 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.

Content: Constraint Equations. Computer Formulation and Solution of the Kinematic Problem. Kinematics of Planar Mechanisms. Kinematic Analysis using MATLAB models. Force Analysis of Mechanisms: Planar Dynamics. The Computer Method for Dynamic Analysis of Constrained Mechanical Systems. Dynamic Analysis using MATLAB models. Computer modeling environments

Practicals: Experiments of Static and Dynamic Balancing of Rotors. Computer modeling and simulating environment for practical systems.
Assessment: Two tests, assignments, one 3 hr exam. Tests: 25% Final exam: 75%
DP Requirement: The student must have 50% of take home tutorials accepted and achieve at least 40% in class tests.

Advanced Manufacturing Systems

ENME4AM H1 (18L-5T-8P-0S-30H-15R-0F-0G-4A-13W-8C)
Prerequisite: 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: Two tests, two practical reports, 30% one 2-hr exam 70%.
DP Requirement: Completion of practicals and class mark of 40%

Engineering Computational Methods

ENME4CM H1 (10L-10T-0P-0S-30H-17R-0F-0G-13A-13W-8C)
Prerequisite: 40% in 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 and fluid mechanics, and heat transfer.
Assessment: Assignments: 70% Tests: 10% Final Exam: 20% - 2 hour. All coursework will be sent to external examiner for assessment.
DP Requirement: Students are required to obtain an average of 50% for all assignments and tests.

Design & Analysis of Manufacturing Processes

ENME4DM H1 (20L-9T-0P-0S-31H-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.
Content: Non-traditional machining and thermal cutting processes (ultrasonic machining, abrasive water jet cutting, chemical and electrochemical machining processes, electric discharge machining). Manufacturing processes for plastics, extrusion, injection moulding, compression moulding, blow moulding. Design, analysis and manufacturing technologies for composites. Modelling, analysis and design optimization of manufacturing processes. Design for manufacturing. Concurrent engineering.
Assessment: 2 tests 30% and one 2-hr exam 70%
DP Requirement: Class mark of 40%

Design & Research Project 2

ENME4DP H2 (9L-9T-0P-26S-189H-0R-0F-0G-7A-13W-24C)
Prerequisite: 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.
Practicals: None.
Assessment: Oral presentation; design deadline; poster presentation (open day); Final report Written reports: 60% Oral/Poster presentations: 20% Discretionary mark: 20%
DP Requirement: Perform all assignments and achieve an average mark of at least 40% for a class mark

Mechanical Engineering Design

ENME4ED H2 (18L-10T-0P-0S-30H-17R-0F-0G-5A-13W-8C)
Prerequisite: 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.
Practicals: None.
Assessment: Two tests, mid-term design report 30%, one 3 hour exam 70%.
DP Requirement: Class mark of 40%.

Energy Management

ENME4EM H2 (20L-8T-0P-0S-30H-17R-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% Final Exam 70%
DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests.

Alternative Energy Systems

ENME4ES H1 (20L-8T-0P-0S-30H-17R-0F-0G-5A-13W-8C)
Prerequisite: 40% in ENME3FM
Aim: To enable students to choose among different energy systems and design energy producing systems.
Content: Introduction. Types of conventional energy sources. Types of 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 energy, electrical energy, chemical energy, 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% Final Exam 70%
DP Requirement: Students are required to attend both tests and attain a combined average of 40% for these tests. Attendance at 60% of the lectures is also required.

Fracture & Fatigue of Engineering Materials

ENME4FF H2 (18L-10T-0P-0S-30H-17R-0F-0G-5A-13W-8C)
Prerequisite: 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.

Practicals: Laboratory demonstration of fracture and fatigue failures.
Assessment: 2 tests, 4 tuts, one 3 hour exam. Assignment: 10% Test: 20% Final Exam: 70%
DP Requirement: DP Requirement: Perform all assignments and achieve an average mark of at least 40% for class mark.

Design of Fluid Power Systems

ENME4FP H1 (20L-8T-0P-0S-30H-17R-0F-0G-5A-13W-8C)

Prerequisite: 40% in ENME3FM
Aim: Candidate will be able to design circuits and appreciate how air and oil equipment can be applied to the manual and automatic operation of production machinery of various types.
Content: Design of hydraulic-mechanical systems, electro-hydraulic systems (electrical supply and control, pumps, motors, rams, logic control, electrical protection, safety interlocks), electro-pneumatic systems (electrical and pneumatic supply and control, circuit components symbols, logic control, automation with pneumatics) and programmable logic controllers.
Assessment: Two tests, assignments, tests: 25%, final examination: 75%
DP Requirement: The student must have 50% of take home tutorials accepted and achieve at least 40% in class tests.

Mechanics of Composite Materials

ENME4MC H1 (18L-10T-0P-0S-30H-17R-0F-0G-5A-13W-8C)

Prerequisite: 40% in 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.
Practicals: Laboratory demonstration of composites testing and processing techniques.
Assessment: 2 tests, 1 three-hour exam
DP Requirement: Attendance at all tests.

Selected Topics in Mechanical Engineering 1

ENME4ME H1 (20L-8T-0P-0S-30H-17R-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: Class mark 30% and final exam 70%.
DP Requirement: Class mark of 40%.

Selected Topics in Mechanical Engineering 2

ENME4MN H2 (20L-8T-0P-0S-30H-17R-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: Class mark 30% and final exam 70%.
DP Requirement: Class mark of 40%.

Mechatronic Engineering

ENME4MT H2 (20L-8T-0P-0S-27H-22R-0F-0G-3A-13W-8C)

Prerequisite: 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.

Content: Modeling of systems and implementation of mechatronic methods of control. Measurement and actuating systems for robots and manufacturing, signal conditioning. Adaptive control, communication systems (interfacing computers), microprocessors, input/output systems for microprocessors, programmable logic controllers, design and mechatronics and neural networks.

Practicals: None.

Assessment: One test, 2 hour exam, test 10%, assignments 20%, final exam: 70%.

DP Requirement: Complete all assignments and achieve an average mark of at least 40% in the test.

Mechanical Vibrations

ENME4MV H1 (20L-8T-0P-0S-30H-17R-0F-0G-5A-13W-8C)

Prerequisite: 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 Eigen value problem and the Eigen vectors. Modal analysis of conservative systems.

Practicals: None.

Assessment: Two tests, assignments, one 3 hr exam. Tests and Tuts: 25% Final exam: 75%. .

DP Requirement: Acceptance of at least 50% of take home tutorials and 40% achieved in class tests.

Design & Research Project 1

ENME4PD H1 (9L-9T-0P-0S-142H-0R-0F-0G-0A-13W-16C)

Prerequisite: 4th year standing. ENME2WS

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.

Practicals: None.

Assessment: Assignments and Final report. Written reports: 75%. Discretionary mark: 25%

DP Requirement: Perform all assignments and achieve an average mark of at least 40% for a class mark.

Thermodynamics 3

ENME4TD H1 (20L-8T-0P-0S-26H-22R-0F-0G-4A-13W-8C)

Prerequisite: ENME3TH

Aim: To introduce students to the methods of analysis of non-reactive mixtures and psychrometric processes, combustion processes and flue gases, and the flow through turbomachinery, with special emphasis on engineering applications.

Content: Non-reactive systems, mixture compositions, laws of partial pressures and partial volumes, ideal gas mixtures and psychrometry. Reactive systems, combustion and exhaust gas analysis. Axial and radial flow turbomachinery.

Practicals: None

Assessment: Tests and assignments 25%, one 2-hour examination 75%

DP Requirement: Performed all assignments and practical, and achieve an average mark of at least 30% in the tests.

Vacation Work

ENME4VW 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 BSc Eng (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.

Fossil Fuel Technology

ENME820 H1 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: The focus of this module will be commercially available supply side technologies using fossil fuels, including coal, gas and oil. It will cover environmental benefits of clean coal technologies that can be retrofitted to existing coal plants; new clean coal technologies such as fluidised bed combustion, and gas turbine technologies.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

UNITE Programme

Offered in the Unite Programme

Chemistry A

ENUN0CY H1 (16L-20T-0P-0S-24H-18R-0F-0G-2A-13W-8C)

Aim: To familiarise learners with basic chemical concepts and the use of this knowledge to solve simple problems. To synthesise, at the elementary level, ideas and concepts using the foregoing knowledge.
Content: Units used in chemistry including mole. Atoms, molecules and ions. Electronic structure. Solutions, compounds and mixtures. Acids, bases and buffers. Chemical equations. Gas laws. Properties of selected metals and non-metals. Bonding theories.
Practicals: None.
Assessment: Two tests (25%)and one 2 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Engineering Communication A

ENUN0EC H1 (15L-25T-0P-0S-20H-20R-0F-0G-0A-13W-8C)

Aim: To acquire the skills needed to compile a written report; to present a verbal report; articulate ideas/questions assertively; present a time management schedule; conduct a group-decision making process successfully; speed read; implement a stress management process.
Content: Communication in perspective. Communication styles. Self awareness. Barriers to communication. Report writing. Verbal presentations. Active listening. Effective reading. Self management (time; stress). Working to objectives.
Practicals: Extensive individual participation in practical application of the above material during tutorial sessions.
Assessment: Ongoing evaluation by lecturer of assignments and practical activities. There is no examination.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Introduction to Engineering Drawing

ENUN0ID H1 (35L-0T-0P-0S-28H-12R-0F-0G-5A-13W-8C)

Aim: To introduce students to the basic principles of Engineering Drawing as a medium of communication.
Content: Use and care of drawing instruments. Basic concepts of Orthographic Projection - 1st and 3rd angle, including sectional representations. Isometric projection. Application of the foregoing to simple shapes. Assembly drawings and freehand sketching. Interpretation of drawings including missing detail. Preparation of simple drawings for manufacturing.
Practicals: Learning is predominantly through repeated practice of the above using pencil and paper.
Assessment: Combination of tests (25%)and one 2 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Supplementary Mathematics A

ENUN0MA H1 (39L-29T-0P-10S-56H-20R-0F-0G-6A-13W-16C)

Aim: Basic arithmetic, algebraic and logic skills. Forming and solving of systems of linear equations. Graphs. Evaluation of derivatives and anti-derivatives of elementary functions. Solving practical problems involving volume, area, trigonometry continuity and the derivative.
Content: Simple calculations without use of calculator. Use of fractions competently. Performance of algebraic manipulations. Disprove by counterexample. Logical reasoning. Elementary theory of matrices and linear equations. The real number system. Limits and continuity of real valued functions. Introduction to differential calculus, basic theory and applications. Anti-derivatives, elementary transcendental functions.
Practicals: None.
Assessment: Combination of tests (25%)and one 3 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Mechanics A

ENUN0ME H1 (16L-20T-0P-0S-24H-18R-0F-0G-2A-13W-8C)

Aim: To learn to translate word problems relating to physical systems in mechanics into systems of mathematical equations. To solve these systems of equations.
Content: Vector algebra : Dot product, cross product, lines and planes in three dimensional space. Concept of force and torque / moment. Equilibrium of a particle. Equilibrium of a rigid body. Equivalent systems and force couples. Centres of mass.
Practicals: None.
Assessment: Two tests (25%)and one 2 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Physics A

ENUN0PY H1 (16L-20T-0P-0S-24H-18R-0F-0G-2A-13W-8C)

Aim: To learn the basic physical concepts of motion, mass, force and energy. To use this knowledge to solve simple problems related to these concepts. Synthesis of these ideas and concepts at the elementary level.
Content: Units and dimensions used in physics. Vector and scalar quantities. Newton=s laws of motion, friction and static equilibrium. Motion in one dimension, speed, velocity and graphical representation thereof. Motion in two dimensions. Circular motion and gravitation. Work and energy. Linear momentum, impulse, conservation of momentum, collisions. Rotational motion, moment of inertia and applicable laws. Fluids at rest, density, pressure, bouyancy and Archimedes Principle.
Practicals: None.
Assessment: Two tests 25% and one 2 hr exam 75%
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Chemistry B

ENUN1CY H2 (16L-20T-3P-0S-21H-18R-0F-0G-2A-13W-8C)

Aim: To prepare students for the study of first year chemistry for engineering with a high probability of success.
Content: Equilibria in the chemistry context. Basic electrochemistry. Chemistry of main group elements and their compounds. Redox reactions. Introductory level organic chemistry.
Practicals: One 3-hr lab practical
Assessment: Two tests (25%)and one 2 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Engineering Communication B

ENUN1EC H2 (15L-25T-0P-0S-20H-20R-0F-0G-0A-13W-8C)

Aim: To learn to conduct consensus decision managing; implement conflict reducing techniques; communicate in a multi cultural environment; differentiate the different functions within organisations; present a verbal and written technical report; implement a stress reducing process; analyse problems.
Content: Cross cultural communication; conflict management, group dynamics, organisational dynamics; learning and study skills; creative thinking and problem solving.
Practicals: None scheduled. Extensive practical application of the above in controlled tutorial sessions.
Assessment: Ongoing evaluation by lecturer of assignments and practical activities. There is no examination.
DP Requirement: A minimum class mark of 40% (Class mark made up of class assignment(s) as per lecturers instructions)

Engineering Drawing

ENUN1ED H2 (20L-15T-0P-0S-28H-12R-0F-0G-5A-13W-8C)

Aim: Candidates will learn to draw and design in detail or by sketch drawing from mechanical engineering applications. Manual and CAD processes. Interpretation of drawings, and analysis of plans for details omitted. They will produce drawings that are ready for manufacturing purposes.
Content: The students will work with more advanced engineering drawings using orthographic and isometric projections. This will be applied to castings and sectional views. This work will be extended to assembly drawings. They will also learn the basic elements of CAD and it=s advantages.
Practicals: Learning is chiefly accomplished by practical application of the above in class and in tutorials.
Assessment: Combination of tests (25%)and one 2 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions).

Supplementary Mathematics B

ENUN1MA H2 (39L-39T-0P-0S-52H-21R-0F-0G-9A-13W-16C)

Aim: The integral and it's use in solving practical problems. Evaluation of integrals. Approximate solution of problems involving vectors, complex numbers and Taylor's theorem. Solving simple problems from chemistry, biology, mechanics, commerce and everyday life.
Content: Inverse trigonometric functions, hyperbolic functions. Techniques of integration. Integration by parts. Applications of integration, surface areas, volumes, arc lengths. Polar coordinates, areas and curve sketching. Taylor's theorem. Taylor's series for sin, cos, exp x, ln (1+x), arctan, binomial Theorem, binomial coefficients. Complex numbers. De Moivre's theorem. 3-dimensional linear geometry. Problem solving techniques.
Practicals: None.
Assessment: Combination of tests (25%)and one 3 hr (75%) exam.
DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Mechanics B

ENUN1ME H2 (16L-20T-3P-0S-24H-18R-0F-0G-2A-13W-8C)

Aim: Candidates will learn to identify and analyse basic engineering structures under ideal assumptions and determine forces internal to a system

Content: Trusses, methods of joints, methods of sections. Frames and simple machines. Relative motion and systems of pulleys. Friction in equilibrium and belt friction. Sliding and tipping.

Practicals: One 3-hr lab practical

Assessment: Two tests (25%)and one 2 hr (75%) exam.

DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Physics B

ENUN1PY H2 (16L-20T-3P-0S-24H-18R-0F-0G-2A-13W-8C)

Aim: To provide an understanding of the basic concepts of electricity and magnetism. Simple calculations related to electricity and magnetism. To synthesise ideas and concepts in the field of electricity and magnetism.

Content: Electrical nature of atoms and matter. Creating charge. Conductors and insulators. Static electricity. Electric current, Ohm=s law, resistivity and conductivity, metals and semiconductors. Superconductivity. Simple circuits and network analysis. Electric power, including distribution. Measurement. Magnetism and magnetic fields. Interaction between moving charges and magnetic fields. Magnetic force on current carrying conductors. Definition of ampere.

Practicals: One 3-hr lab practical

Assessment: Two tests (25%) and one 2 hr (75%) exam.

DP Requirement: A minimum class mark of 40% (Class mark made up of class test(s) and class assignment(s) as per lecturers instructions)

Faculty Wide Modules

Offered in the Faculty of Engineering

English Language for Engineers

ENNO1EL H1 P1 (10L-15T-0P-0S-20H-10R-0F-13G-11A-0W-8C)

Aim: To develop essential skills of reading, writing and expression in English. To also learn the skills of critical analysis, interpretation and evaluation: these are important critical tools which can be applied to a wide range of literary and cultural texts (and academic disciplines). This course will assist in the development of an appropriate critical vocabulary, and will introduce you to a range of contemporary debates. The course also aims to develop essential academic writing skills: the ability to write fluently and persuasively (scientific and non-scientific) in the English language; the ability to organize materials, construct coherent and persuasive arguments and develop a thesis statement. Such skills are important to success in the technical writing as a whole.

Content: Introduction to English language study. Grammatical structures with reference to technical and literary writing styles. Comprehension of literature (scientific and non-scientific), data interpretation and use of computers. Writing skills – development of the written argument, inferring meaning and drawing conclusions. Oral language skills – improving your vocabulary, scientific vocabulary, systematic nomenclature. Types of reports – newspapers, popular science literature, textbooks, data books, scientific journals. The history of scientific pursuit globally and in the African context.

Practicals: None

Assessment: Written assignments (non-technical and technical) 30%, Comprehension tests (non-technical and technical) 20%, Small group discussions of scientific concepts 20% and final exit test – comprehension and writing skill 30%

DP Requirement: Students are required to timeously submit all written assignments and attend oral assessment sessions to sit the final assessment.

Research Project Proposal
ENNO8RP HC (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)
Aim: Clear identification of the problem to be tackled, allowing the candidate to take charge of the ensuing research.
Content: Identification of the problem issues, description of the context of the problem (eg. site, existing plant), determination of the literature background, planning and initiation of equipment development, development of a work plan with target dates, proposal of a theoretical approach, outlining of software requirements, detailing of project objectives, deliverables and benefits, consideration of health, safety, environmental and ethical issues of planned research.
Assessment: Internally and externally examined report with an optional component up to 20% arising from an internal seminar presentation
DP Requirement: As per Faculty Rules.

PhD Progress Report
ENNO9RP HB (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)
Aim: Clear identification of what has been achieved in one year of registration for the PhD.
Content: Describe the progress made in the first year of registration for the PhD by research. This is a duly-performed, zero-credit module prescribed in terms of Faculty Rule EDP2(a) as a progress requirement for re-registration for the PhD degree.
Assessment: Written report to be assessed by the student's Supervisor and an independent moderator for the approval of the Higher Degrees committee.
DP Requirement: Nil.

MODULES FROM OTHER FACULTIES

In the Faculty of Science & Agriculture

Agricultural Economics

Offered in the School of Agricultural Sciences & Agribusiness

Applied Farm Financial Management
AGEC240 P2 (20L-0T-39P-0S-8H-10R-0F-0G-3A-13W-8C)
Prerequisite: AGEC220 (Bioresources Engineering students are exempt).
Aim: To learn and apply the principles and tools of finance to managerial problems in agriculture.
Content: Farm financial management objectives. Information flows in farm financial management. Financial leverage, farm firm growth and liquidity. Risk management in agriculture. Impact of time and risk on managerial decisions. Farm land values. Estate duty and the farmer.
Practicals: Risk analysis, information flows, farm firm growth model, capital budgeting and discounted cash flow problems.
Assessment: Class test (33%), 2 h exam (67%).
DP Requirement: 40% for the class test, and attendance at 80% of all practicals.
Offered in Semester 2. Credit may not be obtained for both AGEC240 and AGEC270.

Crop Science

Offered in the School of Agricultural Sciences & Agribusiness

Field Crop Management

AGPS305 P1 (38L-0T-43P-0S-60H-14R-0F-0G-5A-13W-16C)

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.
Offered in Semester 1.

Horticultural Science

Offered in the School of Agricultural Sciences & Agribusiness

Greenhouse Management

AGPS304 P2 (18L-0T-18P-0S-30H-10R-0F-0G-4A-13W-8C)

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 a controlled environment.
Content: The influence of environment on plant growth and development, greenhouse structures and covering materials, artificial lighting and daylength control, climate control, irrigation and growing systems, with special emphasis on hydroponic production.
Practicals: Excursions to commercial greenhouses and growing plants in controlled environments.
Assessment: 2 tests (16%), prac assessment (17%), 2 h exam (67%).
DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.
Offered in Semester 2.

Orchard Management

AGPS307 P1 (38L-0T-43P-0S-60H-14R-0F-0G-5A-13W-16C)

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.
Offered in Semester 1.

Post Harvest Technology

AGPS724 P2 (18L-0T-35P-0S-14H-8R-0F-0G-5A-13W-8C)

Aim: For students to be proficient in postharvest management of horticultural crops.
Content: Physiological attributes of the major groups of Horticultural products, with reference to preharvest physiology, temperature, water loss and humidity and storage atmosphere; packhouse design and technologies, fruit coatings, packaging, physiological and pathological disorders, effects and requirements of phytosanitary regulations, product processing for added value and storage life and quality and food safety management systems.
Practicals: Illustration of theoretical concepts; field trips.
Assessment: 2 tests (30%), self study assignments (20%), 3 h exam (50%).
DP Requirement: 40% Class mark, attendance at 80% of practicals & 100% of tests.
Offered in Semester 2.

Biological Sciences

Offered in the School of Biological & Conservation Sciences

Marine Environment

BIOL231 W2 (27L-9T-36P-0S-68H-15R-0F-0G-5A-13W-16C)

Prerequisite: 64 C at Level 1 including MATH133.
Aim: To introduce the geological, chemical, physical & biological processes of the marine environment.
Content: Geological: continental drift, plate tectonics, geological environments, sediments. Chemical: seawater, macronutrients, trace elements, dissolved gases, nitrogen cycle. Physical: circulation patterns, upwelling, tides, waves, near-shore currents, vertical processes. Biological: light and primary production, food webs, benthic/pelagic subsystems, functional ecosystems.
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%.
Offered in Semester 2. Subminimum to pass: 40% in exam.

Applied Cell Biology for Env Engineers

BIOL851 HC (30L-0T-9P-3S-86H-20R-0F-0G-12A-7W-16C)

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 students in the Faculty of Engineering only.

Chemistry

Offered in the School of Chemistry

Business Management

CTEC733 P1 (20L-12T-0P-0S-30H-15R-0F-0G-3A-13W-8C)

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%.
Offered in Semester 1.

General Principles of Chemistry

CHEM110 P1 W1 (36L-9T-36P-0S-44H-30R-0F-0G-5A-13W-16C)

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.
Offered in Semester 1. Credit may not be obtained for CHEM110 and CHEM161.

Chemical Reactivity

CHEM120 P2 W2 (36L-9T-36P-0S-44H-30R-0F-0G-5A-13W-16C)

Prerequisite: 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 (8%), practical reports (25%), 3 h exam (67%).
DP Requirement: Class mark 40%, 80% attendance at practicals.
Offered in Semester 2. Credit may not be obtained for CHEM120 and CHEM171.

Chemical Engineering Chemistry 1

CHEM161 H1 (36L-9T-36P-0S-44H-30R-0F-0G-5A-13W-16C)

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%; attendance at practicals 80%.
Offered in Semester 1. For students in the Faculty of Engineering only. Credit may not be obtained for CHEM161 and CHEM110.

Chemistry & Society 1

CHEM163 P1 (18L-9T-18P-0S-26H-6R-0F-0G-3A-13W-8C)

Aim: To provide students with an overview of the role chemistry plays in everyday life.
Content: Recap on 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.
Offered in Semester 1. For students in the Faculty of Engineering only.

Chemical Engineering Chemistry 2

CHEM171 H2 (36L-9T-36P-0S-44H-30R-0F-0G-5A-13W-16C)

Prerequisite: 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.
Offered in Semester 2. For students in the Faculty of Engineering only. Credit may not be obtained for CHEM171 and CHEM120.

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.
Offered in Semester 2. For students in the Faculty of Engineering 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. Engineering 87.
Practicals: Introduction to the measurement of chemical properties; study of chemical behaviour of simple substances.
Assessment: Class mark (33%), 2 h exam (67%).
DP Requirement: Class mark 40%; 80% attendance at practicals.
Offered in Semester 1. For students in the Faculty of Engineering only.

Chemistry for Engineers 1B

CHEM191 H2 (18L-5T-18P-0S-24H-12R-0F-0G-3A-13W-8C)

Prerequisite: 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.

Content: Water - its chemistry and purification. Rates of reaction. Equilibrium. Acids, bases, buffers, pH. Solubility. Oxidation/reduction, electrochemistry, conductivity, corrosion, batteries. Chemistry of selected metals and their compounds. Chemistry of carbon and its compounds. Phase changes, phase diagrams.
Practicals: The practical study of inorganic and organic materials.
Assessment: Class mark (33%), 2 h exam (67%).
DP Requirement: Class mark 40%; 80% attendance at practicals.
Offered in Semester 2. For students in the Faculty of Engineering only.

Applied Organic Chemistry for Chem Eng

CHEM241 H1 (14L-0T-18P-0S-25H-20R-0F-0G-3A-13W-8C)

Prerequisite: 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, Petrochemicals, Sugars, Proteins and Pharmaceutical chemistry. Spectroscopic methods.
Practicals: Six 3 hr practicals relating to the course content.
Assessment: Class mark (33%), 2 h exam (67%).
DP Requirement: Class mark 40%; 80% attendance at practicals.
Offered in Semester 1. For students in the Faculty of Engineering only.

Applied Physical Chemistry for Chem Eng

CHEM251 H2 (14L-0T-18P-0S-25H-20R-0F-0G-3A-13W-8C)

Prerequisite: 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: Class mark (33%), 2 h exam (67%).
DP Requirement: Class mark 40%; 80% attendance at practicals.
Offered in Semester 2. For students in the Faculty of Engineering only.

Applied Inorganic Chemistry for Chem Eng

CHEM261 H1 (14L-0T-18P-0S-25H-20R-0F-0G-3A-13W-8C)

Prerequisite: 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: Class mark (33%), 2 h exam (67%).
DP Requirement: Class mark 40%; 80% attendance at practicals.
Offered in Semester 1. For students in the Faculty of Engineering only.

Computer Science

Offered in the School of Computer Science

Computer Programming

COMP102 P2 W2 (39L-0T-36P-0S-63H-16R-0F-0G-6A-13W-16C)

Prerequisite: COMP100 or COMP101.
Aim: To introduce students to programming in a high level language.
Content: Procedural programming in Java. Structured data types. Sorting. Searching. Recursion. Program testing. Program documentation. Introduction to object oriented programming.
Assessment: Continuous assessment (50%), 3 h exam (50%) with a subminimum of 40% on both.
DP Requirement: At least 40% for continuous assessment, attendance at practicals 80%.
Offered in Semester 2.

Advanced Programming for Engineers

COMP312 H1 (20L-0T-20P-0S-25H-10R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2DS, ENEL2CB.
Aim: To explore and implement methods of developing software systems for engineering applications. To learn and apply the object-oriented approach in designing and implementing solutions in engineering problems, using a high-level programming language.
Content: High-level language programming, programming project, associated tools & techniques, advanced object-orientated programming and user interface design, computer graphics.
Assessment: Tests (10%), Tutorials (5%), Practicals (10%), 3h exam (75%).
DP Requirement: 40% Class mark.
Offered in Semester 1. Available only to students in the Faculty of Engineering.

Geography

Offered in the School of Environmental Sciences

Sustainable Development

ENVS814 HC WC (30L-0T-16P-0S-91H-20R-0F-0G-3A-13W-16C)

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: 3 h exam (67%); Class mark (33%).
DP Requirement: 80% attendance at lectures and practicals; 40% Class mark.
Offered in either Semester 1 or Semester 2.

Soil Science

Offered in the School of Environmental Sciences

Introduction to Soil Science

SSCI212 P1 (18L-4T-18P-0S-24H-12R-0F-0G-4A-13W-8C)

Prerequisite: 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 h exam (67%), 2 theory tests (20%), prac laboratory reports & tutorial reports (13%).

DP Requirement: 80% attendance at practicals; 40% Class mark.

Offered in Semester 1. 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: 3 h exam (67%), 2 theory tests (17%), laboratory & field reports & tutorials (16%).

DP Requirement: 80% attendance at practicals and tutorials; 40% Class mark.

Offered in Semester 1. Credit may not be obtained for both SSCI212 and SSCI217.

Pedology

SSCI230 P2 (36L-0T-61P-0S-40H-19R-0F-0G-4A-13W-16C)

Prerequisite: SSCI217 or 212.

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: 3 h exam (60%), 2 tests (20%), & project reports (20%).

DP Requirement: 40% Class mark.

Offered in Semester 2.

Geological Sciences

Offered in the School of Geological Sciences

Elements of Geology for Civil Engineers

GEOL215 H1 (39L-0T-45P-0S-47H-20R-0F-0G-9A-13W-16C)

Aim: 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: One 3-hour written exam (67%); course work, practical exercises, assignments and tests (33%). There is no practical examination.
DP Requirement: 40% Class mark, 80% attendance at both lectures and practicals.
Offered in Semester 1. For students in the Faculty of Engineering only.

Mathematics

Offered in the School of Mathematical Sciences

Mathematics 1A (Eng)

MATH131 H1 P1 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite: Higher Grade C or Standard Grade A for Matric Mathematics.
Aim: To introduce basic mathematical concepts of differential and integral calculus.
Content: Elements of logic and set theory. Functions and their graphs, limits and continuity. Differentiation. Application of derivatives to optimisation and curve sketching, linear and quadratic approximation, Newton's method. Indeterminate forms. Inverse trigonometric and other transcendental functions. Indefinite integrals, basic techniques of integration. Definite integrals. Approximate integration. Applications in geometry, physics and engineering.
Assessment: Class tests and/or assignments (20%), 3 h exam (80%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Offered in Semester 1. For students in the Faculty of Engineering. Credit may not be obtained for MATH131 and any of MATH104, 130, 133, 134, 137 or 195. For students in the Faculty of Engineering.

Applied Mathematics 1A (Eng)

MATH132 H1 P1 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite: Higher Grade C or Standard Grade A for Matric Mathematics.
Aim: To introduce basic methods of vector and matrix algebra, statistics and kinematics.
Content: Vectors and matrices, determinants, dot and cross products, solving simultaneous systems of linear equations. Force vectors in 2D and 3D. Plane statics, kinematics, simple harmonic motion.
Assessment: Class tests and/or assignments (20%), 3 h exam (80%).
DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.
Offered in Semester 1. For students in the Faculty of Engineering.

Quantitative Methods 1

MATH134 P1 W1 H1 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite: Higher Grade E or Standard Grade C for Matric Mathematics.

Aim: To introduce mathematical techniques for business mathematics and to develop problem solving skills.

Content: Matrices and matrix models. Solution of systems of linear equations and simple linear programming problems. Elements of the mathematics of finance. Differential calculus in one and several variables, applications, partial differentiation, maxima and minima. Exponential and logarithmic functions. Integral calculus with applications. Elementary differential equations.

Assessment: Class tests and/or assignments (33%), 3 h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Offered in Semester 1. Credit may not be obtained for MATH134 and any of MATH104, 130, 131, 133, 137 or 195.

Mathematics 1B (Eng)

MATH141 H2 P2 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite: 40% in MATH131.

Aim: To develop concepts of differential and integral calculus and introduce elements of differential equations and complex numbers theory.

Content: Further techniques of integration. Improper integrals. Further applications of integration. Sequences and series. Taylor expansion. Conic sections. Polar coordinates. Basic differential equations. Complex numbers, basic complex functions.

Assessment: Class tests and/or assignments (20%), 3 h exam (80%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Offered in Semester 2. Credit may not be obtained for MATH141 and any of MATH140, 143, 145 or 196. Offered to students in the Faculty of Engineering.

Applied Mathematics 1B (Eng)

MATH142 H2 P2 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite: 40% in (MATH131 and MATH132).

Aim: To provide knowledge about the fundamentals of engineering dynamics.

Content: Further kinematics of a particle: Curvilinear motion, normal and tangential acceleration. Newton's 2nd law, motion of body in a 3D space. Friction, impulse and conservation of momentum, collisions. Work, energy, power, conservation of energy, applications. Centre of mass, moments of inertia. Plane rotation of rigid bodies. Collisions of rigid bodies.

Assessment: Class tests and/or assignments (20%), 3h exam (80%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Offered in Semester 2. Offered to students in the Faculty of Engineering.

Advanced Calculus & Linear Algebra

MATH212 P1 W1 (39L-39T-0P-0S-52H-24R-0F-0G-6A-13W-16C)

Prerequisite: MATH130, 140.

Aim: To give a coherent treatment of basic theories & problem solving techniques from Advanced Calculus and Linear Algebra and their applications.

Content: Advanced Calculus: functions of several variables, partial derivatives, chain rules, implicit differentiation, extrema and Lagrange multipliers, multiple integrals, change of variables, line integrals with Green's theorem. Linear Algebra: axioms of vector spaces, linear independence, bases and dimension, matrices and linear transformations, eigenvectors and eigenvalues, diagonalization, inner product spaces, Gram-Schmidt process, orthogonal matrices, linear differential equations, quadratic surfaces.

Assessment: Class tests and/or assignments (33%), 3 h exam (67%).

DP Requirement: Class record 35%. 80% attendance at lectures and tutorials.

Offered in Semester 1. Credit may not be obtained for MATH212 and MATH238.

Mathematics 2A (Eng)

MATH238 H1 (39L-39T-0P-0S-52H-24R-0F-0G-6A-13W-16C)

Prerequisite: MATH131, 40% in MATH141.

Aim: To exhaustively cover the methods & applications of multivariable calculus.

Content: Functions of several variables: level curves and surfaces, limits, continuity. Partial derivatives, gradient. Tangent planes and normal lines. Maxima and minima. Constrained functions, Lagrange multipliers. Parametric representation of lines & surfaces; curvature, torsion. Cylindrical & spherical coordinates. Multiple integrals. Line & surface integrals. Applications: centres of mass, moments & products of inertia. The operators grad, div and curl. Green's theorem; divergence theorem; Stokes' theorem. Applications: work, potential energy, conservative fields; flux and diffusion.

Assessment: Class tests and/or assignments (20%), 3 h exam (80%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Offered in Semester 1. Offered to students in the Faculty of Engineering. 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: 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.

Offered in Semester 1. Offered to students in the Faculty of Engineering.

Further Calculus and Differential Equations

MATH241 P2 W2 (39L-39T-0P-0S-52H-24R-0F-0G-6A-13W-16C)

Prerequisite: MATH212.

Aim: To provide a foundation in the theory and methods of Applied Mathematics.

Content: Further multiple integrals, vector functions and fields. Line and surface integrals in higher dimensions. Divergence and Stokes' theorems. Series and tests of convergence. Linear differential equations and their solution. First order and higher order equations, undetermined coefficients, variation of parameters. Boundary value and Sturm-Liouville problems.

Assessment: Class tests and/or assignments (33%); 3 h exam (67%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Offered in Semester 2. Credit may not be obtained for MATH241 and MATH248.

Mathematics 2B (Eng)

MATH248 H2 (39L-39T-0P-0S-56H-20R-0F-0G-6A-13W-16C)

Prerequisite: MATH141, 40% in MATH238.

Aim: To exhaustively cover linear differential equations, eigenvalue theory, & prepare students for more advanced methods.

Content: Laplace transforms. Inversion by partial fractions and basic manipulations. Linear ODE's with constant coefficients, use of Laplace transforms in solving equations & systems. Vector spaces, dimension, basis, linear transformations. Eigenvalues & eigenvectors. Diagonalization. Inner product, projections, orthogonal transformations. Applications. Functions of a complex variable, analytic functions, Cauchy-Riemann equations. Integration. Path independence of integrals, Cauchy-Goursat theorem. Cauchy integral formula; simple applications.

Assessment: Class tests and/or assignments (20%), 3 h exam (80%).

DP Requirement: 35% Class mark, 80% attendance at lectures & tutorials.

Offered in Semester 1. Offered to students in the Faculty of Engineering. Credit may not be obtained for MATH241 and MATH248.

Optimal Control

MATH341 W2 (29L-20T-0P-0S-80H-26R-0F-0G-5A-13W-16C)

Prerequisite: MATH230, 240.
Aim: To provide the student with a knowledge and understanding of optimal control.
Content: Calculus of variations, basic optimal control, linear-quadratic optimal control. Controllability, observability, stability. Pontryagin's maximum principle. Applications.
Assessment: Class tests and/or assignments (33%), 3 h exam (67%).
DP Requirement: Class record 40%. 80% attendance at lectures and tutorials.
Offered in Semester 2.

Discrete Mathematics

MATH349 H2 (20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: MATH248, MATH239 (40%).
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%), 2h exam (80%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Offered in Semester 2. Offered to students in the Faculty of Engineering.

Mathematics 3A (Eng)

MATH354 H1 (20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: MATH238, 40% in MATH248.
Aim: To provide the student with essential tools of advanced applied mathematics.
Content: Fourier series, application to boundary value problems for ordinary differential equations (Sturm-Liouville problem). Series solution of ordinary differential equations, basic special functions. Separation of variables for one and two dimensional PDE's. Fourier transform, applications to PDE's. Further complex variable theory, Laurent's and Taylor's theorem, isolated singularities and residues, evaluation of integrals by residues. Applications.
Assessment: Class tests and/or assignments (20%), 2 h exam (80%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Offered in Semester 1. Offered to students in the Faculty of Engineering.

Numerical Methods

MATH360 H2 (20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: MATH248 (40%).
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.
Offered in Semester 2. Offered to students in the Faculty of Engineering.

Partial Differential Equations

MATH438 H1 (20L-20T-0P-0S-26H-10R-0F-0G-4A-13W-8C)

Prerequisite: MATH354.
Aim: To provide students with a knowledge and understanding of the theory and methods of solution of partial differential equations.
Content: First order partial differential equations and systems. Shock waves. Classification and fundamental properties of second order equations. Method of characteristics. Engineering applications.
Assessment: Class tests and/or assignments (20%), 3 h exam (80%).
DP Requirement: 30% Class mark, 80% attendance at lectures & tutorials.
Offered in Semester 1. Offered to students in the Faculty of Engineering.

Cryptography
MATH724 WC (29L-10T-0P-0S-100H-18R-0F-0G-3A-13W-16C)

Physics

Offered in the School of Physics

Mechanics, Optics and Thermal Physics
PHYS110 P1 W1 (39L-9T-36P-0S-53H-18R-0F-0G-5A-13W-16C)
Corequisite: MATH130.
Aim: Introduction to mechanics, geometrical optics, and thermal physics.
Content: Mechanics: fundamental units, vectors, scalars, kinematics, particle dynamics, gravitation, work, energy, momentum, equilibrium of rigid bodies, rotational motion, angular momentum, hydrostatics, elastic properties of materials, simple harmonic motion. Geometrical Optics: reflection, refraction, thin lenses, mirrors, prisms, optical instruments. Thermal Physics: temperature, heat, calorimetry, thermal expansion, conduction, radiation, ideal gases, thermodynamics.
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
Offered in Semester 1. Credit may not be obtained for PHYS110 and PHYS195.

Electromagnetism, Waves and Modern Physics
PHYS120 P2 W2 (39L-9T-36P-0S-54H-15R-0F-0G-7A-13W-16C)
Prerequisite: 40% in PHYS110 or 60% in PHYS131.
Corequisite: MATH140.
Aim: Introduction to electromagnetism, waves, physical optics and modern physics.
Content: Electricity and Magnetism: charge, Coulomb's law, electric field, Gauss' law, electric potential, capacitance, resistance, Ohm's law, dc circuits, Kirchhoff's rules, ammeters, voltmeters, Ampère's law, Faraday's law, inductance. Waves: transverse, longitudinal, travelling, standing, beats, Doppler effect. Physical Optics: interference, diffraction, polarisation. Modern physics: photoelectric effect, Bohr model of hydrogen atom, nucleus, radiation, elementary particles, aspects of astronomy and cosmology.
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
Offered in Semester 2. Credit may not be obtained for PHYS120 and PHYS196.

Engineering Physics 1A
PHYS151 H1 (39L-9T-36P-0S-51H-19R-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: Class mark (25%), 3 h exam (75%).
DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.
Offered in Semester 1. Offered to students in the Faculty of Engineering only.

Engineering Physics 1B

PHYS152 H2 (39L-9T-36P-0S-51H-19R-0F-0G-6A-13W-16C)

Prerequisite: PHYS151 (40%).

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.

Content: Thermal Physics: First & second laws of thermodynamics. Electricity & magnetism: Electric charge & electric field, Gauss's law, electric potential, capacitance & dielectrics, current, resistance & electromotive force, direct-current circuits, magnetic field & magnetic forces, sources of magnetic field, electromagnetic induction, inductance & alternating current. Optics: The nature & propagation of light, geometric optics & optical instruments. Atomic Physics: Photons, electrons & atoms, atomic structure.

Assessment: Class mark (25%), 3 h exam (75%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Offered in Semester 2. Offered to students in the Faculty of Engineering only.

Chemical Engineering Physics 1A

PHYS161 H1 P1 (20L-5T-18P-0S-20H-12R-0F-0G-5A-13W-8C)

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 ion 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: Class mark (25%), 2 h exam (75%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Offered in Semester 1. Offered to students in the Faculty of Engineering only.

Chemical Engineering Physics 1B

PHYS162 H2 P2 (39L-9T-36P-0S-51H-19R-0F-0G-6A-13W-16C)

Prerequisite: PHYS161 (40%).

Aim: To gain understanding of & ability to apply oscillations & waves, electricity & magnetism, & atomic & nuclear physics at an introductory level. A calculus-based module.

Content: Oscillations & Waves: Periodic motion, mechanical waves, wave interference & normal modes, sound, nature & propagation of light. Electricity & magnetism: Electric charge & electric field, Gauss's law, electric potential, capacitance & dielectrics, current, resistance & electromotive force, direct-current circuits, magnetic field & forces, sources of magnetic field, electromagnetic induction, inductance & alternating current. Atomic & Nuclear Physics: Photons, electrons & atoms, atomic structure, nuclear physics.

Assessment: Class mark (25%), 3 h exam (75%).

DP Requirement: Class mark 40%, 100% attendance at tests, 80% attendance at lectures, tutorials and practicals.

Offered in Semester 2. Offered to students in the Faculty of Engineering only.

Optics and Wave Motion

PHYS251 H1 (20L-3T-12P-0S-26H-16R-0F-0G-3A-13W-8C)

Prerequisite: PHYS151 & 40% in PHYS152.

Aim: 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.

Offered in Semester 1. Offered to students in the Faculty of Engineering only.

Statistics

Offered in the School of Statistics & Actuarial Science

Basic Statistics

STAT101 P2 (18L-10T-8P-0S-24H-15R-0F-0G-5A-13W-8C)

Prerequisite: Higher grade E or Standard grade C in matric mathematics.
Aim: To introduce the student to the basic concepts of Statistics and how these may be applied in problem solving.
Content: Organizing data. Introduction to probability. Probability distributions. Estimation, confidence limits and hypothesis testing. Regression and correlation. Chi-square tests. Questionnaire design and surveys. Practicals on the above topics using SPSS.
Assessment: 2 tests (20%), practicals (10%), 2 h exam (70%).
DP Requirement: 30% Class mark, 80% attendance at tutorial/practicals.
Offered in Semester 2. Credit may not be obtained for STAT101 and any of the following: MATH133, STAT143, STAT171, STAT181, STAT370.

Engineering Statistics

STAT370 H1 (18L-13T-5P-0S-33H-5R-0F-0G-6A-13W-8C)

Prerequisite: 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: 2 h exam (70%), Class mark (30%).
DP Requirement: 30% Class mark, 80% attendance at tutorials.
Offered in Semester 1, only at Howard College to Engineering students.

In the Faculty of Humanities, Development & Social Sciences

Town Planning

Offered in the School of Architecture, Planning & Housing

Introduction to Town Planning

TNPL301 H1 (20L-0T-30P-0S-90H-17R-0F-0G-3A-13W-16C)

Aim: To provide learners with a systematic introduction to the nature of Planning and the methods of design in the planning process.
Content: Introduction to Planning; Classification; New Towns; Site Analysis; Built Form Organisation; Site Engineering; Layout systems.
Assessment: Examination (50%), single project (50%)
DP Requirement: Submission of all assignments on time and compliance with the attendance requirements of the School.

Layout Design

TNPL302 H2 (20L-0T-36P-0S-90H-11R-0F-0G-3A-13W-16C)

Prerequisite: TNPL301 Introduction to Town Planning

Aim: To provide students with the essential preliminary background of the concepts, techniques, principles and procedures of the built environment at the local level.

Content: Land use design principles of major land uses; urban renewal, city and CBD urban form, zoning.

Assessment: Examination (50%), project work (50%)

DP Requirement: Submission of all assignments on time and compliance with the attendance requirements of the School.

Law for Planners

TNPL401 H1 (20L-6T-0P-0S-31H-20R-0F-0G-3A-13W-8C)

Corequisite: TNPL301 Introduction to Town Planning

Aim: To provide an overview of law for planners.

Content: Principles of law, common and statutory law, the South African court structure. Property law: concepts of ownership and possession, restrictions on the use of property (building by-laws, safety and health regulations, town planning regulations). Tenure rights, deeds, conveyancing and sectional title. Race statutes, apartheid land system, expropriation. Physical Planning Act, Environmental Conservation Act, Local Authorities Act, Black Communities Development Act, other planning-related acts. Town planning ordinances and township applications. Recent bills and laws related to urban development.

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 Faculty of Law

Law

Offered in the School of Law

Aspects of South African Law

LAWS1AS (19.5L-10T-0P-19.5S-111H-0R-0F-0G-0A-13W-16C)

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%

Introduction to Law

LAWS1IL H1 P1 (19.5L-10T-0P-19.5S-111H-0R-0F-0G-0A-13W-16C)

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: Lecture attendance is compulsory and must pass written test.

In the Faculty of Management Studies

Accounting

Offered in the School of Accounting

Accounting 101
ACCT101 P1 W1 H1 (39L-19T-0P-0S-71H-26R-0F-0G-5A-13W-16C)
Prerequisite: Nil
Content: The module aims to equip the student with a conceptual framework for the preparation and evaluation of financial statements and with the information and knowledge of the principles and concepts underlying the historic cost model. Topics include the sole trader and the company and are structured to equip the student with a background to the business world and to introduce the bookkeeping principles used in business.
Assessment: Class Mark (33%), Examination (67%)
DP Requirement: A 40% class mark and an 80% attendance of tutorials.

Accounting 103
ACCT103 P2 W2 H2 (39L-19T-0P-0S-71H-25R-0F-0G-6A-13W-16C)
Prerequisite: A minimum mark of 40% in Accounting 101
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 Economics & Finance

Principles of Microeconomics
ECON101 P1 W1 H1 (39L-0T-0P-0S-75H-40R-0F-0G-6A-13W-16C)
Prerequisite: 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: Write all tests and submit all assignments.

Principles of Macroeconomics
ECON102 P2 W2 H2 (39L-0T-0P-0S-75H-40R-0F-0G-6A-13W-16C)
Prerequisite: 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: Write all tests and submit all assignments.