Faculty of Engineering

2009

UNIVERSITY OF KWAZULU-NATAL

FACULTY OF ENGINEERING

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

HANDBOOK FOR 2009

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Dean
Vacant

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FACULTY OF ENGINEERING

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University of KwaZulu-Natal Pact

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

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STAFF OF THE FACULTY OF ENGINEERING

School of Chemical Engineering

Head of School
Professor M Carsky

Professors

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

Associate Professors

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), MSAIChE*	Process Control
K Foxon BScEng (Natal)	Bioprocess Engineering
I Kerr *BSc (Ind Chem) (Wits, MDP (UNISA), MSc (Env Biotech) (Rhodes)*	Pulping & Refining
L Maharaj *BScEng MSc (UKZN)*	Minerals Processing
J Mulopo *BSc (Congo, PhD (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

DR 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

HW Bernhardt *PhD (Natal) BEd PrEng*	Biofuels/Education

Senior Research Fellows

CJ 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
JD Raal *BScEng (Witwatersrand), MASc, PhD (Toronto), MAIChE, FSAIChE* — Thermodynamics

School of Civil Engineering, Surveying & Construction

Head of School
Professor C Trois

Professors

S Chandra *BE, MTech, PhD (IIT Kanpur)* — Geotechnical Engineering
SK Chakrabarti, *BE, MS, PhD (Arizona)* — Structural Engineering
DD Stretch *BScEng, MScEng (Natal), PhD (Cantab)* — Fluid Mechanics/Hydraulics

Associate Professors

PR Everitt *PrEng, BScEng, MScEng, (Natal), FSAICE* — Pavements, Geotech, & Enviro Management
M Saafi *BSc(Eng), MSc(Eng), PhD (Alabama)* — Structural Engineering
C Trois *Environmental Engineer (Italy), PhD (Cagliari), MWISA* — Geotech & Environmental

Senior Lecturers

AAE Othman *BSc(ArchEng), MSc, PhD (Loughborough)* — Construction Project Management
AA Oladapo *BSc (Hons), MSc Construction Management, PhD (Nigeria). NIQS, Reg QS* — Quantity Surveying
AM Forbes *BScSur, MScSur (Natal)* — Remote Sensing
MB Jaros *PrEng, BScEng(Civil) (Wits), MSc (London), DIC (Imperial College), SAICE* — Geotechnical Engineering

Lecturers

M Akombelwa *BEng (Zambia) MSc, PhD (Nottingham)* — Geomatics
JJ Blight PrEng, BScEng, MScEng (Wits) — Hydrology, Hydraulics, Environmental
HR Chappidi *BE, MTech, PhD (IIT, Delhi)* — Geotechnical Engineering
SHP Chikafalamani *BSc (Malawi), MSc (Real Estate) (Pretoria), MSAIV, MSIM, Reg. Assoc. Valuer* — Property Valuations
SM Chilufya *BEng (UNZA), MSc (ITC), MSIZ* — Geomatics (GIS & LIS)
E Friedrich *BScHons, MScEng (Natal)* — Environmental Management
N Harinarain *BSc, PropDevHons(QS,) MSc(QS) (Natal) MCIOB, Candidate PrQS* — Risk Management
NO Matete *BScEng, MScEng (KwaZulu-Natal)* — Environmental Engineering
CH McLeod *BScEng (Natal)* — Structures & Design
M Kumarasamy *BE, ME, PhD (IIT Roorkee)* — Hydraulics
JJ 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

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

Honorary Research Fellows

SK Venayagamoorthy *BScEng, MScEng, PhD (Stanford)* — Enviro Fluid Mechanics

School of Electrical, Electronic & Computer Engineering

Head of School
Professor S Mneney

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

S H Mneney *PrEng, BSc(Hons)Eng (Kumasi), MASc (Toronto), PhD (Dar-es-Salaam),MIEEE, 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

A F Bati *BSc, MSc, PhD (U.K.)* — Power Systems Analysis, High Voltage, Electrical Machines & Power Electronics

G Diana *BScEng (Natal)* — Power & Energy Systems

A Elmitwally *B.Sc, M.Sc, PhD (Egypt)* — Power System Analysis, Electrical Machines, Control Systems & Power Electronics

A L Jarvis *BScEng (Natal), PhD (UKZN),MSAIEE* — Superconductivity & Material Science

H Jay *BScEng (Natal), MSAAI, MSAIMC* — Analogue Systems

B Naidoo *BScEng, MScEng (Natal), MSAIEE* — Software Systems

Lecturers

K Bouallaga *DEA (Orsay), PhD (Paris VI), MIEEE, IEEE*	Electrical Machines
D Coetsee *BScEng, MScEng*	Material Science and Embedded Development
T Muddenahalli *B.Eng, M.TECH (India) MISTE (India)*	Communication Systems & Data Networks & Computer Engineering
T Quazi *BScEng (Natal) , MScEng (Natal), SMIEEE*	Communications & Computer Engineering

Adjunct Professor

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

Adjunct Senior Lecturer

B Burton, *BScEng, MScEng (Natal)*	Motion Control

School of Mechanical Engineering

Head of School

Professor G Bright

Professors

S Adali *Fellow of UKZN, 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*	Thermodynamics,Turbomachinery, Technology Education
LW Roberts* *Pr Eng, BScEng, MScEng (Natal), PhD (London), DIC, HFSAIMechE*	Design, Thermofluids

Senior Lecturers

R Bodger* *Pr Eng, BScEng (Natal)*	Design, Solid Mechanics
N Ashrafi Khorasani *BSc (Iran), MScEng, PhD (W. Ontario)*	Nonlinear Dynamics, Rheology, Nonlinear Fluid Mechanics
F L Inambao *MSc, PhD (Volgograd), MBIE*	Thermodynamics, Energy, Fluid Mechanics
S Kudari *BE (Mech), M.Tech, PhD (IIT, India), MIE (India), MIAENG*	Design, Fracture Mechanics, Mechanical Vibrations

Lecturers

M J Brooks *Pr Eng, BScEng (Natal), MScEng (Stellenbosch)*	Thermofluids, Renewable Energy
C Bemont *BScEng (Natal)*	Metallurgy, Materials
R Stopforth *BSc, MSc CompSci, MSAIEE, MIEEE*	Electronics, Communication, Network Security, Mechatronics, Robotics

Part Time Lecturers

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

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

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
Vacant — Agricultural Engineering
L F Lagrange *BEng, MEng (Pretoria), MSAIAE* — Agricultural Engineering
A Senzanje *BScHons, MSc(Cranfield), PhD (Colorado)* — Agricultural Engineering

Lecturers
K T Chetty *BSc, BScHons (Natal)* — Hydrology
M L Warburton *BSc, BScHons, MSc (Natal)* — Hydrology
S I Ernst *MSc (Bonn)* — Hydrology

Senior Tutors
MJC Horan *BSc, BScHons (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

P Podwojewski *Dr- HDR (Paris), PhD (Strasbourg), MSc* — Hydrology

Honorary Associate Professors

V Chaplot *PhD(ENSA), MSc, BSc* — Hydrology

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

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

Honorary Research Fellow

J-L Janeau *BSc Eng* — Hydrology

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 subjects, 5 of which must be from the designated list, 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 Centre for Science Access

Students wanting to proceed to Engineering from the Science Foundation Programme (SFP) or the BSc4 (Foundation) programme must meet the performance requirements outlined in Rule EB1(c).

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
The Keith Barnett Prize	Final year candidate who submits the best dissertation/design project in Fluids/ Hydraulics/ Coastal Engineering	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 2009

FIRST SEMESTER	Monday, 09 February – Saturday, 27June
WINTER VACATION	Sunday, 28 June – Sunday, 19 July
SECOND SEMESTER	Monday, 20 July – Wednesday, 2 December

PRE-SEMESTER:			
	Mon, 05 – Fri, 09 Jan	Mon, 05 Jan	University Offices open
		Thurs, 08 Jan	Deadline for submission of Exclusion Appeals to Faculty Offices (for November 2008 examinations)
		Wed, 07 – Wed, 14 Jan	Supplementary Exams
	Mon, 12 – Fri, 16 Jan	Mon, 12 - Wed, 14 Jan	FEACOM meetings
	Mon, 19 – Fri, 23 Jan	Wed, 21 Jan	Supp Exam marks to be captured
		Thurs, 22 – Mon, 26 Jan	AEACOM meetings
		Sat, 24 Jan	Parents' Day
	Mon, 26 – Fri, 30 Jan	Mon, 26 Jan	Orientation & Registration (New students) (HC, PMB, WV) commences
		Wed, 28 Jan	Arrival: International students Release of Supp results
		Thurs, 29 Jan – Fri, 30 Jan	Orientation: International students
	Mon, 02 – Fri, 06 Feb	Mon, 02 – Sat, 07 Feb	Registration (Returning students) (HC, PMB, WV) Orientation and Registration (New students) continues

SEMESTER 1:			
1	Mon, 09 – Fri, 13 Feb	Mon, 09 Feb	Lectures commence
		Wed, 11 Feb	Application for re-marks to Faculty Offices
		Fri, 13 Feb	Final date for registration (Semester 1 & Year registrations)
		Fri, 13 Feb	Final date for submitting curriculum changes
2	Mon, 16 – Fri, 20 Feb		
3	Mon, 23 – Fri, 27 Feb		
4	Mon, 02 – Fri, 06 Mar		
5	Mon, 09 – Fri, 13 Mar		

6	Mon, 16 – Fri, 20 Mar	Mon, 16 Mar	Final day for capturing of graduation decisions onto the computer system (Undergraduate Studies)
		Sat, 21 Mar	*Human Rights Day*
7	Mon, 23 – Fri, 27 Mar	Fri, 27 Mar	Final day for capturing of graduation decisions onto the computer system (Postgraduate Studies)
8	Mon, 30 Mar – Fri, 03 Apr	Tues, 31 Mar	Final day for submission of graduation programmes to the Central Graduation Office
		Fri, 03 Apr	Final day for withdrawal from a module (Semester 1 & Year registrations)
		Fri, 03 Apr	Lectures end
	Sat, 04 – Mon, 13 Apr	STUDENT EASTER VACATION	
		Fri, 10 Apr *Mon, 13 Apr*	*Good Friday (Public Holiday)* *Family Day (Public Holiday)*
9	Tue, 14 – Fri, 17 Apr	Tues, 14 Apr	*Follow Monday's timetable* Lectures continue
		Tues, 14 Apr	Final timetable for main and supplementary examinations released
		Fri, 17 – Sat, 18 Apr	Graduation Ceremonies (PMB)
10	Mon, 20 – Sat, 25 Apr	Mon, 20 Apr – Sat, 25 Apr	Graduation Ceremonies (WV)
11	Mon, 27 Apr – Fri, 01 May	*Mon, 27 Apr* Wed, 29 Apr *Fri, 1 May*	*Freedom day (Public Holiday)* Follow Friday's timetable *Workers Day (Public Holiday)*
12	Mon, 04 – Fri, 08 May	Fri, 8 May	Final day for withdrawal from the University (Semester 1 & Year registrations)
13	Mon, 11 – Fri, 15 May		
14	Mon, 18 – Fri, 22 May	Tues, 19 May	DP Refusals published and sent to Faculty Office
		Wed, 20 May	Lectures end
		Thurs, 21 – Tues, 26 May	Study period
		Fri, 22 May	Deadline for submission of DP Appeals to Faculty Offices
	Mon, 25 May – Fri, 29 May	Wed, 27 May	Exams commence (incl. Saturdays)
	Mon, 01 – Sat, 06 Jun		Exam Week
	Mon, 08 – Sat, 13 Jun	Sat, 13 Jun	Exams end

	Mon, 15 – Sat, 20 Jun	Sun, 14 – Thurs, 18 Jun	Break between Exams
		Fri, 19 Jun	1st-semester Supplementary Exams commence
	Mon, 22 – Fri, 27 Jun	Sat, 27 Jun	Supp Exams end
Semester 1: Teaching days: Monday 13, Tuesday 13, Wednesday 13, Thursday 13, Friday 13: **65 days** Study leave: 6 days; Examinations: 16 days; Supplementary Examinations: 8 days			

MID-YEAR BREAK:			
	Sun, 28 Jun – Sun, 19 Jul	Mon, 06 Jul	Supplementary Exam results to be captured
		Wed, 15 Jul	Release of Exam results

SEMESTER 2:			
1	Mon, 20 – Fri, 24 Jul	Mon, 20 July	Lectures commence
		Fri, 24 July	Final date for registration for second semester
		Fri, 24 July	Final date for submitting curriculum changes
2	Mon, 27 Jul – Fri, 31 Jul	Wed, 29 Jul	Applications for Re-marks to Faculty Offices Deadline for submission of Exclusion Appeals
3	Mon, 03 – Fri, 07 Aug	Mon, 3 – Wed, 5 Aug	FEACOM meetings
4	Mon, 10 – Fri, 14 Aug	*Sun, 09 Aug* *Mon, 10 Aug*	*National Women's Day (Public Holiday)* *Public Holiday in lieu of Sunday*
		Tues, 11 – Fri, 14 Aug	AEACOM meetings
5	Mon, 17 – Fri, 21 Aug		
6	Mon, 24 - Fri, 28 Aug		
7	Mon, 31 – Fri, 04 Sep		
8	Mon, 07 – Fri, 11 Sep		
9	Mon, 14 – Fri, 18 Sep	Fri, 18 Sep	Final date for withdrawal from a module Lectures end
	Sat, 19 – Sun, 27 Sep	STUDENT MID - TERM BREAK	
		Thurs, 24 Sep	*Heritage Day (Public Holiday)*
10	Mon, 28 Sept – Fri, 02 Oct	Mon, 28 Sep	Final timetable for main and supplementary examinations released Lectures continue *Yom Kippur (day of condoned absence)*
10	Mon, 05 – Fri, 09 Oct		
11	Mon, 12 – Fri, 16 Oct		

12	Mon, 19 – Fri, 23 Oct	Thurs, 22 Oct	DP Refusals published and sent to Faculty Office
		Fri, 23 Oct	Lectures end
	Sat, 24 – Thurs, 29 Oct		Study period
13	Mon, 26 - Fri, 30 Oct	Tues, 27 Oct	Final date for submission for DP Appeals to Faculty Office
		Fri, 30 Oct	Exams commence (incl. Saturdays)
		Fri, 30 Oct	Final date for submission of Faculty handbooks for 2010
14	Mon, 02 – Sat, 07 Nov		Exam week
15	Mon, 09 – Fri, 13 Nov		Exam week
16	Mon, 16 – Fri, 20 Nov	Tues, 17 Nov	Exams end
		Wed, 18 – Sun, 22 Nov	Break between Exams
17	Mon, 23 – Fri, 27 Nov	Mon, 23 Nov	2nd semester Supplementary Exams commence
		Fri, 27 Nov	*Eid-ul-Adha (day of condoned absence)*
18	Mon, 30 Nov – Wed, 02 Dec	Wed, 2 Dec	Supplementary Exams end Last day for submission of theses/dissertations to the Faculty Offices for April 2010 Graduation

Semester 2:
Teaching days: Monday 12, Tuesday 13, Wednesday 13, Thursday 13, Friday 13: **64 days**
Study leave: 6 days; Examinations: 16 days, Supplementary Examinations: 8 days

YEAR-END BREAK:			
	Thur, 3 Dec – Fri, 04 Dec		
	Mon, 07 – Fri, 11 Dec	Wed, 09 Dec	Exam marks to be captured
	Mon, 14 – Fri, 18 Dec	*Wed, 16 Dec*	*Day of Reconciliation (Public Holiday)*
		Fri, 18 Dec	Release of results
	Mon, 21 – Fri, 25 Dec	Thurs, 24 Dec	University closes

Supplementary Exams	Wednesday, 07 January – Wednesday, 14 January
Orientation and Registration	Monday, 26 January – Saturday, 07 February (New students)
Registration	Monday, 02 February – Saturday, 07 February (Returning students)
Semester 1	Monday, 09 February – Wednesday, 20 May
Easter Vacation	Saturday, 04 April – Monday, 13 April
Study period	Thursday, 21 May – Tuesday, 26 May
1st-Semester Exams	Wednesday, 27 May - Saturday, 13 June
Break between Exams	Sunday, 14 June – Thurs, 18 June
Supplementary Exams	Friday, 19 June – Saturday, 27 June
July Vacation	Sunday, 28 June – Sunday, 19 July
Semester 2	Monday, 20 July – Friday, 23 October
Mid term Break	Saturday, 19 September – Sunday, 27 September
Study period	Saturday, 24 October – Thursday, 29 October
2nd Semester Exams	Friday, 30 October – Tuesday, 17 November
Break between Exams	Wednesday, 18 November – Sunday, 22 November
Supplementary Exams	Monday, 23 November – Wednesday, 02 December

PUBLIC HOLIDAYS AND DAYS OF CONDONED ABSENCE

PUBLIC HOLIDAYS

DATE	DAY	HOLIDAY
1 January	Thursday	New Year's Day
21 March	Saturday	Human Rights Day
10 April	Friday	Good Friday
13 April	Monday	Family Day
27 April	Monday	Freedom Day
1 May	Friday	Workers' Day
16 June	Tuesday	Youth Day
9 August	Sunday	National Women's Day
10 August	Monday	*In lieu* of Sunday
24 September	Thursday	Heritage Day
16 December	Wednesday	Day of Reconciliation
25 December	Friday	Christmas Day
26 December	Saturday	Day of Goodwill

RELIGIOUS HOLIDAYS and DAYS OF CONDONED ABSENCE

DAY	DATE	HOLY DAY
Saturday	19 September	Rosh Hashanah *(commences at nightfall the previous day)*
Sunday	20 September	Eid-ul-Fitr *(fasting commences on 22 August)*
Monday	28 September	Yom Kippur *(commences at nightfall the previous day)*
Saturday	17 October	Diwali/Deepavali
Friday	27 November	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 including supervision 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 academic staff including persons who hold honorary appointments in the University 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.

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

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

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. Supplementary examinations shall not be awarded for any continuously assessed components of modules.

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.
a) 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.
b) 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 National Senior Certificate (NSC) endorsed for Bachelors degrees, or 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 unsatisfactory.
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 and then not more than once.

CR11 Progression

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

CR12 Submission of dissertation

At least three months before the dissertation is to be submitted for examination, a student shall give notice, in writing, to the Postgraduate Office 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.
d) A dissertation submitted under (c) above shall include a detailed description of the student's own distinct contribution to the papers.

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

CR16 Re-examination of dissertation

a) A failed dissertation may not be re-examined.

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 Postgraduate Office 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.

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

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

MR12 Re-examination of dissertation

a) A failed dissertation may not be re-examined.

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

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 submitted a thesis for examination shall be required to apply for re-registration, which will only be permitted on receipt of a satisfactory motivation.

DR8 Submission of thesis

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

DR10 Supervisor's report

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

DR11 Examination

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

DR12 Defence of thesis

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

DR13 Re-examination of thesis

A failed thesis may not be re-examined.

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

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

DS2 Criteria for admission

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

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

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

DS3 Period of registration

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

DS4 Subject of study

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

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

DS5 Submission of thesis

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

b) The published work submitted by a candidate may range over a number of different topics, but these should normally relate in a coherent way to a body of knowledge within a field recognised by the faculty. The amount of work submitted should be substantial, and concluded over a significant period of time having regard to the contribution to the discipline.
c) Candidates may not submit work previously submitted as a thesis for the degree of Doctor of Philosophy or a supervised Doctoral degree.
d) The Board of the faculty may appoint an appropriately qualified academic who is a member of the University staff, to advise the candidate on how to present the material for submission.

DS6 Format of thesis

a) Every thesis submitted shall include a declaration to the satisfaction of the Senate stating that it has not previously been submitted for a degree in this or any other university.
b) Every thesis submitted shall be in such format as prescribed by the Senate and the rules of the relevant faculty; provided that each thesis shall include an introduction in English linking the published work and explaining its significance and coherence.
c) Every thesis submitted shall include a signed statement indicating the level of contribution to each publication and role of the candidate as sole author, senior/principal author or co-author.
d) A thesis may comprise of published books and monographs, chapters in books, edited works, refereed conference proceedings, papers in peer-reviewed journals, accompanied by a comprehensive concluding integrative chapter.

DS7 Assessment

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

RULES FOR CERTIFICATES AND DIPLOMAS

Note: The following 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: ENUN01D Introduction to Engineering Drawing, ENUN0PY Physics, ENUN0CY Chemistry, ENUN0ME Mechanics, ENUN0EC Engineering Communications, ENUN0MA Supplementary Mathematics. Furthermore, they must pass MATH131 Maths 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, a student must achieve an average of 70% for all Foundation modules, with at least 70% for each of Mathematics (or 65% for Additional Foundation Mathematics), Chemistry and Physics; and no failed modules.

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.

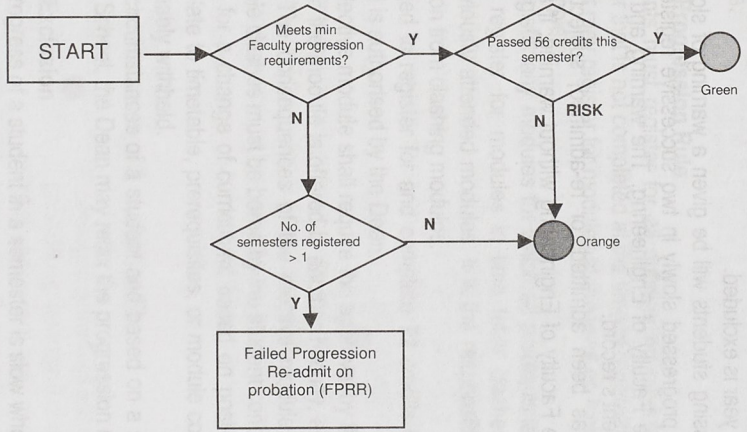
b) All slowly progressing students will be given a warning of slow academic progress. A student who has progressed slowly in two successive registered semesters, shall be excluded from the Faculty of Engineering. The warning and exclusion decision shall remain in the student's record.

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

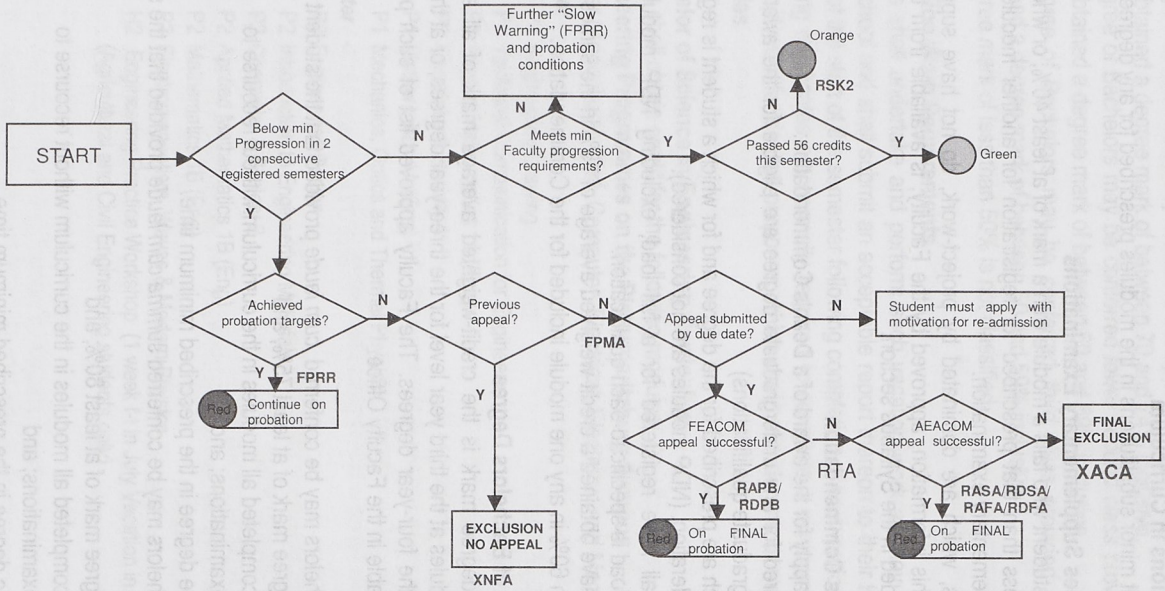
Students current status is:

Students who were never previously below the minimum Faculty progression requirement.



Semesters	Minimum Progression	Maximum	75%
1	48	72	54
2	96	144	108
3	144	216	162
4	192	288	216
5	240	360	270
6	288	432	324
7	336	504	378
8	384	576	432
9	432		
10	480		
11	528		
12	576		

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" and "consult the Faculty Advancement and Support Program - ASAP" should be applied where probation is required (i.e. 70% of normal load)
Note: Students who are granted Supplementary exams are considered to have failed the exam. Term decisions may be rescinded after successful supplementary examinations.

The RISK/RSK2 would NOT be applicable to students who registered for less than 56 credits at the recommendation and approval of the School and passed all, and in cases where students obtained 75% of the maximum credits required by the Faculty progression requirements.

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 b), 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) 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
ENCH1TC	P1	Technical Communication for Engineers	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
ENCV1EP	H2	Engineering Practice 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
ENCH1TR	P1	Technical Communication for Engineers	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 **OR**	
MATH238	H1	Mathematics 2A (Eng)	16
HYDR210	P1	Introduction to Physical 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)	
ENAG3FP	P1	Principles of Food Processing+# (8C)	
ENAG4ST	P1	Selected Topics in Bioresources Engineering# (8C)	
2nd Semester			Credits
MATH241	P2	Further Calculus and Differential Equations **OR**	
MATH248	H2	Mathematics 2B (Eng)	16
COMP102	P1	Computer Programming **OR**	
ENEL2CM	H1	Applied Computer Methods **&** CPHY221 P1 Introduction to Fortran	16
STAT101	P2	Basic Statistics **OR**	
STAT143	P2	Further Statistics for Natural Sciences **OR**	8
STAT370	H1	Engineering Statistics	
AGEC240	P2	Farm Financial Management	8
24 Credits selected from the following			24
ENAG4HY	P2	Environmental Hydrology# (16C)	
HYDR322	P2	Environmental Water Quality (8C)	
ENAG4EC	P2	Environmental Control+# (8C)	
ENAG4FE	P2	Food Engineering Unit Operations+# (8C)	
ENAG4SW	P2	Soil & Water Conservation Eng+# (8C)	
ENAG4AP	P2	Advanced Power and Traction +# (8C)	

ENAG4EA P2 Electrical Applications+# (8C)
ENAG3FE P2 Forest Engineering+# (8C)
ENAG4SE P2 Sustainable Energy for Bio-Systems+# (8C)
ENAG4ST P2 Selected Topics in Bioresources Engineering# (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 (Modified Agricultural Engineering Programme on Pietermaritzburg campus

1st Semester			**Credits**
ENAG4BD	PY	Design Project#	8
CTEC733	P1	Business Management **OR**	
ENCH4ML	H1	Engineering Management & Labour Relations	8
ENAG4EH	P1	Engineering Hydrology	16
24 Credits selected from the following			24
ENAG3PT	P1	Power & Traction+# (8C)	
ENAG3EI	P1	Irrigation Engineering+# (16C)	
ENAG4BM	P1	Bio-Production Systems & Management+# (16C)	
ENAG3FP	P1	Principles of Food Processing+ (8C)	
ENAG4ST	P1	Selected Topics in Bioresources Engineering# (8C)	
16 Credits selected from the following:*			16
ENVS221	P1	Environmental Assessment (8C)	
AGPS305	P1	Field Crop Management (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**
ENAG4BD	PY	Design Project#	16
Elective (Complementary studies)			16
24 Credits selected from the following			24
ENAG4HY	P2	Environmental Hydrology# (16C)	
HYDR312	P2	Dam Design (8C)	
ENAG4EC	P2	Environmental Control+# (8C)	
ENAG4SW	P2	Soil & Water Conservation Eng+# (8C)	
ENAG4FE	P2	Food Engineering Unit Operations+# (8C)	
ENAG4AP	P2	Advanced Power and Traction +# (8C)	
ENAG4EA	P2	Electrical Applications+# (8C)	
ENAG3FE	P2	Forest Engineering+# (8C)	
ENAG4SE	P2	Sustainable Energy for Bio-Systems# (8C)	
ENAG3ST	P2	Selected Topics in Bioresources Engineering# (8C)	

16 Credits selected from the following:* 16

SSCI230 P2 Pedology (16C)
AGPS304 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
ENCH1TC	H1	Technical Communication for Engineers	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	Introduction to Civil Design	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 **Or**	
ENAG4EA	P2	Electrical Applications **&** ENAG4SE P2 Sustainable Energy for Bio-Systems	16
ENCV2SA	H1	Structures 1	16
ENCV3G1	H1	Geotechnical Engineering Studies 1	16
ENSV2SE	H1	Surveying (Eng)	16
ENME2TH	H1	Thermodynamics 1	8
2nd Semester			**Credits**
ENCV2SD	H2	Structural Design 1	16
ENCV2FL	H2	Fluids 1	8
ENCV2SB	H2	Structures 2	16
ENME3TH	H2	Thermodynamics 2	8
ENEL2EN	H2	Environmental Engineering **Or**	
ENVS221	P2	Environmental Assessment	8
ENME2DM	H2	Design Methods	16

C. Chemical Engineering Programme

First Year

1st Semester	**Credits**
ENCH1EA H1 Chemical Engineering Principles 1	8
ENCH1TC H1 Technical Communication for Engineers	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
ENCH2OM H1 Oil & Mineral Processing	8
ENEL2CM H1 Applied Computer Methods	8
ENEL2EE H1 Electrical & Electronic Engineering	16
CHEM241 H1 Applied Organic Chemistry for Chemical Engineers	8
MATH238 H1 Mathematics 2A (Eng)	16
ENME1DR H1Engineering Drawing	8
2nd Semester	**Credits**
ENCH2CP H2 Chemical Engineering Practicals 1	8
ENCH2EF H2 Chemical Engineering Fundamentals	16
ENCH2IT H2 Instrument Technology	8
ENCH2MS H2 Materials of Construction	8
ENCH2TD H2 Thermodynamics 1	8
ENCH2WS H2 Workshop Training (2 weeks)	DP
CHEM251 H2 Applied Physical Chemistry for Chemical Engineers	8
MATH248 H2 Mathematics 2B (Eng)	16

Third Year

1st Semester	**Credits**
ENCH3FD H1 Fluid Mechanics Design	8
ENCH3FM H1 Fluid Mechanics	8
ENCH3HE H1 Heat Transfer	16
ENCH3SL H1 Safety & Loss Prevention	8
ENCH3TH H1 Thermodynamics 2	8
CHEM261 H1 Applied Inorganic Chemistry for Chemical Engineers	8
MATH354 H1 Mathematics 3A (Eng)	8
STAT370 H1 Engineering Statistics	8

2nd Semester	Credits
ENCH3CP H2 Chemical Engineering Practicals 2	8
ENCH3EC H2 Chemical Engineering Design	8
ENCH3MP H2 Materials Processing	8
ENCH3MT H2 Mass Transfer	16
ENCH3PO H2 Process Modelling & Optimization	16
ENCH3RT H2 Reactor Technology Fundamentals	16

Fourth Year

1st Semester	Credits
ENCH4DC H1 Process Dynamics and Control	16
ENCH4LA H1 Laboratory/Industry Project 1	16
ENCH4ML H1 Engineering Management & Labour Relations	8
ENCH4MT H1 Advanced Mass Transfer	8
ENCH4RT H1 Applied Reactor Technology	8
ENCH4TR H1 Technical Report Writing	DP
Plus one of the following modules (Engineering modules):	
ENCH4CA H1 Chemical Engineering Topics 1	8
ENCH4CG H1 Coal Technology and Gasification	8
ENCH4MP H1 Mineral Processing	8
ENCH4WP H1 Wood Pulping Technology	8
ENCH2BE H1 Biochemical and Environmental Engineering (continuing students only)	8
Plus one of the following modules from complementary studies:	
Elective module (complimentary studies)	8

2nd Semester	Credits
ENCH4DP H2 Chemical Engineering Design Project	32
ENCH4PE H2 Projects and the Environment	8
ENEL4EB H2 Engineering Business	8
ENCH4VW HC Practical Vacation Work (12 weeks)	DP
Plus one of the following modules (Engineering modules):	
ENCH4AB H2 Applied Biochemical Engineering	8
ENCH4CB H2 Chemical Engineering Topics 2	8
ENCH4EI H2 Environmental Impact Assessment	8
ENCH4EM H2 Extractive Metallurgy	8
ENCH4LB H2 Laboratory/Industry Project 2	8
ENCH4PM H2 Paper Making Technology	8
ENCH4PP H2 Petroleum and Synthetic Fuel Processing	8
Plus 16C of the modules from complementary studies:	
Elective module 1(complementary studies)	8
Elective module 2(complementary studies)	8

D. Civil Engineering Programme

First Year

1st Semester	Credits
ENCH1TC H1 Technical Communication for Engineers	8
ENME1DR H1Engineering Drawing	8
CHEM181 H1 Chemistry 1A	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 Introduction to Civil Design	8
ENME1EM H2 Introduction to Engineering Materials	8
CHEM191 H2 Chemistry for Engineers 1B	8
MATH142 H2 Applied Mathematics 1B (Eng)	16
MATH141 H2 Mathematics 1B (Eng)	16
PHYS152 H2 Engineering Physics 1B	16
ENCV1EP H2 Engineering Practice Workshop (1 week full-time in July Vacation)	DP

Second Year

1st Semester	Credits
ENCV2MT H1 Civil Engineering Materials	8
ENCV2SA H1 Structures 1	16
ENSV2SE H1 Surveying (Engineering)	16
MATH238 H1 Mathematics 2A (Eng)	16
Elective Module(s)	16
2nd Semester	**Credits**
ENCV2FL H2 Fluids 1	8
ENCV2SB H2 Structures 2	16
ENCV2SD H2 Structural Design 1	16
GEOL215 H2 Elements of Geology for Civil Engineers	16
MATH248 H2 Mathematics 2B(Eng)	16
ENCV2MW H2 Materials workshop (1 week full-time in July vacation)	DP

Third Year

1st Semester	Credits
ENCV3FA H1 Fluids 2	16
ENCV3G1 H1 Geotechnical Engineering Studies 1	16
ENCV3ST H1 Structures 3	16
ENCV3TT H1 Transport 1	16
STAT370 H1 Engineering Statistics	8
	Credits

2nd Semester

ENCV3SD H2 Structural Design 2	16
ENCV3FB H2 Fluids 3	16
ENCV3G2 H2 Geotechnical Engineering Studies 2	16
ENCV3MS H2 Mathematical Systems	8
ENCV3TP H2 Transport 2	8
ENCV3CW H2 Civil CADD workshop (1 week full-time) in July vacation	DP
Elective module	8

Fourth Year

1st Semester	**Credits**
ENCV4WE H1 Water and Environmental Engineering	16
ENCV4GS H1 Ground & Structural Engineering	16
ENCV4TE H1 Transport and Environmental Management	16
ENPD7PP H1 Professional Practice	8
Elective module(s)	16

2nd Semester	**Credits**
ENCV4DE H2 Civil Engineering Design Project	24
ENCV4DS H2 Dissertation	24
ENPD7CL H2 Management of Construction Contracts	8
ENCV4VW HC Practical Vacation Work (11 weeks)	DP
Elective module(s)	16

Some possible elective modules, which are subject to availability:

ENCV4FL HC Fluids 4	8
ENCV4DV HC Development Engineering	8
ENCV4PE HC Pavement Engineering	8
ENCV4TI HC Traffic Intersections	8
ENCV4AA HC Auxiliary A	8
ENCV4AB HC Auxiliary B	8
ENCV4AD HC Auxiliary D	8

Notes to Civil Engineering Programme:

1. *Civil Engineering candidates must complete 56 credits of elective modules of which at least 32 credits must be in Social Studies and Humanities. A minimum of 16 credits of electives will be required at 4th year level. The Head of School must approve all electives.*
2. *Prerequisites may be imposed for non-Civil Engineering candidates registering for any of the above modules.*
3. *Candidates must have been registered for and have obtained the specified minimum grade in all prerequisite modules to be eligible for registration in a module.*

E. Computer Engineering Programme

First Year

1st Semester	Credits
ENCH1TC H1 Technical Communication for Engineers	8
ENME1DR H1 Engineering Drawing	8
CHEM181 H1 Chemistry for Engineers 1A	8
MATH132 H1 Applied Mathematics 1A(Eng)	16
MATH131 H1 Mathematics 1A(Eng)	16
PHYS151 H1 Engineering Physics 1A	16
2nd Semester	***Credits***
ENEL1ED H2 Electrical Design 1	8
ENME1EM H2 Introduction to Engineering Materials	8
CHEM191 H2 Chemistry for Engineers 1B	8
MATH142 H2 Applied Mathematics 1B(Eng)	16
MATH141 H2 Mathematics 1B(Eng)	16
PHYS152 H2 Engineering Physics 1B	16

Second Year

1st Semester	*Credits*
ENEL2CA H1 Computer Methods 1	8
ENEL2EA H1 Electrical Principles 1	16
MATH239 H1 Applied Finite Mathematics	8
MATH238 H1 Mathematics 2A(Eng)	16
PHYS251 H1 Optics and Wave Motion	8
Elective modules	16
2nd Semester	***Credits***
ENEL2CB H2 Computer Methods 2	8
ENEL2DS H2 Data Structures & Algorithms	8
ENEL2EN H2 Environmental Engineering	8
ENEL2EB H2 Electrical Principles 2	16
MATH248 H2 Mathematics 2B(Eng)	16
ENEL2FT H2 Field Theory	8
ENEL2SE H2 Software Engineering 1	8
ENEL2WS H2 Workshop Practice Module (1 week full-time July/August)	DP

Third Year

1st Semester	*Credits*
ENEL3CA H1 Computer Engineering Design 1	8
ENEL3DS H1 Digital Systems	16
ENEL3TA H1 Analogue Electronics 1	8
STAT370 H1 Engineering Statistics	8
MATH354 H1 Mathematics 3(Eng)	8
ENEL3CC H1 Computer Methods 3	8
ENEL3SS H1 Systems and Simulation	8
ENCH4ML H1 Engineering Management & Labour Relations	8

2nd Semester	*Credits*
ENEL3SF H2 Software Engineering 2	8
ENEL3CO H2 Communications	16
ENEL3CB H2 Computer Engineering Design 2	8
ENEL3AE H2 Analogue Electronics 2	8
ENEL3DE H2 Digital Electronics	8
ENEL3CS H2 Control Systems 1	8
MATH349 H2 Discrete Mathematics	8
MATH360 H2 Numerical Methods	8

Fourth Year

1st Semester	*Credits*
ENEL4AA H1 Design & Analysis of Algorithms	8
ENEL4CA H1 Computer Engineering Design 3	16
ENEL4CO H1 Computer Architecture and Organisation	8
ENEL4DC H1 Digital Communications	8
ENEL4DT H1 Data Communications	8
ENEL4EE H2 Engineering Entrepreneurship	8
ENEL4OS H1 Operating Systems for Engineers	8
Plus one from the following options:	
ENEL4CM H1 E-commerce Systems	8
ENEL4CS H1 Control Systems 2	8
ENEL4SE H1 Security and Encryption	8
ENEL4TC H1 Selected Topics in Computer Engineering 1	8
ENEL4DS H1 Digital Signal Processing	8

2nd Semester	*Credits*
ENEL4CB H2 Computer Engineering Design Project	32
ENEL4EB H1 Engineering Business	8
ENEL4ES H2 Embedded Systems	8
ENEL4IE H2 Internet Engineering	8
ENEL4RC H2 Real Time Computing (self-study)	8
ENEL4VW HC Vacation Work (13 weeks)	DP
Plus one from the following options:	
ENEL4AI H2 Artificial Intelligence	8
ENEL4CC H2 Distributed Computing Systems	8
ENEL4IP H2 Image Processing	8
ENEL4ST H2 Selected Topics in Computer Engineering 2	8
ENEL4VL H2 VLSI Design	8

F. Electrical Engineering Programme

First year

1st Semester	Credits
ENCH1TC H1 Technical Communication for Engineers	8
ENME1DR H1 Engineering Drawing	8
CHEM181 H1 Chemistry for Engineers 1A	8
MATH132 H1 Applied Mathematics 1A (Eng)	16
MATH131 H1 Mathematics 1A (Eng)	16
PHYS151 H1 Engineering Physics 1A	16
2nd Semester	**Credits**
ENEL1ED H2 Electrical Design 1	8
ENME1EM H2 Introduction to Engineering Materials	8
CHEM191 H2 Chemistry for Engineers 1B	8
MATH142 H2 Applied Mathematics 1B (Eng)	16
MATH141 H2 Mathematics 1B (Eng)	16
PHYS152 H2 Engineering Physics 1B	16

Second Year

1st Semester	Credits
ENEL2CA H1 Computer Methods 1	8
ENEL2EA H1 Electrical Principles 1	16
ENME2TF H1 Thermofluids	8
ENME2 MS H1 Material Strengths	8
MATH239 H1 Applied Finite Mathematics	8
MATH238 H1 Mathematics 2A (Eng)	16
PHYS251 H1 Optics and Wave Motion	8
2nd Semester	**Credits**
ENEL2CB H2 Computer Methods 2	8
ENEL2NP H2 Nuclear and Semiconductor Physics	8
ENEL2ED H2 Electrical Design 2	8
ENEL2EB H2 Electrical Principles 2	16
ENEL2FT H2 Field Theory	8
MATH248 H2 Mathematics 2B (Eng)	16
ENEL2EN H2 Environmental Engineering	8
ENEL2WS H2 Workshop Practice Module (1 week full-time) July/August	DP

Third Year

1st Semester	Credits
ENEL3EA H1 Electrical Design 3	8
ENEL3TA H1 Analogue Electronics 1	8
ENEL3DS H1 Digital Systems	16
ENEL3MA H1Electrical Machines 1	8
ENEL3SS H1 Systems and Simulation	8
MATH354 H1 Mathematics 3 (Eng)	8
STAT370 H1Engineering Statistics	8
ENCH4ML H1 Engineering Management & Labour Relations	8
2nd Semester	**Credits**
ENEL3EM H2 E-M Theory	8
ENEL3AE H2 Analogue Electronics 2	8
ENEL3DE H2 Digital Electronics	8
ENEL3CS H2 Control Systems 1	8
ENEL3EB H2 Electrical Design 4	8
ENEL3MB H2 Electrical Machines 2	8
ENEL3PS H2 Power Systems 1	16
ENEL3PE H2 Power Electronics 1	8

Fourth Year

1st Semester	Credits
ENEL4EA H1 Electrical Design 5	24
ENEL4EE H2 Engineering Entrepreneurship	8
Elective module	8
Plus three or four from the following options:	
ENEL4CS H1 Control Systems 2	8
ENEL4HA H1 High Voltage Engineering 1	8
ENEL4MA H1 Electrical Machines 3	8
ENEL4PA H1 Power Electronics 2	8
ENEL4WA H1 Power Systems 2	8
Plus one or none from the following options:	
ENEL4IN HI Instrumentation	8
ENEL4SA H1 Selected topics in Electrical Engineering 1 (self-study)	8
2nd Semester	**Credits**
ENEL4EB H1 Engineering Business	8
ENEL4EP H2 Electrical Design Project	32
ENEL4VW HC Vacation Work (13 weeks)	DP
Elective module	8

Plus two or three from the following options:

ENEL4HB H2 High Voltage Engineering 2	8
ENEL4MB H2 Electrical Machines 4	8
ENEL4PB H2 Power Electronics 3 (self-study)	8
ENEL4SS H2 Power System Stability	8
ENEL4WB H2 Power Systems 3 (self-study)	8

Plus one or none from the following options:

ENEL4AM H2 Automation	8
ENEL4ES H2 Embedded Systems	8
ENEL4IL H2 Illumination	8
ENEL4OR H2 Operations Research	8
ENEL4SB H2 Selected topics in Electrical Engineering 2 (self-study)	8

G. Electronic Engineering Programme

First Year

1st Semester	**Credits**
ENCH1TC H1 Technical Communication for Engineers	8
ENME1DR H1 Engineering Drawing	8
CHEM181 H1 Chemistry for Engineers 1A	8
MATH132 H1 Applied Mathematics 1A (Eng)	16
MATH131 H1 Mathematics 1A (Eng)	16
PHYS151 H1 Engineering Physics 1A	16

2nd Semester	**Credits**
ENEL1ED H2 Electrical Design 1	8
ENME1EM H2 Introduction to Engineering Materials	8
CHEM191 H2 Chemistry for Engineers 1B	8
MATH142 H2 Applied Mathematics 1B (Eng)	16
MATH141 H2 Mathematics 1B (Eng)	16
PHYS152 H2 Engineering Physics 1B	16

Second Year

1st Semester	**Credits**
ENEL2CA H1 Computer Methods 1	8
ENEL2EA H1 Electrical Principles 1	16
ENME2TF H1 Thermofluids	8
MATH239 H1 Applied Finite Mathematics	8
MATH238 H1 Mathematics 2A (Eng)	16
PHYS251 H1 Optics and Wave Motion	8
ENEL2PA H1 Physical Electronics 1	8

2nd Semester	**Credits**
ENEL2CB H2 Computer Methods 2	8
ENEL2ED H2 Electrical Design 2	8
ENEL2EB H2 Electrical Principles 2	16
ENEL2EN H2 Environmental Engineering	8

ENEL2FT H2 Field Theory	8
ENEL2PB H2 Physical Electronics 2	8
MATH248 H2 Mathematics 2B (Eng)	16
ENEL2WS H2 Workshop Practice module (1 week full-time) July/August	DP

Third Year

1st Semester	**Credits**
ENEL3DA H1 Electronic Design 1	8
ENEL3DS H1 Digital Systems	16
ENEL3SS H1 Systems and Simulation	8
ENEL3TA H1 Analogue Electronics 1	8
MATH354 H1 Mathematics 3 (Eng)	8
STAT370 H1 Engineering Statistics	8
ENEL3CC H1 Computer Methods 3	8
ENCH4ML H1 Engineering Management & Labour Relations	8
2nd Semester	**Credits**
ENEL3CO H2 Communications	16
ENEL3CS H2 Control Systems 1	8
ENEL3DB H2 Electronic Design 2	8
ENEL3EM H2 E-M Theory	8
ENEL3PE H2 Power Electronics 1	8
ENEL3AE H2 Analogue Electronics 2	8
ENEL3DE H2 Digital Electronics	8
MATH360 H2 Numerical Methods	8

Fourth Year

1st Semester	**Credits**
ENEL4DA H1 Electronic Design 3	16
ENEL4EC H1 Analogue Electronics 3	8
ENEL4EE H2 Engineering Entrepreneurship	8
Elective Module	8
Plus three or four from the following options	
ENEL4CS H1 Control Systems 2	8
ENEL4DC H1 Digital Communications	8
ENEL4DP H1 Digital Processes	8
ENEL4DS H1 Digital Signal Processing	8
Plus one or none from the following options:	
ENEL4AC H1 Acoustics	8
ENEL4DT H1 Data Communications	8
ENEL4IN H1 Instrumentation	8
ENEL4PA H1 Power Electronics 2	8
ENEL4TA H1 Selected topics in Electronic Engineering 1	8

2nd Semester	Credits
ENEL4EB H1 Engineering Business	8
ENEL4ED H2 Electronic Design Project	32
ENEL4TB H2 Selected Topics in Electronic Engineering 2 (self-study)	8
ENEL4VW HC Vacation Work (13 weeks)	DP
Elective module	8
Plus two from the following options:	
ENEL4AI H2 Artificial Intelligence	8
ENEL4AM H2 Automation	8
ENEL4ES H2 Embedded Systems	8
ENEL4IP H2 Image Processing	8
ENEL4MS H2 Microwave Systems	8
ENEL4SC H2 Superconductivity	8
ENEL4SY H2 Communication Systems	8

H. Mechanical Engineering Programme

First Year

1st Semester	**Credits**
ENME1DR H1 Engineering Drawing	8
ENCH1TC H1 Technical Communication for Engineers	8
CHEM181 H1 Chemistry for Engineers 1A	8
MATH132 H1 Applied Mathematics 1A (Eng)	16
MATH131 H1 Mathematics 1A (Eng)	16
PHYS151 H1 Engineering Physics 1A	16
2nd Semester	**Credits**
ENME1ED H2 Mechanical Engineering Design	8
ENME1EM H2 Introduction to Engineering Materials	8
CHEM191 H2 Chemistry for Engineers 1B	8
MATH142 H2 Applied Mathematics 1B (Eng)	16
MATH141 H2 Mathematics 1B (Eng)	16
PHYS152 H2 Engineering Physics 1B	16

Second Year

1st Semester	**Credits**
ENME2CF H1 Computer Fundamentals	8
ENME2DY H1 Dynamics	8
ENME2FM H1 Fluid Mechanics 1	8
ENME2PM H1 Fundamentals of Physical Metallurgy	8
ENEL2EL H1 Electrical Engineering	16
ENME2TH H1 Thermodynamics 1	8
MATH238 H1 Mathematics 2A (Eng)	16
	Credits

2nd Semester

ENME2DM H2 Design Methods	16
ENEL2EC H2 Electronic Engineering	8
ENEL2EN H2 Environmental Engineering	8
ENME2MM H2 Measurements and Experimental Methods	8
ENME2SM H2 Strength of Materials 1	16
MATH248 H2 Mathematics 2B (Eng)	16
ENME2WS H2 Workshop Course	DP

Third Year

1st Semester	**Credits**
ENEL3MA H1 Electrical Machines 1	8
ENEL3SS H1 Systems and Simulation	8
ENME3DM H1 Design of Machine Elements	16
ENME3ST H1 Strength of Materials 2	16
MATH354 H1 Mathematics 3 (Eng)	8
STAT370 H1 Engineering Statistics	8
ENCH4ML H1 Engineering Management & Labour Relations	8

2nd Semester	**Credits**
ENME3FM H2 Fluid Mechanics 2	16
ENME3HM H2 Heat and Mass Transfer 1	16
ENME3MT H2 Manufacturing Technology	8
ENME3SM H2 Selection of Engineering Materials	8
ENME3TH H2 Thermodynamics 2	8
ENME3TM H2 Theory of Machines	8
ENEL3CS H2 Control Systems 1	8

Fourth Year

1st Semester	**Credits**
ENME4AM H1 Advanced Manufacturing Systems	8
ENME4CM H1 Engineering Computational Methods	8
ENME4FP H1 Design of Fluid Power Systems	8
ENME4PD H1 Design and Research Project 1	16
ENME4TD H1 Thermodynamics 3	8
Elective modules (see note 1)	
ENME4DM H1 Design & Analysis of Manufacturing Processes	8
ENME4ES H1 Alternative Energy Systems	8
ENME4MC H1 Mechanics of Composite Materials	8
ENME4ME HI Selected Topics in Mechanical Engineering 1	8
ENEL4EB H1 Engineering Business	8
Free elective modules (see note 2)	

Credits

2nd Semester

ENME4DP H2 Design and Research Project 2	24
ENEL4EE H2 Engineering Entrepreneurship	8
ENME4MT H2 Mechatronic Engineering	8
ENME4MV H2 Mechanical Vibrations	8
ENME4VW HC Vacation Work (12 weeks)	DP

Elective modules (see note 1)

ENME4ED H2 Mechanical Engineering Design	8
ENME4EM H2 Energy Management	8
ENME4FF H2 Fracture and Fatigue of Engineering Materials	8
ENME4MN H2 Selected Topics in Mechanical Engineering 2	8
MATH360 H2 Numerical Methods	8

Free elective modules (see note 2)

Notes to Mechanical Engineering Programme:

1. *A student shall take a total of 48 elective credits to be selected following consultation with, and approval by the Head of School.*
2. *Free elective modules are modules offered outside the College of Agriculture, Engineering and Science. Each student must complete a minimum of 24 credits of free elective modules. Any selected module(s) shall require the approval of the Dean of the Faculty of Engineering, and the Dean of the Faculty offering the module. The consequences of the elective module selection resulting in examination time-table clashes must be borne by the candidate concerned.*
3. *The remaining 24 credits should be selected from modules offered by the School of Mechanical Engineering.*
4. *Except with the approval of the Head of School, candidates shall not be registered for any fourth year modules, unless the candidate has completed the requirements for the third year of study.*

EB10 Bachelor of Science in Land Surveying Programme

Candidates shall obtain credit for the following modules:

First Year

1st Semester	**Credits**
ENCH1TC H1 Technical Communication for Engineers	8
ENSV1G1 H1 Geomatics 1	16
MATH132 H1 Applied Mathematics 1A (Eng)	16
MATH131 H1 Mathematics 1A (Eng)	16
PHYS151 H1 Engineering Physics 1A	16
2nd Semester	**Credits**
ENSV1G2 H2 Geomatics 2	16
ENSV1SA H2 Statistics and Adjustment	16
ENSV1SC H2 Survey Camp 1 (in July vacation)	8
MATH141 H2 Mathematics 1B (Eng)	16
PHYS152 H2 Engineering Physics 1B	16

Second Year

Note: Candidates shall have obtained credit for both PHYS151 and PHYS152 before registering for any Physics modules at the second year level.

1st Semester	**Credits**
ENSV2SE H1 Surveying (Engineering)	16
ENSV2HY H1 Hydrographic Surveying	16
PHYS251 H21 Optics and Wave Motion	8
MATH238 H1 Mathematics 2A Eng	16
Elective Module	16
2nd Semester	**Credits**
ENSV2CS H2 Cadastral Surveying 1	16
ENSV2RS H2 Remote Sensing	16
ENSV2SC H2 Survey Camp 2 (in July vacation)	8
ENSV2TH H2 Theory of Adjustments	16
Elective module	16

Third Year

1st Semester	**Credits**
ENEL2CA H1 Computer Methods 1	8
ENSV3CS H1 Cadastral Surveying 2	16
ENSV3PO H1 Photogrammetry	16
TNPL301 H1 Introduction to Town and Regional Planning	16
Elective Module	16
2nd Semester	**Credits**
ENSV3CG H2 Co-ordinate Systems & Geodetic Projections	16
ENSV3SC H2 Survey Camp 3 (in July vacation)	8
ENSV3SS H2 Satellite Surveying	16
TNPL302 H2 Layout Design	16
Elective Module	16

Fourth Year

1st Semester	**Credits**
ENSV4GI H1 Geographic Information Systems	16
ENSV4GY H1 Geodesy	16
ENSV4RM H1 Research Methodology	8
ENEL4EB H1 Engineering Business	8
TNPL401 H1 Law for Planners	8
ENPD3PL H1 Project Planning	16
2nd Semester	**Credits**
ENSV4TN H2 Land Tenure	16
ENSV4PS H2 Precision Engineering Surveying	8
ENPD7PP H2 Professional Practice	8
ENSV4SP H2 Surveying and Mapping Project	32
ENEL4EE H2 Engineering Entrepreneurship	8

EB11 Bachelor of Science in Property Development Programme

Candidates shall complete approved modules to a value of not less than 432 credits and shall comply with the prescribed curriculum requirements:

First Year

1st Semester	**Credits**
ENPD1DW H1 Construction Drawing	8
ENPD1TA H1 Construction Technology & Processes 1A	16
ECON101 H1 Economics 1A: Principles of Microeconomics	16
MATH134 H1 Quantitative Methods	16
ACCT101 H1 Accounting 101	16
2nd Semester	**Credits**
ENPD1BE H2 Introduction to the Built Environment	8
ENPD1DM H2 Intro to Design Appraisal & Measurement	16
ENPD1TB H2 Construction Technology & Processes 1B	16
ECON102 H2 Economics 1B: Principles of Macroeconomics	16
ACCT103 H2 Accounting 103	16

Second Year

1st Semester	**Credits**
ENPD2DA H1 Design Appraisal & Measurement 2A	16
ENPD2EA H1 Construction Economics & Management 2A	16
ENPD2TA H1 Construction Technology & Processes 2A	16
LAWS1IL H1 Introduction to Law	16
Elective modules	8
Some recommended modules are listed below:	
ENCV2MT H1 Civil Engineering Materials	8
2nd Semester	
ENPD2DB H2 Design Appraisal & Measurement 2B	16
ENPD2EB H2 Construction Economics & Management 2B	16
ENPD2TA H2 Construction Technology & Processes 2B	16
LAWS1AS H2 Aspects of South African Law	16
Elective Modules	8

Third Year

1st Semester	**Credits**
ENPD3DA H1 Design Appraisal & Measurement 3A	16
ENPD3EA H1 Construction Economics & Management 3A	16
ENPD3TA H1 Construction Technology & Processes 3A	8
ENPD3PS H1 Property Studies	16

2nd Semester

ENPD3CC H2 Construction Contracts	8
ENPD3DB H2 Design Appraisal & Measurement 3B	16
ENPD3PR H2 Property Law	16

Third Year Elective Modules

Elective modules	48

Some recommended modules within the Faculty are listed below:

ENPD3PL H1 Project Planning (pre-requisite for progression to CM Honours)	16
ENPD3PM H2 Project Management (pre-requisite for progression to QS Honours)	24

Honours Degrees

This section refers to the following degrees:

a) Bachelor of Science in Property Development Honours (Construction Management) - BScPropDevHons(CM)

b) Bachelor of Science in Property Development Honours (Quantity Surveying) - BScPropDevHons(QS)

EH1 Bachelor of Science in Property Development Honours Admission Requirements

Candidates may not be admitted to the Bachelor of Science in Property Development Honours programmes unless:

a) they have satisfied the requirements for the degree of Bachelor of Science in Property Development and must have achieved at least a credit weighted average mark of 60% in the third year professional modules in the University, have passed ENPD3PL Project Planning (for the CM option) and ENPD3PM Project Management (for the QS option), (the 60% rule may be relaxed with the permission of the Dean on the advice of the Head of School concerned under exceptional circumstances), or have been admitted to status of the degree and have obtained an equivalent level of performance, or

b) they have been admitted in terms of General Academic Rule GR7.

EH2 Bachelor of Science in Property Development Honours Progression Requirements

Candidates proceeding under Rules EH7 and EH8, shall be required to attend and, by examination, complete a prescribed project and certain approved modules totalling 144 credits of which the Research Report shall contribute 24 credits.

Provided that:

(i) a maximum of the equivalent of 48 credits may be obtained from another university from modules approved by the and the Dean; and

(ii) a minimum of the equivalent of three quarters of the credits obtained by coursework shall be in respect of modules at postgraduate (Honours) level as listed in Rules EH7 and EH8.

(iii) a maximum of 32 credits in elective modules may be obtained from any approved modules not previously passed, offered in the University but not included in Rules EH7 and EH8. Such modules shall require the approval of the Head of School, the Dean of Faculty in which the modules are being offered, and the Dean of the Faculty of Engineering.

(iv) the prescribed project must be undertaken and completed at this University.

EH3 Honours Degrees Exclusion Rule

a) The University General Rule HR7 applies.

b) A student who 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.

EH4 Honours Degrees Supplementary Examinations

Bachelors degrees supplementary rule EB5 applies.

EH5 Award of Dean's Commendation

The Board of the Faculty of Engineering awards Dean's Commendations to candidates at the end of each semester for their high level of achievement. The commendation is awarded to candidates registered for a full semester load who obtain first class passes (75 percent or more) in all modules or first class passes in all modules except one, where an upper second class is obtained (70 percent to 74 percent).

EH6 Award of Class of Honours Degree

HR8 is of effect.

EH7 Bachelor of Science in Property Development Honours (Construction Management) Programme

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

Compulsory Modules

1st Semester

ENPD7RM H1 Research Methodology	16
ENPD7PA H1 Project Administration	32
ENPD7PE H1 Property Development Economics	16

2nd Semester

ENPD7RR H2 Research Report	24
ENPD7BC H2 Law of Building Contracts	16
ENPD7CM H2 Applied Construction Management	24

Elective Modules

Candidates must select modules to a maximum value of 16 credits from the following:

1st Semester

ENPD7DA H1 Advanced Design Appraisal & Measurement	8
ENPD7CT H1 Advanced Construction Technology	8

2nd Semester

ENPD7PV H2 Property Valuations 8

Any other level 7 module options to the approval of the Head of School 16

EH8 Bachelor of Science in Property Development Honours (Quantity Surveying) Programme

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

Compulsory Modules

1st Semester

ENPD7RM H1 Research Methodology 16

ENPD7PE H1 Property Development Economics 16

ENPD7CE H1 Cost Engineering 32

ENPD7PP H1 Professional Practice 8

2nd Semester

ENPD7SO H2 Simulated Office Project 16

ENPD7RR H2 Research Report 24

ENPD7BC H2 Law of Building Contracts 16

Elective Modules

Candidates must select modules to a maximum value of 16 credits from the following:

1st Semester

ENPD7DA H1 Advanced Design Appraisal & Measurement 8

ENPD7CT H1 Advanced Construction Technology 8

2nd Semester

ENPD7DA H2 Advanced Design Appraisal & Measurement 8

ENPD7PV H2 Property Valuations 8

ENPD7CL H2 Management of Construction Contracts 8

Any other level 7 module options to the approval of the Head of School 16

Masters Degrees

This section refers to the following degrees:

a) Master of Science in Construction Management - MScConstMan,

b) Master of Science in Construction Project Management – MSc(CPM)

c) Master of Science in Engineering - MScEng,

d) Master of Science in Land Surveying - MScSur,

e) Master of Science in Quantity Surveying - MScQS

EM1 Masters Admission Requirements

The following candidates shall be eligible to apply for admission to study towards a Masters degree in the Faculty of Engineering:

a) Graduates of the University who have obtained an appropriate, four-year Bachelor of Science degree (at the level of Honours), in one of the disciplines offered by this faculty, namely, Construction Management, Engineering, Land Surveying or Quantity Surveying, and the postgraduate Bachelor of Architecture (Advanced). Candidates are expected to have achieved at least a second class pass. Under exceptional circumstances, applications from candidates with below a second class pass may be considered by the Faculty Board.

b) Graduates of another recognised university, who have been admitted to the status of an appropriate, four-year Bachelor of Science degree (at the level of Honours), in one of the disciplines offered by this faculty, namely, Construction Management, Engineering, Land Surveying or Quantity Surveying and the postgraduate Bachelor degree of Bachelor of Architecture (Advanced). Candidates are expected to have achieved the equivalent of at least a 60% pass of the University.

c) Graduates with a South African Bachelor of Technology degree, with a credit-weighted average of no less than 70% for their BTech modules, who complete 64 credits of Bachelor of Science in Engineering undergraduate modules with a credit-weighted average of no less then 60%. The 64 credits must be made up of at least 24 credits of modules, at least at second year level, offered to undergraduate engineering students by the Faculty of Science and at least 32 credits of fourth year level professional engineering modules. The modules must be relevant to the discipline of the proposed coursework MScEng degree.

   The undergraduate modules will be taken for non-degree purposes, and with the approval of the Head of School. Failed modules are included in the calculation of averages.

d) Candidates who have been admitted under special conditions in terms of General Academic Rule GR7.

EM2 Research Masters

Candidates who undertake a Masters degree by research shall prosecute an approved field of research and present a dissertation based on that research.

EM3 Coursework and Dissertation Masters

Candidates who undertake a Masters degree by coursework and dissertation shall attend and, by examination, complete approved modules of advanced study and present a dissertation on an approved topic.

Subject to the approval of Board, candidates who already hold a Postgraduate Diploma, an Advanced Postgraduate Diploma, an Advanced Postgraduate Certificate, or equivalent qualification in an appropriate field of study from a recognised university, may have the module component requirements reduced by a maximum of 64 credits in recognition of pertinent modules passed for the Certificate or Diploma. Such candidates would not be required to surrender the Certificate or Diploma but may be required to take additional modules in order to complete the Masters degree.

EM4 Research Masters Progression Requirements

Candidates proceeding under Rule EM2 (Research Masters):

a) shall, after being admitted, be registered as a full-time candidate for not less than two semesters of work under approved supervision, or as a part-time candidate for not less than four semesters of work under approved supervision;

b) may be required to present a research project proposal within the first 6 months, and pass the associated module ENNO8RP Research Project Proposal as listed under Rule EM7, without any reduction in the research requirement;

c) shall not be allowed to register for more than six semesters without an acceptable progress report, approved by the supervisor and Head of School;

d) may be required to pass such other examinations as the Board may determine;

e) may be required to pursue other modules of study pertinent to the research;

f) may request that modules taken and passed during the candidature for the degree be taken into consideration by the examiners of the dissertation; and

g) may be required to make presentations at seminars as appropriate.

EM5 Coursework Masters Progression Requirements

Candidates proceeding under Rule EM3 (Masters by coursework and dissertation), shall be required to attend and, by examination, complete a dissertation and certain approved modules totalling 144 credits of which the dissertation shall contribute at least 48 credits and not more than 72 credits. The dissertation must be completed at this University and also comply with the general requirements given in Rule EM4 d).

The following conditions apply to obtaining the requisite number of credits from the coursework modules:

a) no supplementary examinations are awarded for failed modules;

b) failed modules may not be repeated or re-examined;

c) a maximum of the equivalent of 64 credits may be obtained from another university from modules approved; and

d) a minimum of the equivalent of three quarters of the credits obtained by coursework shall be in respect of modules at postgraduate level (listed below).

e) a maximum of 48 credits may be obtained, from any approved modules not previously passed, offered in the University but not included in the list below. Such modules shall require the approval of the Head of School, the Dean of the Faculty in which the modules are being offered, and the Dean of the Faculty of Engineering.

EM6 Format of Dissertation

Candidates proceeding under Rule EM2 (Research Masters) and Rule EM3 (Coursework and dissertation Masters):

a) shall present a dissertation showing that they:

(i) understand the nature and purpose of the investigation;

(ii) are sufficiently acquainted with the relevant literature;

(iii) have mastered the necessary techniques;

(iv) have acquired a thorough understanding of scientific method;

(v) are capable of assessing the significance of their findings; and

(vi) such dissertation must be satisfactory as to literary style and presentation;

b) shall not be permitted to submit a dissertation by papers. In the Faculty of Engineering, according to the provisions of Preamble C and Rule GR4d), the University Rules MR9 and CR13 are restricted in the submission of a dissertation by papers.

EM7 Masters Degrees Exclusion Rule

a) A student who fails to meet progression requirements shall be excluded.
b) A student who fails a compulsory module shall be excluded.
c) A student who fails to complete the coursework part of the curriculum in four semesters of full-time study, or six semesters of part-time study, shall be excluded.

EM8 Masters by Coursework Modules

Note: *The following list of modules are offered entirely at the discretion of the Head of School concerned and it cannot be assumed that modules listed here will be offered in 2009.*

Faculty-wide Module

ENNO8RP Research Project Proposal	DP

A School of Bioresources Engineering & Environmental Hydrology Programmes
Master of Science in Engineering – Bioresources Engineering

Compulsory Modules (96 cr)	*Credits*
ENAG8RM PC Research Methodology	8
ENAG8AT PC Advanced Topics in Bioresources Engineering	16
ENAG8DI PC Dissertation	72
Elective Modules (48 cr)	
Selected modules as approved by Programme Director	48

B School of Chemical Engineering Programmes
B.1 Master of Science in Engineering - Chemical Engineering

ENCH8AP HC Advanced Pulping Technology	16
ENCH8AT HC Advanced Chemical Engineering Topics	16
ENCH8PC HC Paper Chemistry	16
ENCH8PP HC Pulp & Paper Environmental Issues	8
ENCH8PT HC Advanced Papermaking Technology	16
ENCH8WC HC Wood Chemistry	8

B.2 Master of Science in Engineering - Risk Engineering and Industrial Waste Treatment (by coursework and dissertation)

Semester 1	
Compulsory Core Modules(40 cr)	
ENCH801 HC Hazard Evaluation Procedures and Risk Assessment	16
ENCH802 HC Toxic Waste Treatment and Design	8
Elective courses (Two from the list shown below)	16
Semester 2	
Compulsory Core Modules(32 cr)	
ENCH803 HC Inherently Safe and Clean Design	16
ENCH804 HC Industrial Toxicology and Environmental Hazard	8
Elective course: (One from the list shown below)	8
Total credits (courses):	72

List of elective modules:

ENCV807 HC Environmental Impact Assessment	8
ENCV817 HC Environmental Pollution and Control	8
ENCV803 HC Unit Operations and Processes (non-chem. Eng. BSc only)	8
ENCH805 HC Advanced Separation Processes	8
ENCH8IW HC Industrial Wastewater Treatment	8
ENCV818 HC Convection Dispersion Modelling	8
ENCH8CP HC Cleaner Production	8
ENCH806 HC Advanced Bioengineering Methods of Waste Treatment	8
Dissertation	72

Note: Course assessment: Final mark will be constructed as 70% of mark from a written examination and 30% of a semester mark. The pass mark for each module will be 50%.

C. School of Civil Engineering, Surveying & Construction

C.1 Master of Science in Engineering - Civil Engineering (by coursework and dissertation)

Compulsory Common Modules: (72)	Credits
ENCV801 HC Dissertation	72
Compulsory Core Modules (32)	
ENCV8NM HC Numerical Methods	16
ENPD8RM HC Advanced Research Methodology	8
ENCV8EI HC Environmental Impact Assessment	8

Choose 40 elective credits from any two of the following four areas. Up to 16 credits may be chosen from other postgraduate programmes in the Faculty of Engineering, approved by the Civil Engineering postgraduate co-ordinator and the Head of School

Geotechnical Engineering	
ENCV8GS HC Site Investigation	16
ENCV8GF HC Advanced Foundation Design	16
ENCV8GE HC Introduction to Environmental Geotechnics	16
ENCV8GA HC Advanced Soil Mechanics	16
ENCV8GB HC Rock Mechanics	16
Pavement and Transportation Engineering	
ENCV8PT HC Public Transport	16
ENCV8TC HC Transport Control	16
ENCV8TD HC Transport Development	16
ENCV8TP HC Transportation Planning	16
ENCV8CP HC Concrete Pavements	8
ENCV8PD HC Pavement Design	16
ENCV8PM HC Pavement Materials	16
ENCV8CT HC Concrete Technology	8

Structural Engineering

ENCV8SB HC Advanced Reinforced Concrete Strctures	16
ENCV8SA HC Prestressed Concrete theory and Design	16
ENCV8DS HC Structural Design	16
ENCV8SD HC Structural Design	16
ENCV8ST HC Structural Theory	16

Water Engineering

ENCV8EF HC Environmental Fluid Dynamics	16
ENCV813 HC Advanced Hydrology	8
ENCV834 HC Advanced Groundwater Hydrology	8
ENCV837 HC Hydraulics of Pipelines	8
ENCV838 HC Open Channel Flow	8

C.2 Master of Science in Engineering - Environmental Engineering (by coursework and dissertation)

Compulsory Common Modules: (88cr)	Credits
ENCV801 HC Dissertation	72
ENCV800 HC Research Methodology	16

Choose 48 credits from the following options:

ENCH8EP HC Environmental Engineering Process Principles	16
ENCV8ES HC Environmental Sanitary Engineering	16
ENCV8WT HC Design of Water/Wastewater Treatment Plants	
BIOL851 HC Applied Cell Biology for Environmental Engineers	16
ENCV8EI HC Environmental Impact Assessment	8

Choose 24 elective credits from the following options. Up to 16 credits may be chosen from other postgraduate programmes at the University of KwaZulu-Natal, approved by the Environmental Engineering postgraduate co-ordinator and the Head of School

Water and Wastewater Treatment

ENCH8BP HC Biological Effluent Treatment Processes	16
ENCH8WT HC Fundamentals of Physio-Chemical Processes in Water Treatment	16
ENCH8IW HC Industrial Wastewater Treatment	8
ENCV804 HC Water Resources Planning & Management	8
ENCV8UH HC Urban Hydrology	8
ENCV8WQ HC Principles of Water Quality & Legislation	8

Waste Management

ENCV8LD HC Landfill Design & Management	8
ENCH8CP HC Cleaner Production	8
ENVS814 HC Sustainable Development	16

Environmental Modelling

ENCV8EF HC Environmental Fluid Dynamics	16
ENCH8AA HC Applied Aquatic Chemistry	16
ENCV817 HC Environmental Pollution and Control	8

C.3 Master of Science in Land Surveying

ENSVLI Land Information Systems	16
ENSV8LM Land Management	16

D. School of Electrical, Electronic & Computer Engineering

D.1 Master of Science in Engineering - Telecommunications and Information Technology (by coursework and dissertation)

The Coursework MScEng in the field of Telecommunications and Information Technology requires 144 credits: 72 credits for coursework and 72 credits dissertation.

Compulsory Modules (80 cr):	Credits
ENEL800 Dissertation	72
ENEL807 Research Methodology (Telecommunications)	8
Elective modules (64cr)	
Modules are offered at the discretion of the Head of School.	
ENEL854 HC Engineering Project Planning	8
ENEL804 HC Intelligent Systems Engineering	8
ENEL803 HC Advanced Software Engineering	8
ENEL811 HC Telecommunications Networks	8
ENEL806 HC Advanced Digital Communications	16
ENEL813 HC Advanced Digital Signal Processing	8
ENEL815 HC Advanced Microwave Circuits	8
ENEL816 HC Satellite Communication Systems	8
ENEL855 HC Advanced Network Architectures.	8
ENEL856 HC Advanced Computer Organisation and Architecture	8
ENEL857 HC Advanced Embedded Systems	8
ENEL808 HC Cryptography & Network Security or	8
MATH724 HC Cryptography	16
STAT350 HC Random Processes	16
ENEL858 HC Optimal Estimation	8
MATH726 HC Coding Theory	16
ENEL824 HC Optical Networking	8
Up to 16cr of courses not on this list and approved by the Head of School as per Rule EM5(e)	16

D.2 Master of Science in Engineering - Electric Power and Energy Systems (by coursework and dissertation)

The Coursework MScEng in the field of Electric Power and Energy Systems requires 144 credits: 72 credits for coursework and 72 credits for dissertation.

Compulsory Modules (104cr):	Credits
ENEL800 Dissertation	72
ENEL801 Research Methodology (Power)	16
ENEL802 Project Engineering & Utility Management	16

Elective modules (40cr)

Select five out of six electives from one of the following specialisations. Each elective course is 8 credits. Modules are offered at the discretion of the Head of School.

HVDC SYSTEMS (5 out of 6 electives)

ENEL852 Power Electronics
ENEL892 Transmission Planning and Design
ENEL893 Distribution Systems Planning and Design
ENEL891 High Voltage Engineering
ENEL895 HVDC Systems Design and Operation
ENEL871 Power Systems Modelling and Analysis

POWER SYSTEMS PLANNING (5 out of 6 electives)

ENEL883 Financial Analysis and Modelling
ENEL892 Transmission Planning and Design
ENEL893 Distribution Systems Planning and Design
ENEL805 EMC, Power Quality & Environment
ENEL896 Transmission & Distribution Systems Operations
ENEL871 Power Systems Modelling and Analysis

POWER SYSTEMS DESIGN (5 out of 6 electives)

ENEL897 Substation Design
ENEL898 Overhead Line Design
ENEL899Underground Cables
ENEL805 EMC, Power Quality & Environment
ENEL878 Gas Insulated Systems
ENEL879 Performance & Maintenance of Transmission & Distribution systems

POWER SYSTEMS PROTECTION (5 out of 6 electives)

ENEL897 Substation Design
ENEL875 Protection Systems Design and Application
ENEL876 Protection Systems Commissioning & Performance
ENEL805 EMC, Power Quality & Environment
ENEL877 Metering and tele-control
ENEL874 Components of Protection Systems

POWER SYSTEM ECONOMICS (5 out of 6 electives)

ENEL884 Optimal Power Flow & Economic Dispatch
ENEL885 Electricity Market Design
ENEL886 Power network & Electricity Market Operation
ENEL805 EMC, Power Quality & Environment
ENEL887 Tariff design & Distribution Economics
ENEL888 Energy Trading and Risk Management

SUPPLY SIDE TECHNOLOGY (5 out of 6 electives)

ENME820 Fossil Fuel Technology
ENEL831 Hydro-electric plant Technology
ENCH820 Nuclear plant Technology
ENCH821 Renewable Energy Technologies
ENCH822 Future Energy Technologies
ENEL836 Environmental Engineering

POWER SYSTEM OPERATION (5 out of 6 electives)

ENEL871 Power Systems Modelling & Analysis
ENEL832 Power System Stability
ENEL873 Power Systems Control
ENEL805 EMC, Power Quality & Environment
ENEL834 Advanced Systems Operation
ENEL836 Environmental Engineering

UTILITY ASSET MANAGEMENT (5 out of 6 electives)

ENEL835 Fundamentals of Asset Management
ENEL892 Transmission Planning & Design
ENEL837 Reliability Analysis & Risk Mitigation
ENEL838 Refurbishment
ENEL839 Project Prioritization
ENEL836 Environmental Engineering

Note: The topic for the dissertation shall be on a topic in the specialisation area and will be chosen in consultation with the Head of School.

EM8 Award of Class of Masters Degrees

The Masters degrees by research and those by coursework may be awarded with distinction as defined in the General Academic Rule CR17 (Coursework) and MR13 (Research).

Doctoral Degrees - Doctor of Philosophy

This section refers to the following degree: Doctor of Philosophy - PhD
in the fields of:

a) Construction Management,
b) Engineering,
c) Land Surveying and
d) Quantity Surveying

EDP1 PhD Admission Requirements

The following candidates shall be eligible to apply for admission into a PhD programme in the Faculty of Engineering:

a) Graduates of the University who have obtained an appropriate Master of Science in one of the disciplines offered by this Faculty, namely Construction Management, Engineering, Land Surveying or Quantity Surveying.
b) Graduates of another recognised university, who have been admitted to the status of an appropriate Master of Science degree in one of the disciplines offered by this Faculty, namely Construction Management, Engineering, Land Surveying or Quantity Surveying.
c) Candidates who have been admitted under special conditions in terms of Common Rule GR7.
d) Candidates, registered for a research Masters degree in the Faculty, who have completed the requirements for the Masters degree, may apply to have their registration converted to a Doctor of Philosophy (PhD) registration before the Masters degree is awarded. The time allowed for the PhD would be reduced by two semesters. The material from the masters dissertation may then be used towards the PhD. If the PhD is not completed, the masters degree will be awarded.

EDP2 PhD Progression Requirements

a) A candidate shall not be allowed to re-register after two semesters without a progress report from the candidate, commensurate with one-year's research work, being accepted by the supervisor and the Higher Degrees committee of the Faculty.
b) Candidates shall not be allowed to register for more than eight semesters without an acceptable progress report, approved by the supervisor and Head of School.

INTRODUCTION TO SYLLABI

In order to understand the syllabus section that follows, consider the following example:

Chemical Engineering Practicals 1
ENCH2CP H2 (4L-0T-15P-0S-40H-14R-0F-0G-7A-13W-8C)
Prerequisite: 40% 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 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.

The **title**
ENCH2CP H2 **Chemical Engineering Practicals 1** is interpreted as follows:
The **full title** of the module is Chemical Engineering Practicals 1. The **code** ENCH2CP shows that the syllabus is in Chemical Engineering ("ENCH") and that it is at level 2. H2, shows that it is offered in semester 2 at Howard College. Similarly H1 would show it is offered in semester 1 in Howard College. Other codes are B if the module is offered in both semesters, C if it may be offered in either the first or second semester, Y if it is a year-long module, and V if it is offered in the Winter vacation. Thus, for example, WILD301PV is a Pietermaritzburg module in Wildlife Science module, and V it is offered in 3rd year during the Winter vacation.

The **notional study hours** (4L-0T-15P-0S-40H-14R-0F-0G-7A-13W-8C)
are interpreted as follows:

4L means 4 hours of lectures, i.e. 5 lectures of 45 minutes	
0T means 0 hours of tutorials	15P means 15 hours of practicals
0S means 0 hours of seminars	40H means 40 hours of self-study
14R means 14 hours of revision	0F means 0 hours of field trips
0G means 0 hours for problem based groups	7A means 7 hours of assessment
13W means the module runs for 13 weeks	8C means the module is worth 8 credits

SYLLABUS

SCHOOL OF BIORESOURCES ENGINEERING & ENVIRONMENTAL HYDROLOGY

Agricultural Engineering

Offered in the School of Bioresources Engineering & Environmental Hydrology

Engineering Design

ENAG1DE P2 (20L-39T-0P-0S-10H-8R-0F-0G-3A-13W-8C)

Aim: To develop the ability to configure an appropriate design process and to select appropriate materials and manufacturing processes to carry out the construction and testing of a simple device.

Content: Philosophy of design process: problem definition, implementation, evaluation, time and project management and safety. Software tools for problem solving and engineering analysis: MATLAB (introduction to MATLAB and basic programming).

Assessment: Class mark (30%), including assignments, projects and tests, Practical exam (25%), final exam (45%).

DP Requirement: Students are required to write all class tests and complete all practicals and assignments satisfactorily, as specified in the module outline.

Introduction to Engineering Materials

ENAG1MT P2 (20L-10T-0P-0S-22H-24R-0F-0G-4A-13W-8C)

Aim: The candidates will acquire a basic understanding of materials, their structure and its influence on the physical and mechanical properties; crystallographic structures, defects in these structures and how this influences the mechanical properties; the mechanical properties of materials; and phase diagrams and how microstructures are formed.

Content: Introduction to Materials, Structure of Materials, Crystal Imperfections, Mechanical Behaviour of Materials, Alloys and Properties of Alloys, Equilibrium Phase Diagrams.

Assessment: Class mark: 30% (2 tests, assignments/tutorials), one 2-hour exam: 70%

DP Requirement: Students are required to write all class tests and complete all tutorials and assignments satisfactorily, as specified in the module outline.

Irrigation Engineering

ENAG3EI P1 (29L-13T-39P-0S-56H-12R-6F-0G-5A-0W-16C)

Prerequisite: ENCV2FL

Aim: To familiarise the student with the integrated components that need to be considered when designing irrigation systems for South African conditions.

Content: Introduction to irrigation systems and design considerations. Soil, water, atmosphere and plant continuum and how they relate to design planning. Pipe hydraulics. Design of sprinkler,micro, flood and moving irrigation systems, Types of pumps and performance characteristics, irrigation scheduling, system evaluation and maintenance.

Practicals: Irrigation design projects; laboratory and field exercises on syllabus covered.

Assessment: Two one hour tests and four assignments (40%), 3-hour examination (60%)

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Forest Engineering

ENAG3FE P2 (20L-10T-3P-0S-28H-12R-3F-0G-4A-0W-8C)

Prerequisite: ENAG3PT (40%) or ENAG4BM (40%)

Aim: To acquaint students with the processes of timber harvesting, including current harvesting equipment, methods, and systems; methods of estimating logging productivity and costs; system evaluation principles; forest product markets, wood procurement systems, logging safety, harvest planning, environmental impacts, Best Management Practices, wildlife/visual concerns, regulations/legislation affecting harvesting, and forest road layout.

Content: Introduction, Forest Engineering terminology, units. Conventional ground-based harvesting systems. Steep terrain harvesting systems. Cut—to-length, tree length systems, infield chipping. Value recovery. Environmental management, environmental monitoring and certification. Best Management Practices. Strategic, tactical and operational planning. Time and motion studies, Productivity and productivity functions. Machine costing. System evaluation.

Practicals: Practicals and field trips.

Assessment: Two one hour tests and assignments (30%). Two hour examination (70%)

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Principles of Food Processing

ENAG3FP P1 (18L-4T-18P-0S-20H-10R-6F-0G-4A-0W-8C)

Prerequisite: ENME3TH (40%)

Aim: To equip students with the basic principles, flow diagrams, mass and energy balances and factory layout governing the processing of food.

Content: Basics of meat, vegetable, cereal, dairy, oil seed and sugar processing and packaging. Basics of factory layout, legal aspects, marketing and labelling and hygienic best practices.

Practicals: 2 Visits to dairy and vegetable processing factories, laboratory practicals on layout and physical processing of foodstuff, practical on mass and energy balances

Assessment: Pre-class questions (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each) and one 2-hour examination (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Power and Traction for Agricultural Machines

ENAG3PT P1 (21L-3T-12P-0S-25H-10R-5F-0G-4A-13W-8C)

Prerequisite: ENME3TH & ENME2DY (40%)

Aim: To impart to the student skills and basic understanding of the engineering principles of agricultural power machines, how to optimize power transfer for optimum usage and to utilise these skills to solve agricultural machinery problems.

Content: Diesel engines and performance, power optimization and efficiency; power transfer transmission trains, hitching systems; tyres and traction; tractor chassis mechanics.

Practicals: Tractor engine components, engine performance and fuels, tractor traction performance, hydraulic controls and hitching systems.

Assessment: Pre-class questions (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each) and one 2-hour examination (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Structural Analysis and Design

ENAG3SA P1 (20L-5T-7P-0S-31H-10R-3F-0G-3A-0W-8C)

Prerequisite: ENCV2DE & ENCV2SB (40%)

Aim: Students will learn design and analysis techniques related to agricultural structures, including load analysis and stress analysis, statically determinate and statically indeterminate structures, appropriate use of steel, concrete, and timber in agricultural structures.

Content: Stress Analysis, Statically Determinate Trusses, Bending Deformation, Statically Indeterminate Frames, Load Analysis, Structural Connections, Steel Design in Agriculture, Timber Design in Agriculture, Concrete Design in Agriculture
Practicals: Structural Assessment of Existing Structures, Load Testing.
Assessment: Class tests (15%), mini-project (15%), one 2-hour examination (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Undergraduate Seminar

ENAG3US P1 (6L-0T-24P-21S-29H-0R-0F-0G-0A-13W-8C)
Prerequisite: ENNO1EL
Aim: To undertake a literature review; to prepare a seminar or report; to be able to present a seminar effectively
Content: Individual investigations or studies by means of a literature review of any facet of Bioresources Engineering selected by the candidate and approved by the Director of Programme who will nominate a supervisor for the study. Technical Communication: Literature research techniques; seminar writing and presentation.
Practicals: Proper use of library resources to obtain relevant literature.
Assessment: Seminar document (70%) and oral presentation (30%).
DP Requirement: N/A
No supplementary examination.

Advanced Power & Traction for Agric Machines

ENAG4AP P2 (20L-7T-9P-0S-25H-10R-5F-0G-4A-13W-8C)
Prerequisite: ENAG3PT (50%)
Aim: To impart to the student skills and advanced understanding of the engineering principles of agricultural power machines, how to optimize power transfer for optimum usage and to utilise these skills to solve agricultural machinery problems.
Content: Diesel engines performance thermodynamics, power optimization and efficiency; power transfer systems, hitching systems and weight transfer; traction aids, tractor testing.
Practicals: Tractor engine performance and fuels, tractor traction performance and implement combination, hydraulic controls and hitching systems,
Assessment: Pre-class questions (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each) and one 2-hour examination (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Bioresources Engineering Design Project

ENAG4BD PY (4L-26T-0P-0S-210H-0R-0F-0G-0A-0W-24C)
Prerequisite: ENAG3SA; ENAG3US; Student must be in a position to complete the degree at end of year.
Aim: To identify and solve real-world design problems in collaboration with industry, with the students assuming the role of consulting engineers working in a team and experiencing constraints typical of what would be found in the workplace.
Content: Open-ended, industry related design projects which utilise principles of engineering design, engineering analysis and functional operation of engineering systems. Projects extend over two semesters and are selected, design teams formed, concepts visualised and alternatives evaluated. Emphasis on design strategies, project management, communication skills and technical writing.
Assessment: Project report (75%), oral presentation (15%), weekly progress and participation (10%).
DP Requirement: N/A
No supplementary examination.

Bio-Production Systems and Managemen

ENAG4BM P2 (44L-8T-20P-0S-60H-20R-3F-0G-5A-0W-16C)

Prerequisite: ENCV2SB (40%)

Aim: To equip students with the skills to analyze and solve problems related to the interaction between the agricultural environment and engineering interventions, the design principles underlying agricultural equipment design and optimizing management strategies.

Content: Principles of systems analysis, operation principles and basic equipment design for tillage, planting, chemical application, hay & forage harvesting and crop harvesting processes. Strategic planning principles, cost analysis; mechanisation planning and optimal equipment selection.

Practicals: Field trips to farmers and related conferences. Visits to major equipment suppliers.

Assessment: 2 assignments (5 % each), practicals (2.5%), 2 tests (10% each) and one 3-hour examination(70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Electrical Applications for Bio-Systems

ENAG4EA P1 (20L-5T-0P-0S-36H-10R-6F-0G-0A-13W-8C)

Prerequisite: ENEL2EE (40%)

Aim: To provide students with skills to analyse problems related to electrical applications in agricultural production in order to optimise control of and use of energy and water, and be able to set up farm electrification.

Content: Appraisal of current proven systems in South Africa, definitions, resistive networks, reactive networks, electrical machines, 3-phase heating in farm structures, control systems, power factors, corrections, farm contribution systems, protection.

Practicals: Building Electrical System Layout, Control Systems.

Assessment: One test (15%), one-project (15%), one 2-hour examination (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Environmental Control for Biol Commodities

ENAG4EC P2 (20L-5T-7P-0S-31H-10R-3F-0G-3A-0W-8C)

Prerequisite: ENME3TH (40%)

Aim: To enable students to understand the environmental requirements for livestock and plants and learn the important parameters in agricultural structures so that they will be able to apply engineering sciences to analyse and solve problems in environmental control.

Content: Heat transfer, mass transfer, psychrometry, energy and mass balance, environmental control in greenhouse, poultry and dairy structures.

Practicals: Visits to industrial indoor agricultural production systems (greenhouse, poultry, dairy, piggery etc.), thermal measurements of buildings, fan testing procedures

Assessment: One test (15%), mini-project (15%), one 2-hour examination (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Engineering Hydrology

ENAG4EH P1 (52L-13T-6P-0S-60H-20R-0F-0G-5A-13W-16C)

Prerequisite: HYDR210

Aim: A knowledge of hydrological systems and models applied to design, water yield, irrigation supply/demand, crop yields.

Content: Application of hydrological models to sustainable integrated water resources management and planning, under varying environmental conditions. Understanding theoretical concepts of hydrological simulation; ability to select appropriate models for particular problems; application of hydrological models to obtain water resources design and planning information; ability to set up and run the ACRU Agrohydrological and other models.

Practicals: 12 Practicals. Compulsory 3 day field trip. Students contribute to costs.

Assessment: 3 tests (20%), tutorials, practicals and other assignments (10%), practical exam (10%), 3-hour exam (60%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

ECSA Outcomes Portfolio

ENAG4EP PY (0L-0T-0P-0S-0H-0R-0F-0G-0A-26W-0C)

Aim: For students to understand the requirements for, and demonstrate competence to meet, all outcomes required by Engineering Council of South Africa (ECSA) as specified in ECSA Document PE-61.

Content: The concept of outcomes and assessment criteria; ECSA Outcomes and ECSA Assessment Criteria; Bloom's Taxonomy, and its link to ECSA's outcomes, assessment criteria, and range statements; the importance of attaining competence in each of ECSA's ten outcomes; concepts of, and techniques for reflection and self evaluation; how to structure, construct and present a professional portfolio.

Assessment: Submission of ECSA Outcomes Portfolio containing evidence of both development and competence to meet ECSA outcomes; Exit level interviews/questionnaires.

DP Requirement: Satisfactory evidence of competence to meet all ECSA outcomes.

Food Engineering Unit Operations

ENAG4FE P2 (20L-4T-18P-0S-20H-10R-3F-0G-5A-0W-8C)

Prerequisite: ENAG3FP (40%)

Aim: To equip students with understanding the different unit operations and related equipment used in food engineering.

Content: Post harvest handling operations, size reduction operations, processing using ambient temperature operations, processing with heat using steam and water, processing with heat using hot air, processing with heat using hot oils, processing with heat using irradiation, processing though the removal of heat.

Practicals: Mass and energy balances, pasteurization and blanching, dehydration and freezing food processing factory visit.

Assessment: Pre-class questions (2.5%), practicals (2.5%), assignment (5%), 2 tests (10% each) and one 2-hour examination (70%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Environmental Hydrology

ENAG4HY P2 (39L-10T-14P-0S-71H-15R-6F-0G-5A-0W-16C)

Aim: To provide an integrated understanding of hydrological sciences and the ability to solve applied hydrological problems.

Content: Interrelationships between principles and theories learned in preceding courses; applied hydrological issues and problem solving. These include: prediction of soil loss at different scales; basic hydraulic principles; variability and uncertainty in water resources planning; anthropogenic factors affecting water resources management such as forestry, climate change, etc.

Practicals: 12 practicals and a field trip.

Assessment: 3 tests (20%), tutorials, practicals and other assessments (10%), practical exam (10%), 3-hour exam (60%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Sustainable Energy for Bio-systems

ENAG4SE (20L-7T-6P-0S-20H-8R-0F-0G-15A-0W-8C)

Prerequisite: All first and second year engineering and ENME3TH modules must be completed, plus the following modules completed or as corequisite: ENAG3PT, ENAG3EI, ENAG4BM, ENAG3FP.

Aim: To develop an understanding of sustainable energy systems in the Bioresources industries.

Content: Bio-Energy Systems: Generation principles and basic design. Energy Utilisation and conservation strategies in Bioresource facilities.

Practicals: Three practicals are spread throughout the semester

Assessment: Two 45 minute tests (30%) and one 2-hour examination (70%)

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Selected Topics in Bioresources Engineering

ENAG4ST PC (20L-5T-7P-0S-36H-10R-0F-0G-2A-13W-8C)

Aim: To provide the student with a flexible ability to tackle a subject of Bioresources Engineering and apply these new technologies and analytical techniques to solve problems.

Content: The topics will be selected from new and current disciplines in the field of Bioresources Engineering and will focus on the latest technologies and analytical techniques.

Assessment: Practicals and assignments (5%), tests (25%) final report (75%).

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

No supplementary examination.

Soil and Water Conservation Engineering

ENAG4SW P2 (20L-13T-0P-0S-29H-12R-3F-0G-4A-0W-8C)

Prerequisite: ENAG4HY(40%); HYDR312 (40% or as corequisite)

Aim: To provide students with an understanding of the principles of soil and water conservation and to design and analyse soil and water conservation structures.

Content: Hydrologic processes and data analysis. Principles of open channel flow. Design of lined and vegetated open channels. Soil erosion processes and control practices. Design of conservation structures.

Practicals: Field visits

Assessment: Assignments and two one hour tests (40%) and one two hour examination (60%)

DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Vacation Work

ENAG4VW PC (0L-0T-0P-0S-0H-0R-0F-0G-0A-12W-0C)

Aim: Students to experience a realistic working environment thus enabling candidates to consider their studies in context and to gain a sense of perspective into their university studies.

Content: This is a Duly Performed requirement for the BSc Eng (Agricultural) degree. Vacation work is to be arranged and undertaken by students during the course of the degree in fields relevant to Agricultural Engineering. A total of 12 weeks must be accumulated. A report on the work conducted is to be submitted to the department within one month of the conclusion of each vacation work period, together with a certificate of progress from the firm concerned, in which the actual period is also stated.

Assessment: Reports acceptable in terms of scientific method, synthesis, computer use and presentation.

DP Requirement: Satisfactory completion of vacation work reports.

Workshop Course

ENAG4WS PC (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Prerequisite: Eligibility to register for ENAG4DP

Aim: Candidates to acquire an appreciation and basic skills in common fabrication techniques, and familiarise themselves with the structure and function of commonly used workshop equipment.

Content: This is a Duly Performed requirement. Practical workshop instruction and experience includes workshop safety, workshop techniques including welding and machining, and the manufacture of machine components, both individually and in groups.

Practicals: 100%

Assessment: Students attend week - long course and submit a report.

DP Requirement: Satisfactory completion of training and workshop report.

Advanced Topics in Bioresources Engineering

ENAG8AT PC (40L-0T-5P-0S-100H-12R-0F-0G-3A-13W-16C)

Aim: Advanced study of Bioresources Engineering topics presented by experts in the field

Content: Topics will depend on the expertise and interests of available staff, and will vary from year to year. Probable topics will include Bio-Environmental Systems Modelling, Soil and Water Engineering Modeling and Analysis, Engineering Hydrology, Bio-Processing.

Assessment: Written Report (20%), Presentation (10%), Final Exam (70%).
DP Requirement: Students are required to write all class tests, attend all practicals and complete all tutorials, assignments and practical reports satisfactorily, as specified in the module outline.

Dissertation
ENAG8DI 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

Introduction to Physical Hydrology
HYDR210 P1 (26L-7T-40P-0S-64H-15R-0F-0G-8A-13W-16C)
Prerequisite: CHEM110, COMP105, MATH133, PHYS131, or equivalent modules acceptable to the Dean.
Aim: To develop an understanding of the fundamentals of major components making up the hydrological cycle and human interaction with it.
Content: The key concepts underlying the science of hydrology including studies of rainfall, interception, evaporation, runoff, soil water, systems and anthropogenic impacts on the hydrological cycle.
Practicals: 12 - covering various basic hydrological concepts.
Assessment: 2 tests (15%), tutorials, practicals and other assessments (8%), 3h practical exam (10%), 3 h theory exam (67%).
DP Requirement: 40% Class mark, Attendance at 80% of practicals.
Offered in Semester 1.

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: Class tutorials & pracs (20%), 2 class tests (20%), 2 h exam (60%).
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 to complete the project satisfactorily, as specified in the module outline.

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 to complete the project satisfactorily, as specified in the module outline.

Technical Communication for Engineers

ENCH1TC H1,P1 (10L-15T-0P-13S-20H-16R-0F-0G-6A-13W-8C)

Prerequisite: None.

Aim: To develop students' discourse competence in Technical English with the intention of improving their ability to read a range of texts, to write genres important to Engineering students, and to give oral presentations on Engineering topics

Content: Course content is short research projects relating to Engineering. Technical Communication for Engineers is a practical course in which students improve their writing through practical experience of a number of different kinds of writing: Design Reports, Technical Reports, and seminar papers. Through the process of short research projects relating to Engineering, students will be supported in their reading in order to improve their ability to extract meaning from Engineering-related texts taken from a range of genres, (from news articles to textbooks and simple research articles) and to use these sources appropriately in writing their own texts in the appropriate academic register. In addition students gain experience in presenting a short talk.

Assessment: Continuous assessment (written assignments, tests and oral presentation).

DP Requirement: Continuously assessed module, No examination, No supplementary examination.

Biochemical & Environ Engineering

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

Prerequisite: 40% in CHEM161

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 to complete all practicals satisfactorily, as specified in the module outline.

Chemicals Engineering Practicals 1

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

Prerequisite: 40% 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% 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 and to complete all practicals satisfactorily, as specified in the module outline.

Instrument Technology

ENCH2IT H2 (20L-3T-6P-0S-30H-18R-0F-0G-3A-13W-8C)

Prerequisite: 40% in ENEL2EE

Aim: Understanding of measurement methods in laboratory and industry, and ability to set up and calibrate instruments

Content: Measurements: Standards, units, absolute and relative, range, accuracy, linearity, isolation, filtering, signal ranges, A/D, D/A, discrete, calibration and traceability. Transducers: Transduction methods; resistance and reactance change, electromagnetic, semiconductor, thermoelectric. Instruments: Flow, pressure, temperature, level, composition, displacement, force, torque, velocity, light, frequency, valves/actuators/positioners

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 to complete all practicals and assignments satisfactorily, as specified in the module outline.

Mass and Energy Balances

ENCH2MB H1 (20L-14T-0P-0S-24H-15R-0F-0G-7A-13W-8C)

Prerequisite: 40% 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% in CHEM161 & CHEM171

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% 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 to complete all assignments satisfactorily, as specified in the module outline.

Thermodynamics 1

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

Prerequisite: 40% 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 to complete all assignments satisfactorily, as specified in the module outline.

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 Practicals 2

ENCH3CP H2 (5L-0T-18P-0S-50H-4R-0F-0G-3A-13W-8C)

Prerequisite: ENCH2CP and STAT370

Aim: To equip the learner with skills to analyse and interpret experimental data, in addition to, being able to undertake experimental studies. To enable the learner to use common statistical methods in the analysis of experimental design and data. 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 formal lectures given in the module with emphasis on design of experiments, analysis of experimental data, regression analysis and error reporting, Six practical experiments will be undertaken in the module, viz. Residence time distribution (illustrates concepts of differing time taken by fluid to flow through apparatus); Mass transfer across an interface in a stirred cell (illustrated concepts of mass transfer); Fluidisation (illustrates and tests concepts of fluidisation theory); Cooling Tower (demonstrates operation of cooling tower and tests cooling tower theory); Pump and Fan (illustrates concepts related to movement of fluids) and Vapour-Liquid equilibrium (demonstrates use of still to obtain VLE data).

Assessment: Pre and Post Practical Interviews, written reports, data analysis test. Continuous Assessment.

DP Requirement: Satisfactory completion of Post-practicals as specified in the module outline.

Chemical Engineering Design

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

Prerequisite: ENCH3HE, ENCH3FD, ENCH3SL

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%), Assignment (10%), one 2-hr exam (75%).
DP Requirement: 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

Heat Transfer

ENCH3HE H1 (39L-12T-6P-0S-61H-36R-0F-0G-6A-13W-16C)
Prerequisite: 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, assignment (total 30%), one 3-hr exam (70%).
DP Requirement: 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

Materials Processing

ENCH3MP H2 (20L-8T-0P-0S-20H-12R-0F-0G-20A-13W-8C)

Prerequisite: 40% in ENCH2EF and ENCH2OM

Aim: To equip the learner with an understanding of current solids processing unit operations within chemical engineering, to apply the fundamentals of heat transfer, fluid mechanics and mass transfer to a variety of unit operations, and the skill to analyse the operation of and design such units.

Content: Processing of dry solids: Storage, conveying, pneumatic conveying and fluidization, pressure drop and heat transfer in fluidized beds. Thickening: sedimentation and types of equipment commonly used in industry. Filtration: fundamentals of filtration, pressure drops across filter cakes, types of filters. Drying: Drying rate characteristics, types of dryers. Evaporators, single and multiple effect. Crystallization: Nucleation, rate of crystallization, effect of impurities, types of crystallizers.

Practicals: None.

Assessment: Test, Assignment, (30%) Final Examination (70%)

DP Requirement: 80% attendance at tutorials and to complete all assignments satisfactorily, as specified in the module outline.

Mass Transfer

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

Prerequisite: 40% in ENCH3TH

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, assignment (total 30%), one three-hour exam (70%).

DP Requirement: 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

Process Modelling & Optimisation

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

Prerequisite: ENCH3HE, ENCH3FL, MATH354

Corequisite: ENCH3MT or ENCH3RT.

Aim: To enable the student to express the known material and energy balance as well as rate equations which govern physical and chemical processes in a mathematical form containing all the information necessary for process simulation. 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 to complete all assignments satisfactorily, as specified in the module outline.

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: 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, assignment (total 30%), one three-hour exam (70%)

DP Requirement: 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

Safety and Loss Prevention

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

Prerequisite: 40% in ENCH2MS

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, one assignment (30%), one two-hour examination. (70%)

DP Requirement: 80% attendance at tutorials and to complete assignment satisfactorily, as specified in the module outline.

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 to complete all practicals satisfactorily, as specified in the module outline.

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 to complete all assignments satisfactorily, as specified in the module outline.

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 to complete all assignments satisfactorily, as specified in the module outline.

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: 40% in ENCH3RT

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% in 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 to complete all practicals satisfactorily, as specified in the module outline.

Design Project

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

Prerequisite: 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: 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: 80% attendance at tutorials, completion of the self - study assignments (with a 50% pass)

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: 40% in ENCH3TH

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, 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.

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 point.

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: 40% in ENCH3SL or ENEL2EN
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 at tutorials and to complete all assignments and tests satisfactorily, as specified in the module outline.
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: 40% in ENCH3UO
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, 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.

Advanced Mass Transfer

ENCH4MT H1 (20L-7T-1P-0S-12H-34R-0F-0G-6A-13W-8C)

Prerequisite: 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 to complete all assignments satisfactorily, as specified in the module outline.
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: 40% in ENCH3SL
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 to complete all assignments satisfactorily, as specified in the module outline.
This module is an ECSA Exit Level Outcome 5 final assessment point.

Paper Making Technology

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

Prerequisite: 40% in ENCH3UO
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 to complete all assignments satisfactorily, as specified in the module outline.
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: 40% in ENCH3TH
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, 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.

Applied Reactor Technology

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

Prerequisite: 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 to complete all practicals satisfactorily, as specified in the module outline.

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: 40% in ENCH3UO

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: Complete all assignments satisfactorily, as specified in the module outline.
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%.

Biol 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

Introduction to Civil Design

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

Prerequisite: ENME1DR (40%)
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 (40%), 4-hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Engineering Practice Workshop

ENCV1EP H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)

Aim: Development of communication and management skills; introduction to practical aspects of engineering.
Content: One week workshop in the mid-year vacation covering basic management (including OHS, labour law, group work, management writing skills); informal graphical communications; introduction to practical aspects of civil engineering.
Practicals: Oral presentation and group project.
Assessment: Coursework comprising individual and group assignments: 100%.
DP Requirement: 100% attendance.

Fluids 1

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

Aim: To introduce fundamental concepts of fluid dynamics/hydraulics and develop foundational knowledge and problem solving skills 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 (40%), 2-hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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 (40%), one 2hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Geotechnical Engineering 2

ENCV2GB H1 (20L-8T-9P-0S-28H-12R-0F-0G-3A-13W-8C)

Pre/Corequisite: ENCV2GA
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 (40%), one 2hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Civil Engineering Materials

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

Prerequisite: ENME1EM (40%)
Aim: To introduce practical materials technology to enable understanding of the links between materials and design technologies and the behaviour and interaction of the material with its environment.
Content: Overview of stress, strain, elasticity and deformation behaviour. Introduction to timber, steels, aluminium and its alloys, concrete technology.
Practicals: Three practicals covering metals in tension, timber in bending and compression and concrete mix design and testing.
Assessment: Class mark including test(s), tutorials and practical reports (40%), one 2hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Materials Workshop Course

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

Prerequisite: 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: N/A

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 (40%), one 3-hour exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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 (40%), one 3 hour exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Structural Design 1
ENCV2SD 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: Assignment relating to rc beams and steel.
Assessment: Class mark (40%), 3-hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Civil CADD Workshop
ENCV3CW H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-1W-0C)
Prerequisite: (ENCV2DE or ENCV2SD), DP for ENCV3ST
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: N/A

Civil Engineering Design 2
ENCV3DA H2 (21L-5T-0P-0S-22H-24R-3F-0G-5A-13W-8C)
Prerequisite: ENCV3ST (40%), (ENCV2DE or ENCV2SD)
Aim: To provide students with concepts and further applications of reinforced concrete and structural steel design not previously considered in second year.
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 (40%), one 3 hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Civil Engineering Design 3
ENCV3DB H2 (21L-5T-0P-0S-22H-24R-6F-0G-10A-13W-9C)
Pre/Corequisite : ENCV3DA
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 (40%), one 3 hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Fluids 2

ENCV3FA H1 (40L-24T-16P-0S-51H-24R-0F-0G-5A-13W-16C)
Prerequisite: ENCV2FL
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 (40%), one 3-hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Fluids 3

ENCV3FB H2 (39L-10T-9P-0S-77H-20R-0F-0G-5A-13W-16C)
Prerequisite: 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). Hydrology for water resources management, and flood hydrology. Reservoir and channel routing. Dams & hydraulic structures (weirs, flumes, spillways, culverts, etc). River & canal engineering. Other selected topics & applications 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: Class mark (40%), one 3 hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Geotechnical Engineering Studies 1

ENCV3G1 H1 (40L-24T-16P-0S-51H-24R-0F-0G-5A-13W-16C)
Prerequisite: GEOL215
Aim: To introduce students to the fundamental concepts of Geotechnical Engineering with reference to basic characteristics and physical properties of the soils. Soils behaviour in presence of static and dynamic water. Foundational knowledge for geotechnical engineering.
Content: Introduction to Soil Mechanics, origin and composition of soils, soil classification, basic physical properties of soils, description of soils, water in soils, introduction to stresses in soils (total, effective and pore water stresses). Compaction tests, methods and interpretation of test results. Analysis of settlement of engineering works, stress distribution in soils and consolidation settlements on clays. Fundamentals of shear strength for dry soils, shear box tests and frictional model. Drained and undrained shear strength analysis.
Practicals: Execution and analysis of soils laboratory tests and field trip
Assessment: Class mark including test(s), tutorials and practical reports (40%), one 2hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Geotechnical Engineering Studies 2

ENCV3G2 H2 (39L-9T-20P-0S-70H-20R-1F-0G-3A-13W-16C)
Prerequisite: ENCV3G1 or (ENCV2GA, ENCV2GB)
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: Soil as a foundation for structures and as a material of construction. Soil formation, classification, its physical and mechanical properties, Soil - water systems. Bearing capacity and settlement of shallow and deep foundations. Slope stability. Geotechnical investigations, sampling techniques and determination of soil parameters. Settlement of granular soils. Stress distribution in soil.
Practicals: Site visit for collection of soil sample and execution of appropriate laboratory tests and submission of Geotechnical Investigation report.
Assessment: Class mark including test(s), tutorials, and practical report (40%). 3-hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Systems conceptualisation, 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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Structural Design 2

ENCV3SD H2 (42L-10T-0P-0S-44H-48R-6F-0G-10A-13W-16C)

Prerequisite: (ENCV2DE or ENCV2SD), ENCV3ST (40%)
Aim: To introduce the students to further applications of reinforced concrete and structural steel design not previously considered in second year.
Content: Continuation of reinforced concrete and structural steel design from second year. Theoretical treatment and interpretation of structural codes and models is extended. Topics include concrete flooring systems, insitu beam/ slab systems, flat slabs, concrete columns under bending, concrete foundation systems, reinforced concrete and steel framed buildings, behaviour of and design of plate girders, monosymmetric and class 4 beams, steel columns with bending, frames, steel beam to column connections (including prying action), base connections, lattice girders and trusses. Introduction to bracing systems and wind loading. Plastic design of beams.
Practicals: Mini design project involving reinforced concrete and steel.
Assessment: Class mark including test(s), tutorials and project (40%), one 3 hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Assignment involving use of computer software for structural analysis.
Assessment: Class mark (40%), one 3- hr examination 60%.
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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 (40%), 2-hour examination (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Transport 1B
ENCV3TB H1 (20L-5T-0P-0S-37H-16R-0F-0G-2A-13W-8C)
Pre/Corequisite: ENCV3TA
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 (40%), 2-hour examination (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Transport 2
ENCV3TP H2 (20L-5T-9P-0S-26H-16R-0F-0G-3A-13W-8C)
Prerequisite: GEOL215, ENCV3G1 (40%), ENCV3TT (40%) or (ENCV2GA+ENCV2GB and ENCV2TA (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 (40%), 2-hr exam (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Transport 1
ENCV3TT H1 (39L-10T-0P-0S-68H-38R-0F-0G-5A-13W-16C)
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 (40%), 2-hour examination (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Civil Engineering Design Project
ENCV4DE H2 (0L-0T-0P-0S-236H-0R-0F-0G-4A-13W-24C)
Prerequisite: Has passed all preceding core modules in the program
Aim: To independently research a relevant Civil Engineering issue and produce a professionally presented portfolio.
Content: Investigation into a field of Civil Engineering involving a literature survey, conceptual and detailed computation and design in varying proportions. Summarised in a professionally presented manner in a report with design calculations and construction drawings. Typical topics could include the following: An industrial site development, buildings, roads, parking and retaining walls. A freeway interchange with adjoining roads. A dam and ancillary works.

Assessment: Based on a detailed design report (including drawings), and an oral examination. Module divided into two portions: group work (30%) and individual portion (70%). A pass mark for the individual portion is required as a sub-minimum. Students are required to show competence in each ECSA outcome relevant to this module as specified in the 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: Has passed all preceding core modules in the program
Aim: The candidate will be able to independently research a Civil Engineering issue and present their findings. To develop and consolidate research & reporting skills.
Content: Investigation into a field of Civil Engineering involving a literature survey, experimentation, and computation in varying proportions, summarised in a professionally presented research document. Typical topics could include the following: Hydrological investigations such as reservoir reliability. Transportation investigations such as secondary trips to shopping centres. Labour intensive construction methods.
Assessment: Based on a written dissertation (70%), and oral presentation/examination(30%). 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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Ground and Structural Engineering
ENCV4GS H1 (39L-18T-0P-0S-51H-40R-7F-0G-5A-13W-16C)
Prerequisite: (ENCV2GA + ENCV2GB) or ENCV3G1, ENCV3GT or ENCV3G2, (ENCV3DA + ENCV3DB) or ENCV3SD, 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: (40%). One 3-hr exam (60%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Transport and Environmental Management

ENCV4TE H1 (39L-11T-0P-0S-73H-32R-2F-0G-3A-13W-16C)

Prerequisite: (ENCV3TA & ENCV3TB) or ENCV3TT

Aim: To introduce basic aims and principles of management, which are integrated into practical examples in environmental and transport infrastructure management.

Content: Introduction to the basic management and ecological cycles as well as the social, financial, and legal environments into which the technical concepts of civil engineering are integrated. Applications in the natural and built environment in conformance with the world conservation strategy and more detailed study of the management and design of (transport) infrastructure systems to fulfill all requirements.

Assessment: Assignment (40%) and two 2-hr exams (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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 engineering and water resources management (quality and quantity), 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; groundwater pollution engineering.

Assessment: Class mark: 40%. 3-hr exam (60%).

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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.

Content: 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; Operationalisation 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).

Assessment: Research Project Proposal 50%. 1 two hour Examination 50%

DP Requirement: Satisfactory completion of tutorials and assignments.

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.

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: Assignments 30%. One two hour examination 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Advanced Hydrology

ENCV813 HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Aim: After completing the course, the student should: 1. Understand the physical processes of the land phase of the hydrological cycle; 2. Have reasonable knowledge of hydrological data measurement and processing techniques; 3. Be aware of the problem of inadequacy of hydrological data and ways of dealing with this; 4. Be able to apply typical flood models, water balance models and hydrogeological models; 5. Be aware of the global climate change problem and its potential hydrological implications.

Content: Advanced hydrological processes, overland flow, channel flow, river-aquifer interactions, drought occurrence, spatial and temporal distribution, floods: prediction, flood peak estimation, design flood, flood modelling, recent trends in occurrence and magnitudes of droughts and floods, data fitting techniques, approaches for dealing with inadequate hydrological data, water balance modelling, hydrogeological modelling, synthetic data generation. Application of selected modelling packages e.g. HEC1, HYMAS, MODFLOW etc.

Assessment: Assignments 30%. one two-hour examination 70%

DP Requirement: As per Faculty Rules.

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: Assignments 30%. One two hour exam 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Advanced ground water Hydrology

ENCV834 HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-0W-8C)

Aim: At the end of the course, the student should be able to: 1. Understand methods of modelling water flow in aquifers and gain experience on groundwater modelling using numerical methods; 2. Analyse the effects of pumping on the productivity of aquifers.

Content: Numerical methods of fluid flow systems. Flow in unsaturated zone. Hydrodynamic dispersion. Identification of regional aquifer parameters. Modelling of aquifer systems. Flow in unconfined and leaky aquifers. Hydraulics of pumping and recharge of wells.

Assessment: Assignments 30%. One two-hour examination 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Hydraulics of pipelines

ENCV837 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: Analyse and design water distribution networks including water hammer devices.

Content: Mechanics of liquid flow in pipes and pipe network systems, steady flow, unsteady flow, surge and water hammer problems. Linear and Newton-Raphson's methods of pipe network analysis.

Assessment: Assignments 30%. One two-hour examination 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Open channel flow

ENCV838 HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Aim: At the end of the course, the student should: 1. Be able to apply hydraulic flood routing methods; 2. Have adequate knowledge on the theory and design of open channels; 3. Be able to analyse the dam break problem and estimate the associated losses.

Content: Steady and unsteady flows in surface waters. Different methods of hydraulic flood routing. Solution of the Saint-Venant's equation. Bores and dam break.

Assessment: Assignments 30%. One two-hour examination 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Concrete Pavements

ENCV8CP (20L-10T-0P-0S-30H-16R-0F-0G-4A-0W-8C)

Aim: To introduce students to state of the art practice and research in rigid pavement design and performance.

Content: Fundamental principles underlying the design of rigid pavements and industrial floors on the ground. Current practice with respect to design, construction, equipment, jointing, mix requirements and properties and behaviour modelling of concrete pavements.

Practicals: A field trip may be arranged.

Assessment: Assignments 30%. One two-hour examination 70%.

DP Requirement: Satisfactory completion of tutorials and assignments.

Concrete Technology

ENCV8CT (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Aim: To introduce the student to state of the art practice and research in the field of concrete technology.

Content: Concrete technology, including topics such as durability, dimensional stability, special concrete mixes and construction techniques.

Practicals: A field trip may be arranged.

Assessment: Assignments 30%. One two-hour examination 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Structural Design

ENCV8DS (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: To enable students to understand the underlying principles of selected topics in structural design; and to be able to apply the theory in practice.

Content: Selected topics in advanced structural design.

Assessment: Assignments 30%. One three-hour examination 70%

DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Fluid Dynamics

ENCV8EF HC (40L-22T-0P-0S-79H-15R-0F-0G-4A-13W-16C)

Aim: To develop an understanding of flow (air or water) in the natural environment 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 30%, and one 3-hr examination.
DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Impact Assessment

ENCV8EI HC (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Aim: To enable the student to: 1. Perceive likely impacts of the planned activity on the environment; 2. Apply methodologies to quantify the likely impacts for decision making.
Content: Methods of impact analysis. Prediction and assessment of the physical, sociological, legal and economic environment. Effect of the changed environment on man. Role of environmental engineering in the prevention of environmental stress. Planning and policy, administration and organization of natural resources development and public health. Land use planning and landscape design. The 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: Assignments 30%. One two-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

Environmental Sanitary Engineering

ENCV8ES HC (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: The module will introduce the students to the fundamentals of environmental sanitary engineering, especially with reference to pollution of water systems, waste waters treatment (municipal waste waters, landfill leachate and mine effluents), solid waste management and control of gaseous emissions. It will provide an outlook in the design and management of solid/liquid waste disposal techniques and control of environmental impacts of liquid/solid/gaseous emissions.
Content: Fundamentals of environmental engineering and solid/liquid waste management.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

Advanced Soil Mechanics

ENCV8GA (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: The module will provide advanced knowledge for geotechnical courses in the Civil Engineering post graduate programme and provide a basis for pursuing research in related areas. The module will introduce the students to the advanced concepts of Geotechnical Engineering with reference to engineering characteristics of the soils. It will enable the students to understand the behaviour of soils in the presence of static and dynamic water. The module will also cover the shear strength of soils under drained and undrained conditions and elastic response to static loads.
Content: Soil composition and soil structure; Steady State flow, 2D and 3D seepage, transient flow; Compressibility and rate of consolidation, one, two, and three dimensional consolidation theories; Shear strength and stress-strain relationships of soils; Stability of slopes; Arching effects; Buried Structures. Soil-structure interaction. Application of numerical methods and the finite element method to geotechnical projects.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

Rock Mechanics

ENCV8GB (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: The module will introduce the students to the fundamental concepts of Rock Mechanics with reference to basic characteristics and physical properties of the rocks. It will, also, enable the students to study, understand and predict rock mass behaviour and to design rock slopes and underground openings. The module will provide basic knowledge for pursuing research in the related areas.

Content: Physical properties and classification of intact rock and rock masses, rock exploration, engineering properties of rock, stresses in rock near underground openings; Rock tunnelling, rock slope stability, bolting, blasting, grouting and rock foundation design.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

Intro to Environmental Geotechnics

ENCV8GE (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: The module will introduce students to the environmental principles of geotechnics
Content: The course will cover waste and tailings disposal and retention sites; groundwater flow and the transport of contaminants; legal aspects of environmental geotechnics; and site remediation.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

Advanced Foundation Design

ENCV8GF (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: The candidate will be able to: evaluate and compare foundation systems for a project; to analyse and design foundations according to limit state principles using partial safety factors; make design decisions based on the information emanating from the analysis and designs.
Content: Analysis, design and testing of foundation systems such as piles, basements, rafts and spread footings in terms of ultimate and serviceable states.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

Site Investigation

ENCV8GS (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: Students will be introduced to a comparative understanding of site investigation covering the 3rd World and 1st World practices.
Content: Field techniques of in-situ testing, drilling and sampling and their effects on the quality of the information gained. Description of field profiling and interpretation of field data. Laboratory testing and interpretation of field data.
Assessment: Assignments 30%. One three-hour examination.
DP Requirement: Satisfactory completion of tutorials and assignments.

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: Assignments 30%. One 3-hour examination 60%
DP Requirement: Satisfactory completion of tutorials and assignments

Numerical Methods

ENCV8NM (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: Introduction to the concepts and applications of systems thinking and numerical methods as relevant to management and planning in civil engineering.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

Pavement Design
ENCV8PD (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: To introduce students to state of the art practice and research in the field of flexible pavement design and performance, including life prediction.
Content: Concepts of pavement modelling and traffic loading. Standard flexible pavement design methods used world-wide. The South African mechanistic design method. Current research in pavement design and modelling.
Assessment: Assignment 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

Pavement Materials
ENCV8PM (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: To introduce students to state of the art practice and research in characterisation, testing, specification, construction and environmental performance prediction of pavement materials.
Content: Behaviour and fatigue characteristics of subgrade soils, aggregates, stabilised materials, bitumen, bituminous mixes and surface seals. Specifications for construction, quality control and compaction techniques. Materials requirements for design.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of tutorials and assignments.

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: Assignments 30% One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments/test and project.

Prestressed Concrete Theory and Design
ENCV8SA (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: To enable students to understand the underlying principles of prestressed concrete, and to be able to apply the theory in practice.
Content: General principles of prestressed concrete. Losses in prestress. Flexural stresses. Ultimate flexural strength. Shear strength. Bond and anchorage. Load balancing. Design approaches. Statically determinate structures. Composite structures.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

Adv Reinfrced Concr Structures
ENCV8SB (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)
Aim: To introduce students to the basic principles of advanced reinforced concrete structures.
Content: Basic assumptions of theory for flexural strength. Strength and deformation of members with shear and with torsion. The mechanisms of shear resistance in RC with and without web reinforcement. Strength of members with flexure and axial loads. Design of special structures. Design projects.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

Structural Dynamics
ENCV8SD (40L-27T-0P-0S-50H-40R-0F-0G-3A-13W-16C)
Aim: To enable students to understand the underlying principles of structural dynamics and to be able to apply the theory in practice.

Content: Equations of motion of elastic systems are established and solved in the cases of systems with single, multiple and an indefinite number of degrees of freedom. Free, damped and forced vibrations are dealt with, followed by application to practical cases. Where mathematical solution is not feasible, recourse is made to numerical techniques. Earthquake behaviour is also considered. The main purpose of the course is the emphasis on potential dynamic magnification of static effects.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

Structural Theory

ENCV8ST (40L-32T-0P-0S-70H-15R-0F-0G-3A-13W-16C)

Aim: To introduce students to advanced structural theory.
Content: Advanced structural theory covering static and dynamic behaviour, with linear and non-linear analysis techniques using the finite element method.
Assessment: Assignments 30%. One three-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

Transport Control

ENCV8TC HC (40L-10T-0P-0S-74H-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: Assignments 30%, one three-hour examination 70%
DP Requirement: Satisfactory completion of assignments/test and project.

Transport Development

ENCV8TD HC (40L-10T-0P-0S-70H-37R-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: Assignments 30%, one three-hour examination 70%
DP Requirement: Satisfactory completion of assignments/test and project.

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: Assignments 30%, one three-hour examination 70%
DP Requirement: Satisfactory completion of assignments/test and project

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 storm water and approaches for minimising their impacts.
Content: Methods of flood peak estimation, flood hydrograph estimation methods, the HEC model, design floods, storm water drainage design – roof, road and drains, drainage network optimization, economic cost of flooding, quality of urban runoff, environmental impacts of urban storms, potential use of urban storm water.
Assessment: Assignments 30%. One two-hour examination 70%
DP Requirement: Satisfactory completion of assignments and tutorials.

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: Assignments 30%. One two-hour examination 70%.
DP Requirement: Satisfactory completion of assignments and tutorials.

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: Assignments (10%), one project (20%), one test (10%) and one 3-hour examination (60%)
DP Requirement: Satisfactory completion of assignments/test and project

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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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.
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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Construction Technology & Processes 2A
ENPD2TA H1 (35L-0T-13P-0S-74H-20R-13F-0G-5A-13W-16C)
Prerequisite: 50% in ENPD1TA & ENPD1TB
Aim: To familiarise students with the concepts of technology, resource requirements, programming and cost analysis associated with various building types.
Content: Thermal acoustic and fire properties and requirements. Construction methods involving steel frames, portal frames and shell roofs. Waterproofing and flat roofs, and lightweight claddings and coverings.
Practicals: Site surveys and data presentation.
Assessment: Assignments & tests (40%), one 3-hr exam (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Construction Contracts
ENPD3CC H2 (20L-6T-6P-0S-31H-6R-6F-0G-5A-13W-8C)
Prerequisite: LAWS1IL (40%)
Aim: To introduce standard building contract forms in common usage, sub contract documentation, and the relationship between this formal documentation, common law principles and delict.
Content: Model preliminaries. Development of construction contracts in South Africa. International forms of contract. How to make appropriate choices and recommendations regarding the form of contract to be employed on a project. Targeted procurement procedures.
Assessment: Case study presentation and test (30%), one 3-hr exam (70%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Design Appraisal & Measurement 3A
ENPD3DA H1 (26L-9T-17P-0S-65H-6R-32F-0G-5A-13W-16C)
Prerequisite: 50% in ENPD2DA & ENPD2DB
Aim: To develop the procurement documentation expertise of students by application of Standard System of Measuring Building Work clauses to the measurement of framed reinforced concrete multi-storey structures.

Content: Students are set various measuring tasks on specific projects to afford them contact with actual conditions in the workplace. Aspects covered: bulk earthworks; column bases, foundation beams, various slab forms together with columns, beams, staircases.
Practicals: Real-life case studies
Assessment: Assignments & tests (40%), one 4-hr exam (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Construction Economics & Management 3A

ENPD3EA H1 (47L-32T-0P-0S-34H-42R-0F-0G-5A-13W-16C)

Prerequisite: 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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Construction Technology & Processes 3A

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

Prerequisite: 50% in ENPD2TA & ENPD2TB
Aim: The study of advanced building construction and services.
Content: Critical evaluation of design layouts and detailing in relation to viability of cost, ease of construction and aesthetic acceptability. The production process relating to the interaction of specialist services within the context of the overall building programme for complex and specialist buildings.

Practicals: Practical case study
Assessment: Assignments & tests (40%), one 3-hr exam (60%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Law of Building Contracts

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

Prerequisite: LAWS1AS or LAWS1IL
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: Satisfactory attendance at tutorials / lectures / and satisfactory completion of all practicals / assignments / tutorials as applicable

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Management of Contruction Contracts

ENPD7CL 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 forms of contract adopted internationally, as well as statutes governing Occupational Health and Safety standards within the built environment in South Africa.
Content: International Construction Contracts; Primary legal principles adopted in construction contracts; Occupational Health and Safety legislation in South Africa.
Assessment: Assignments 40%. One 3-hr exam 60%. Engineering students are required to show competence in ECSA Outcomes 7 & 10 relevant to this module.
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Advanced Design Appraisal & Measurement

ENPD7DA H2 (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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Professional Practice

ENPD7PP H1 (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 professional practice. Introduce students to the complexity of modern professional office administration and practice management.
Content: Structuring the professional practice and contractual agreements; Marketing the practice; Legislation governing professional practice; Practice administration and management; Financial management; Tax planning; Insurances; Elements of social interactions / interpersonal communication.
Assessment: Assignments 40% One 3-hr exam 60%. Engineering students are required to show competence in ECSA Outcomes 8 & 10 relevant to this module.
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Research proposal (100%).
DP Requirement: Report of satisfactory progress by supervisor.
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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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 (100%).
DP Requirement: Report of satisfactory progress by supervisor.
No supplementary examination.

Surveying

Offered in the School of Civil Engineering, Surveying & Construction

Geomatics I
ENSV1G1 H1 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)
Aim: To introduce the learner to the scope and uses of spatially referenced information and methods of acquiring it, at local and global scales. To introduce the concept of data quality and ways of assessing it. To introduce ways of representing spatial data in different reference systems of the 3-dimensional Earth and on various map projections, and transformation of information between reference systems.
Content: An overview of the concepts of geomatics; the nature of spatial data; representation of spatial data; co-ordinate systems and the standard map projection systems used in South Africa (Gauss Conformal, Lambert's Conical Conformal and Alber's Equal Area); overview of the methods of acquision of spatial data; processing, analysis, representation and display of spatial data; introduction to statistical description and analysis of spatial data; introduction to the concepts of geographical information systems (GIS); interpretation and analysis of maps, aerial photographs and remote sensing imagery.
Practicals: Field and Office work on data acquisition, processing and presentation.
Assessment: Course Mark (30%), Three (3) hour final examination (70%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Geomatics 2
ENSV1G2 H2 (28L-10T-19P-0S-68H-30R-0F-0G-5A-0W-16C)
Prerequisite: 40% in ENSV1G1
Aim: To provide students with an ability to plan and carry out a survey of any mapping and/or engineering project, and to select the right methodology, equipment and software to facilitate processing and presentation of the survey results in an appropriate and easy to understand format.
Content: Levelling; angle measurement; distance measurement; methods for fixing ground control and observation points; site and field surveying; Similarity and affine co-ordinate transformations; GPS for use in Geographic Information Systems (GIS); theory and application of a gyrotheodolite.
Practicals: Field and Office work on data acquisition, processing and presentation.
Assessment: Course Mark (30%), Three (3) hour final examination (70%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Survey Camp 1
ENSV1SC H2 (0L-0T-0P-0S-0H-0R-80F-0G-0A-2W-8C)
Prerequisite: 40% in ENSV1G1
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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Hydrographic Surveying
ENSV2HY H1 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)
Aim: To provide students with an ability to plan and carry out a near shore bathymetric survey using total stations, real time differential GPS and digital echo sounder. Reduce the results and produce a contoured chart of the area.
Content: Maritime baselines, boundaries, limits and coastal rights; Control for inshore and offshore position fixing; Acoustic ranging systems; Depth determination, depth datums, underwater acoustics; Tidal regime, wave heights, mean sea level and chart datum transfer; Harmonic components, tidal constituents; Wave refraction, reflection and diffraction; CSP principles. Satellite altimetry and its application to ocean bathymetry; Secular variations in MSL and their relevance to climate. Positional control of robotic hydrographic exploration; Geophysical exploration of the oceanic subsurface.
Practicals: Methods used in hydrographic surveying.
Assessment: Practical/tutorial assignment 15%, one 3-hour examination 85%.
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Course Mark (30%), Three (3) hour final examination (70%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Surveying (Engineering) 1 (20L-10T-19P-0S-15H-10R-0F-0G-5A-13W-8C)
ENSV2SA H1
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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Surveying (Engineering) 2
ENSV2SB H1 (20L-10T-19P-0S-15H-10R-0F-0G-5A-13W-8C)
PreCorequisite: ENSV2SA/ENSV1G2
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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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.

Surveying (Engineering)
ENSV2SE H1 (28L-10T-19P-0S-68H-30R-0F-0G-5A-13W-16C)
Aim: To introduce students to the concepts of observing, recording, reduction and presentation of survey measurements and their applications in engineering projects and to highlight the importance of recognising landownership when executing engineering projects.
Content: The nature and representation of spatial data; co-ordinate systems and map projection systems used in South Africa; overview of modern surveying instruments for spatial data acquisition; Levelling; angle measurement; distance measurement; methods for fixing ground control and observation points; site surveying and terrain modelling; photo interpretation; introduction to Geographical Introduction Systems (GIS); Introduction to Global Position System (GPS); engineering applications of survey measurements; introduction to cadastral surveys and landownership.
Practicals: Field and office work involving various survey techniques, processing and presentation of survey measurements.
Assessment: Course Mark (30%), Three (3) hour final examination (70%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Survey Camp 3

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

Prerequisite: 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. To introduce students to the instrumentation and techniques used in realisation of global reference, enabling the Student to integrate these systems into national and regional projects.
Content: Satellite co-ordinate systems and satellite orbits, principles of position location using satellites. The Global Position System; navigation and surveying using GPS. Design a control system for a specific geodetic task.
Practicals: Perform GPS surveys.
Assessment: Tutorial/Practical assignments and one test (30%), one 3-hour examination. (70%)
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

Geodesy

ENSV4GY H1 (30L-20T-0P-0S-75H-30R-0F-0G-5A-13W-16C)

Aim: To give students an understanding of the Earth's gravity field as it affects measurements on it, the various models for height and gravity reductions and representational frameworks.

Content: Potential theory, gravity observations, reductions and instruments, isostacy, height systems, 3-dimensional triangulation; geodetic co-ordinate systems. Geodetic surveying in one dimension (geodetic levelling and gravimetry), in two dimensions (geodetic astronomy and two-dimensional geodetic networks) and in three dimensions: three-dimensional geodetic networks, inertial surveying systems, geodetic use of the Global Position System, very long baseline interferometry, lunar and satellite laser ranging, satellite and airborne gravity gradiometry, satellite altimetry.

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

DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

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.

Land Tenure
ENSV4TN H1 (39L-0T-0P-15S-68H-30R-0F-0G-5A-13W-16C)
Aim: To enable the student to understand the role of security of tenure and land ownership in the land survey profession in order to be informed of the right approach to solving cadastral and land management problems.
Content: Introductory land tenure concepts; world land tenure systems; historical development of land tenure patterns in South Africa; Land policies of the South African Government of National Unity; South African Land Tenure Systems; Cadastral systems and Cadastral reform.
Practicals: Essay assignments and seminar/s on approaches to solve cadastral, tenure and land management problems.
Assessment: Course Mark (30%), Three (3) hour final examination (70%).
DP Requirement: Students are required to attend all tutorials/lectures and complete all practicals/ assignments/ tutorials satisfactorily, as specified in the module outline.

SCHOOL OF ELECTRICAL, ELECTRONIC & COMPUTER ENGINEERING

Offered in the School of Electrical, 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: Project Design of an electrical/electronic instrument
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all practicals and assignments satisfactorily, as specified in the module outline. Subminimum: None

Computer Methods 1

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

Prerequisite: ENEL1EN, ENEL1ED
Aim: To Introduce the basic concepts of writing procedural code with sequence, selection and repetition. The representation of data in arrays, passing of data and storage in files. Presentation of structured and documented solutions to selected data processing problems.
Content: Procedures, selection and looping control structures, basic data representation and file access, algorithms, programs and computers.
Practicals: Programming assignments covering major aspects of the course content.
Assessment: Coursework and Tests 30%, Examination 70% .
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Computer Methods 2

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

Prerequisite: ENEL2CA
Aim: To extend the computer programming paradigms presented in the first course to cover: Programming for Graphical User Interfaces; Event Driven programming; Object oriented Programming and Application Frameworks. These four concepts will be illustrated with a suitable programming language and application development system / framework to instil in the student a good grasp of these concepts and how they are applied to large software projects to enhance productivity and reliability through good code encapsulation, documentation and re-use.
Content: The chosen language syntax; coding for the event driven paradigm; the concepts and tenets of Object Oriented Programming; an introduction to application frameworks and the use of one typical framework; developing a system using all these paradigms.
Practicals: VB.NET software design.
Assessment: Coursework and Tests 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

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 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Electrical Principles 1

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

Prerequisite: PHYS152, MATH132, MATH141
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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Principles 2

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

Prerequisite: 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electronic Engineering

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

Prerequisite: 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Design 2

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

Prerequisite: 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 satisfactorily, as specified in the module outline.

Electrical & Electronic Engineering

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

Prerequisite: (PHYS152 or PHYS162), MATH132, MATH141

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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Engineering

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

Prerequisite: PHYS152, MATH132, MATH141

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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

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: PHYS152, CHEM191
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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Physical Electronics 1

ENEL2PA H1 (20L-5T-6P-0S-34H-10R-0F-0G-5A-13W-8C)
Prerequisite: CHEM181, 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Physical Electronics 2

ENEL2PB H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)
Prerequisite: 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 effectt ransistors. MOSFET devices. Optical devices. The silicon controlled rectifier

Practicals: Two 3-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Software Engineering 1

ENEL2SE H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Aim: To teach learners how to write properly structured computer software to a professional standard.
Content: The activities that make up a typical software development lifecycle including requirements elicitation and analysis, system design and object design. Software development lifecycle modeling. Design and development methodologies. The use of UML in software development activities.
Assessment: Coursework and Tests (30%) Examination (70%)
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

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: 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Computer Engineering Design 1

ENEL3CA H1 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

Corequisite: ENEL3TA
Aim: Design and implement practical product oriented system. Apply theoretical engineering knowledge to practical design. Effectively communicate design concepts in written report and orally. Judge the merit and correctness of solutions to problems. Communicate the logic and detailed approach to problem solving. Work as part of a design team tasked with providing a design solution. Understand the nuances of the social issues confronting business in South Africa.
Content: Design studies and seminars will be conducted on selected topics of interest.
Practicals: Build, test and characterise analogue and digital circuits.
Assessment: 30 % Continuous assessment and 70% Final Assessment.
DP Requirement: None
No supplementary exam.

Computer Engineering Design 2

ENEL3CB H2 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

Prerequisite: ENEL2WS, ENEL3DA, ENEL3DS

Aim: To give students the opportunity to participate in the design of computer hardware and software systems. The design process is formally structured to simulate a formal design approach. The design techniques build on those acquired in ENEL3CA 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: None.

No supplementary exam.

Computer Methods 3

ENEL3CC H1 (20L-0T-20P-0S-25H-10R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2CA

Aim: Using a high-level platform independent programming language to explore software systems with a focus on cooperative engineering application development. This will incorporate the use of advanced object orientated programming and basic user interface design.

Content: High-level object orientated programming, associated tools and techniques, cooperative engineering application.

Assessment: Coursework and Test 30%. Examination 70%.

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 5: Engineering method skills and tools including Information Technology (Pass the course).

Communications

ENEL3CO H2 (39L-10T-12P-0S-84H-9R-0F-0G-6A-13W-16C)

Prerequisite: 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Control Systems 1

ENEL3CS H2 (20L-5T-6P-0S-31H-12R-0F-0G-6A-13W-8C)

Prerequisite: 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electronic Design 1

ENEL3DA H1 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

Corequisite: ENEL3TA

Aim: Design and implement practical product oriented system. Apply theoretical engineering knowledge to practical design. Effectively communicate design concepts in written report and orally. Judge the merit and correctness of solutions to problems. Communicate the logic and detailed approach to problem solving. Work as part of a design team tasked with providing a design solution. Understand the nuances of the social issues confronting business in South Africa.

Content: Design studies and seminars will be conducted on selected topics of interest.

Practicals: Build, test and characterise analogue and digital circuits.

Assessment: 30 % Continuous assessment and 70% Final Assessment.

DP Requirement: None.

No supplementary examination.

Electronic Design 2

ENEL3DB H2 (10L-22T-0P-0S-45H-0R-0F-0G-3A-13W-8C)

Prerequisite: ENEL2WS, ENEL3DA, ENEL3TA, ENEL3DS

Corequisite: ENEL3AE, ENEL3DE

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% final assessment (written report & oral presentation)

DP Requirement: None.

No supplementary examination.

Digital Electronics

ENEL3DE H2 (20L-5T-6P-0S-20H-20R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2EB

Aim: To provide a study of the design and analysis sequential circuits and to provide an introduction to VHDL.

Content: S-R latch, D-latch, D-FF, S-R FF, J-K FF and T-FF; Analysis of hazard effects in sequential circuits; the synchronous finite state machine analysis; the synchronous finite state machine design; feedback sequential circuits analysis; feedback sequential circuits design; sequential MSI components; introduction to VHDL; implementation of digital circuits using VHDL.

Practicals: Two 3-hr laboratory practicals.

Assessment: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Digital Systems

ENEL3DS H1 (40L-11T-12P-0S-60H-32R-0F-0G-5A-13W-16C)

Prerequisite: ENEL2CA

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 30%, Examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Design 3

ENEL3EA H1 (10L-22T-5P-0S-35H-5R-0F-0G-3A-13W-8C)

Prerequisite: ENEL2EA, ENEL2EB, ENEL2FT

Corequisite: ENEL3MA

Aim: Model and analyse electromagnetic actuators using the Finite Element Method. To work in a team in a structured way

Content: Principles of finite element analysis of magnetostatic fields, 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. Selection of materials and design of electrical machines and actuators using finite element techniques.

Practicals: Design & testing of machines & actuators.

Assessment: Project reports, design tutorials, mini design project, test. Sub minima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 5: Engineering methods, skills and tools including information technology ECSA Outcome 8: Working in a team.

DP Requirement: None

No supplementary examination.

Electrical Design 4

ENEL3EB H2 (10L-5T-5P-0S-52H-5R-0F-0G-3A-13W-8C)

Prerequisite: ENEL3DS ENEL3SS, ENEL2WS, ENEL3TA,

Aim: To understand electrical engineering applications of embedded microcontroller systems. To work in a team in a structured way.

Content: Design and test a simple microprocessor systems. Real-Time embedded System Control. Design, simulation, building and testing of real time embedded control systems. Interfacing to power electronic devices.

Assessment: Project reports, design tutorials, mini design project, test. Sub minima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 5: Engineering methods, skills and tools including information technology ECSA Outcome 8: Working in a team

DP Requirement: None

No supplementary examination.

E-M Theory

ENEL3EM H2 (20L-5T-6P-0S-34H-10R-0F-0G-5A-13W-8C)

Prerequisite: 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Electrical Machines 1

ENEL3MA H1 (20L-5T-6P-0S-28H-16R-0F-0G-5A-13W-8C)

Prerequisite: ENEL2EL or ENEL2EA

Aim: Understand the characteristics and applications of various electrical machines and mechanical loads. Predict electrical and mechanical characteristics of different electrical machines with loads and appreciation of temperature rise. Understand AC to DC current conversion techniques.

Content: DC machines, armature windings, efficiency and speed control. Single and 3-phase transformers, equivalent circuits, phasor diagrams, efficiency, regulation, autotransformers and 3-phase power measurement. Induction motors, equivalent circuits, performance calculations and starting. AC to DC conversion.

Practicals: Two 3-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: Component of ECSA exit-level outcome 8: multidisciplinary work (pass the assignment). Students to perform an assignment in a team which includes both mechanical and electrical engineering students. The assignment will include mechanical and electrical components (such as matching mechanical load to machine specifications, motor-gearbox design)

Electrical Machines 2

ENEL3MB H2 (20L-5T-6P-0S-28H-16R-0F-0G-5A-13W-8C)
Prerequisite: 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Power Electronics 1

ENEL3PE H2 (20L-6T-6P-0S-31H-12R-0F-0G-5A-13W-8C)
Prerequisite: ENEL2EA & 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Software Engineering 2

ENEL3SF H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: ENEL2CA. ENEL2SE

Aim: To provide a broad view of both quality assurance and testing so that students will have a broad awareness of many of the activities that contribute to managing the quality of a software product..

Content: Introduction: Software life cycle, role of testing and quality assurance (QA), risk management. Test design techniques: Exploratory testing, testing design techniques, system testing, test documentation.Bug isolation and reporting. Static testing; Process improvement; Overview of automated testing; Object oriented software engineering techniques: An in-depth view to using UML in the design and development of object-oriented software projects.

Assessment: Coursework and Tests (30%) Examination (70%)

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline.

Systems & Simulation

ENEL3SS H1 (20L-5T-6P-0S-33H-12R-0F-0G-4A-13W-8C)

Prerequisite: MATH238, 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Analogue Electronics 1

ENEL3TA H1 (20L-5T-6P-0S-24H-20R-0F-0G-5A-13W-8C)

Prerequisite: 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline.

Design & Analysis of Algorithms

ENEL4AA H1 (14L-6T-12P-0S-29H-15R-0F-0G-4A-13W-8C)

Prerequisite: ENEL2DS,ENEL3CC

Aim: To present the fundamental techniques for designing efficient computer algorithms, proving their correctness, and analyzing their running times.

Content: Review of algorithm design and analysis: Time and space complexity; average and worst-case analysis; asymptotic notation; measuring the asymptotic growth functions; summations; recurrence relations. Divide and Conquer: Max-dominance.Review of sorting and lower bounds: Analysis of mergesort, quicksort and heapsort, lower bounds on comparison-based sorting, linear time sorting, randomized selection. Graph algorithms: Graph representations, depth-first and breadth-first search, directed acyclic graphs, minimum spanning trees, and shortest paths. Techniques for problem solving - Dynamic programming: Knapsack, chain-matrix multiplication, all-pairs shortest paths; longest common subsequence. Technique for problem solving –

Greedy algorithms: Huffman codes, activity selection. NP-completeness: Non-determinism, the classes P and NP, NP-complete problems, polynomial reductions, approximations.
Assessment: Coursework and Tests 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignment satisfactorily, as specified in the module outline.

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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Artificial Intelligence
ENEL4AI H2 (14L-6T-12P-0S-32H-12R-0F-0G-4A-9W-8C)
Prerequisite: ENEL3CC
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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Computer Engineering Design 3

ENEL4CA H1 (0L-10T-44P-7S-85H-11R-0F-0G-3A-13W-16C)

Prerequisite: ENEL3DA, ENEL3DS, ENEL3DB, ENEL3AE, ENEL3DE.

Aim: Function in self-managed group projects. Have a good awareness of the full scope of the engineering design process. Design a reasonably complex electronic system to match an approved, self-generated product specification. Understand the importance of time and project management and be able to apply common tools to this end. Be aware of a variety of CAD tools to be used in the design process and able to apply some of these tools to create and/or implement a design.

Content: Design studies and seminars conducted on selected topics.

Practicals: Group laboratory design project.

Assessment: Continuous assessment 50%, final assessment 50%.

DP Requirement: None. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 1: Problem Solving (Pass the course) ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 3: Engineering Design (Pass the course) ECSA Outcome 8: Individual working team-work and multidisciplinary working (Pass the team work component)

Computer Engineering Design Project

ENEL4CB H2 (0L-0T-126P-0S-194H-0R-0F-0G-0A-13W-32C)

Prerequisite: ENEL4CA

Aim: Develop the skills necessary to interpret project specifications and plan the necessary work. Demonstrate an independent ability to solve Electronic Engineering design problems. Demonstrate the ability to assess the feasibility of design ideas, work safely and independently. Present ideas by means of written report, oral presentation with audio-visual aids and by means of a poster.

Content: Perform an individual design to an agreed specification. Present the design by means of a written report and an oral. Exhibit the design project at the School of Electrical and Electronic Open Day.

Practicals: Individual laboratory design project.

Assessment: Continuous Assessment 25%, Examination 75%.

DP Requirement: Students are expected to work consistently throughout the semester on their projects. Each student's performance on both the Interim Oral and Interim Report will be used to make a decision on the award of a duly performed certificate for the course. Subminima: The following ECSA exit level outcomes assessed in this course are course subminimum. 1: Problem Solving (Pass the project component) 2: Application of scientific and engineering knowledge (Pass the project component) 3: Engineering Design (Pass the project component) 6: Professional and technical written and oral communication (Pass the report writing and oral component).

No supplementary examination.

Distributed Computing Systems

ENEL4CC H2 (20L-6T-12P-0S-26H-10R-0F-0G-6A-13W-8C)

Prerequisite: 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: Two project-assignment

Assessment: Test and Projects 30% Final exam 70%

DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments)

E-Commerce Systems

ENEL4CM H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

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 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments)

Computer Architecture and Organisation

ENEL4CO H1 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3DS
Aim: To teach learners about the hardware used in computer systems.
Content: Computer architecture; processor hardware; memory systems; microprocessor systems; interfacing; data acquisition systems. 140 Engineering.
Assessment: Coursework and Tests 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (Pass practicals or equivalent assignments)

Control Systems 2

ENEL4CS H1 (20L-2T-12P-0S-30H-12R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3SS & ENEL3CS
Aim: Understand more about control systems and robust feedback design.
Content: Parametric and non-parametric system identification; Frequency domain and quantitative feedback design; Digital implementation; Introduction to non-linear systems.
Practicals: Two 6-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals)

Electronic Design 3

ENEL4DA H1 (0L-20T-46P-11S-70H-16R-0F-0G-0A-13W-16C)

Prerequisite: ENEL3DA, ENEL3DS, ENEL3DB, ENEL3AE, ENEL3DE.
Aim: Function in self-managed group projects. Have a good awareness of the full scope of the engineering design process. Design a reasonably complex electronic system to match an approved, self-generated product specification. Understand the importance of time and project management and be able to apply common tools to this end. Be aware of a variety of CAD tools to be used in the design process and able to apply some of these tools to create and/or implement a design.
Content: Design studies and seminars conducted on selected topics.
Practicals: Group laboratory design project.
Assessment: Continuous assessment 50%, final assessment 50%.
DP Requirement: None. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 1: Problem Solving (Pass the course) ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 3: Engineering Design (Pass the course) ECSA Outcome 8: Individual, team-work and multidisciplinary working (Pass the team work component).
No supplementary examination.

Digital Communications

ENEL4DC H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the practicals).

Digital Processes

ENEL4DP H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3DS, 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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (pass the laboratory practicals).

Digital Signal Processing

ENEL4DS H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3SS

Aim: To understand the use of z-transforms in the analysis of discrete linear time invariant systems. Design of FIR and IIR filters using MATLAB and implementation on a DSP chip. Applications of DSP techniques in at least one of the following areas: speech and image processing, communications, medicine.

Content: The z-Transform and its application to LTI systems. Frequency analysis of signals and systems. Design of FIR and IIR filters. Finite word length effects. The DFT and the FFT. Multirate DSP. The TMS320C50 DSP.

Practicals: Two 6-hr laboratory practicals.

Assessment: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Data Communications

ENEL4DT H1 (14L-6T-12P-0S-35H-9R-0F-0G-4A-9W-8C)

Prerequisite: ENEL3CO

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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Electrical Design 5

ENEL4EA H1 (0L-0T-100P-0S-140H-0R-0F-0G-0A-13W-24C)

Prerequisite: Passed at least 10 ENEL3xx subjects, ENEL3EA, ENEL3EB.
Aim: Develop the skills necessary to interpret design specifications, plan and execute a design procedure so as to meet such specifications. Demonstrate through project work an independent ability to solve Electrical Engineering design problems. Demonstrate through practical work the ability to assess the feasibility of design ideas, work safely and independently. Present ideas by means of written report and oral presentation with audio-visual aids.
Content: Design studies and seminars will be conducted on selected topics.
Practicals: Laboratory design project.
Assessment: Interim and final written reports and interim and final oral presentations.
DP Requirement: None. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 1: Problem Solving (Pass the course) ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 3: Engineering Design (Pass the course) ECSA Outcome 8: Individual working (Pass the course)
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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all assignments satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 7: Impact of Engineering activity (Pass the course) ECSA Outcome 10: Engineering Professionalism (Pass the professionalism assignment).

Analogue Electronics 3

ENEL4EC H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)

Prerequisite: ENEL3AE
Aim: Analyse complex analogue systems as used in the electronics industry. Design and synthesize analogue circuits to match specific requirements. Analyse and compensate for component non-linearities.
Content: The analysis and design of electronic circuits used in communication systems, digital systems, integrated circuits, instrumentation systems and data acquisition systems.

Practicals: Two 6-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

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%.
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. Subminima: The following ECSA exit level outcomes assessed in this course are course subminimum. 1: Problem Solving (Pass the project component) 2: Application of scientific and engineering knowledge (Pass the project component) 3: Engineering Design (Pass the project component) 6: Professional and technical written and oral communication (Pass the report writing and oral component).
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: Course work 20%, Examination 80%
DP Requirement: Performed all assignments satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 7: Impact of Engineering activity (Pass the course).

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%.
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. Subminima: The following ECSA exit level outcomes assessed in this course are course subminimum. 1: Problem Solving (Pass the project component) 2: Application of scientific and engineering knowledge (Pass the project component) 3: Engineering Design (Pass the project component) 6: Professional and technical written and oral communication (Pass the report writing and oral component).
No supplementary examination.

Embedded Systems

ENEL4ES H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)
Prerequisite: 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 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments).

High Voltage Engineering 1

ENEL4HA H1 (20L-2T-18P-0S-25H-10R-0F-0G-5A-13W-8C)
Prerequisite: 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

High Voltage Engineering 2

ENEL4HB H2 (14L-6T-8P-0S-32H-15R-0F-0G-5A-9W-8C)
Prerequisite: ENEL3EM, MATH354, ENEL4HA
Aim: To provide candidates with the necessary theoretical and practical understanding of the design principles of high voltage power systems and the performance of outdoor insulation.
Content: Numerical techniques for calculating electric field distributions in typical geometries. Partial discharge testing. Performance of outdoor insulators in polluted environments. Insulation co-ordination and transmission line design principles. Self-study through literature review related to the design, operation and maintenance of high voltage equipment.
Practicals: One 8 hour laboratory session plus report.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis. (Pass the laboratory practicals)

Internet Engineering
ENEL4IE H2 (14L-8T-12P-0S-30H-10R-0F-0G-6A-13W-8C)
Prerequisite: ENEL4DT
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 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments).

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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis. (Pass the laboratory practicals).

Instrumentation
ENEL4IN H1 (20L-2T-12P-0S-33H-9R-0F-0G-4A-13W-8C)
Prerequisite: ENEL3TA, ENEL3MB
Aim: To introduce instrumentation and instrumentation systems & their engineering design; the selection of primary sensors, principles behind process instrumentation. To design instrumentation amplifiers for low level primary signals. To learn electromagnetic interference effects and mitigating strategies.
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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis. (Pass the laboratory practicals)

Image Processing
ENEL4IP H2 (20L-5T-6P-0S-35H-10R-0F-0G-4A-13W-8C)
Prerequisite: ENEL4DS
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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Electrical Machines 3

ENEL4MA H1 (20L-2T-12P-0S-31H-10R-0F-0G-5A-13W-8C)

Prerequisite: ENEL3MA, ENEL3MB, ENEL3CS, ENEL3PS and ENEL3SS
Aim: Analyse salient pole synchronous machines. Test synchronous machines and measure their basic parameters. Analyse simple electromechanical converters. Deal with simple cases of transient behaviour of synchronous and dc machines. Analyse and calculate performance of closed loop speed control systems of dc motors.
Content: Salient pole synchronous machines, two axis theory of synchronous machines, principles of electromechanical energy conversion, generalised machine theory, primitive machine, transient behaviour of synchronous machines, transient behaviour of dc machines, closed loop control of dc machines.
Practicals: Two 6-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course). ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Microwave Systems

ENEL4MS H2 (14L-6T-12P-0S-36H-8R-0F-0G-4A-9W-8C)

Prerequisite: ENEL3EM
Aim: Analyse and solve simple high frequency networks. Design simple passive microwave components. Explain the operation of some microwave measurement equipment. Analyse and design small signal microwave amplifiers.
Content: S parameters. Spectrum and network analyzer operation. Microstrip design and synthesis with reference to; frequency dependence, loss mechanisms, discontinuity models. Passive microstrip circuits including; multi-section impedance transformers and matching networks. Stepped impedance filters, power dividers, directional couplers and hybrid junctions. Coupled transmission line theory. Microwave CAD: Circuit analysis and component models at high frequencies. Small signal microwave amplifiers; specified gain, low noise, biasing and construction.

Practicals: Two 6-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

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)

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 and Coursework 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments).

Power Electronics 2

ENEL4PA H1 (20L-2T-12P-0S-29H-12R-0F-0G-5A-13W-8C)

Prerequisite: 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Power Electronics 3

ENEL4PB H2 (14L-6T-12P-0S-32H-12R-0F-0G-4A-9W-8C)

Prerequisite: 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 satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals) ECSA Outcome 9: Independent learning ability (Pass the course).

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 or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments).

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: There may be two 6-hr laboratory practicals.
Assessment: Coursework and Tests 50%, Examination 50%.
DP Requirement: Performed all laboratory practicals or assignments satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 9: Independent learning ability. (Pass the course).

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: There may be two 6-hr laboratory practicals.

Assessment: Coursework and Tests 50%, Examination 50%.
DP Requirement: Performed all laboratory practicals or assignments satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 9: Independent learning ability. (Pass the course).

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: One 6-hr laboratory practicals.
Assessment: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course.ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (pass the laboratory practical).

Security and Encryption

ENEL4SE H1 (20L-0T-6P-0S-35H-10R-0F-0G-4A-13W-8C)

Prerequisite: MATH349
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. Database and its security
Assessment: Coursework and Tests 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (Pass practicals or equivalent assignments).

Power System Stability

ENEL4SS H2 (14L-6T-12P-0S-25H-15R-2F-0G-6A-9W-8C)

Prerequisite: ENEL3CS, 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: Continuous assessment 30%, examination 70%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis. (Pass the laboratory practicals)

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)

Prerequisite: ENEL4DC

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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactiorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (pass the laboratory practicals).

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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (pass the laboratory practicals).

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: Continuous assessment 50%, examination 50%.
DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals) ECSA Outcome 9: Independent learning ability (Pass the course).

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, ENEL3DS
Aim: To understand the main suite of tools that are available for VLSI design, and how they work together to support the design flow of a project. Understand the capabilities and limitations of each individual tool from their external interfaces and roles in the design process. To use modern CAD tools for VLSI design. Understand how computers can be programmed to help in the design of very-large-scale integrated (VLSI) circuits.
Content: Procedures for designing and implementing digital integrated systems. Design environments: System level, algorithm level, component level and layout level. Structured design technology and design tools: Synthesis tools; Cell contents generation and manipulation, generators of layout outside the cell, silicon compilers, post-layout generators. Static analysis tools; Node extraction, geometrical design-rule checkers, electrical-rule checkers, verification. Dynamic analysis tools; Circuit-level simulation, logic-level simulation, functional-and 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 30%, Examination 70%.
DP Requirement: Performed all laboratory practicals or equivalent assignments satisfactorily, as specified in the module outline. Subminima: ECSA outcome 4: Investigation, Experiment and Data analysis (pass practicals or equivalent assignments).

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: Continuous assessment 30%, examination 70%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge. (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals).

Power Systems 3

ENEL4WB H2 (14L-6T-12P-0S-33H-10R-0F-0G-5A-9W-8C)

Prerequisite: 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: Continuous Assessment 50%, Examination 50%.

DP Requirement: Performed all laboratory practicals satisfactorily, as specified in the module outline. Subminima: The following ECSA exit level outcomes are assessed in this course. Students who fail the outcome assessment will fail the course. ECSA Outcome 2: Application of scientific and engineering knowledge (Pass the course) ECSA Outcome 4: Investigations, experiments and data analysis (Pass the laboratory practicals) ECSA Outcome 9: Independent learning ability (Pass the course).

Research Methodology (Power)

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%

EMC, Power Quality & Environment

ENEL805 W1 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: The module will consider power quality, electromagnetic compatibility and environmental issues. It will also cover topics related to the compatibility between customer equipment and processes, and the quality of the electricity supplied by the utility. The parameters addressed will include harmonics, voltage magnitude, unbalance, flicker, voltage dips, and interruption performance. The causes, effects, measurements, propagation, mitigation, and management of these parameters will be discussed. Technical and regulatory standards and their impact on customers and utilities will also be covered in this module.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

Advanced Digital Communications

ENEL806 HC (0L-0T-0P-0S-160H-0R-0F-0G-0A-0W-16C)

Prerequisite: ENEL4DC or equivalent level of knowledge

Content: Modeling wireless channels; Signal modulation and performance analysis; Signal detection theory; Information theory; Coding theory; Equalization; Multiple access interference and multiuser detection; MIMO systems; Advanced topics in wireless communication.

Assessment: Class marks 25% Exam marks 75%.

DP Requirement: Class marks of 40%.

Research Methodology (Telecommunications)

ENEL807 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Research proposals, feasibility studies, literature surveys, library and electronic sources. Research ethics. Data collection and analysis, measurements and error analysis. Research report writing, referencing and dissemination.

Assessment: An examined outcome of this course is the project proposal for the dissertation component of the degree

DP Requirement: Not applicable.

Cryptography & Network Security

ENEL808 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Fundamentals of contemporary cryptography. Application of cryptographic techniques to provide essential security services to modern communication networks. Mathematics background and number-theoretic reference problems. Stream ciphers and block ciphers, pseudorandom number and sequence generators. Public key encryption. Message authentication and hash functions. Digital signatures and authentication protocols. Key establishment and key management protocols. Selected topics in network security (authentication applications, electronic mail security, IP security, web security, distributed system security) Selected topics in computer security (access control, intruders and viruses, firewalls, computer security models, Windows and open source (e.g. Linux) operating system security, data base security) Security in practice.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Telecommunications Networks

ENEL811 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: Hierarchical networks, circuit and packet switched, ITU-T, ITU-R role in planning. Signals, transmission media and impairments for digital and analogue networks. Transmission levels, stability and echo criteria in telephone networks, speech, data and video plus noise measurement. Reference equivalent and transmission planning. Review of FDM system design. Trunk distribution Systems - analogue/digital radio relay and optical fibre systems. Introduction to networks - circuit switched (loss dominated), message switched (delay dominated). Teletraffic and queueing theory. Basic probability - mean, variance. Independence, conditional probability, statistical equilibrium arguments. Little's results, Birth/Death Systems, derivation of Erlang B and M/M/1 queueing, Engset, overflow traffic, overall grade of service. Topology of networks. Use of concentrators/local switches. Typical hierarchies, circuit switched, alternative routing, future trends. Circuit switching telephony (+ fax, telex) - transmission requirements (2/4 wire, loss), switching requirements - technology, EM electronic, digital control. Signalling - exchange/terminal, exchange/exchange, channel associated, common channel (No. 6, 7 concepts), separate signalling network.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Advanced Digital Signal Processing

ENEL813 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Prerequisite: ENEL4DS1 or equivalent level of knowledge.
Content: Special digital filters: Allpass filters, tunable filters, IIR and FIR cascaded lattice structures. Computational complexity of digital filter structures. Advanced design of digital filters. DSP algorithm implementation: Computation of the DFT, number representation, arithmetic operations, handling of overflows. Analysis of finite word-length effects; quantization errors and processes in fixed point and floating points numbers, coefficient quantization, arithmetic round-off errors. Multi-rate digital signal processing; sample rate alteration, decimators and interpolators, polyphase decomposition, L-channel QMF filter banks.
Assessment: Class work 25%. Exam marks 75%
DP Requirement: Class mark of 40%

Advanced Microwave circuits

ENEL815 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Prerequisite: ENEL4MS or equivalent level of knowledge.
Content: Linear and non-linear analysis techniques for the design of oscillators and mixers. High power amplifier design and analysis. Distributed and broadband amplifier design. Advanced impedance matching techniques including wideband LC and RLC matching techniques. Antennas: Self study on antenna related issues. This section will not cover more than 20% of the course.
Assessment: Class marks 25% Exam marks 75%
DP Requirement: Class mark of 50%.

Satellite Communications Systems

ENEL816 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Prerequisite: ENEL812 or equivalent level of knowledge.

Content: Overview of Satellite Systems. Orbits and Launching Methods. System Elements: Space Segment; Ground Segment; User Terminals; Satellite System Architecture; Spotbeams; Satellite System Coverage; Satellite Orbit; Operating Frequencies; Acce ss Sharing Scheme. Satellite Communications Network Classifications. Satellite Communications Industry Development. Satellite Communications Links. Communications Systems Hardware. Satellite Communication and Radio Wave Propagation. System Design and Multiple Access. Technology Topics in Satellite Communications. Satellite Communications Regulatory Environment: International & National Regulatory Structure.

Assessment: Class marks 25% Exam marks 75%.

DP Requirement: Class mark of 40%.

Optical Networking

ENEL824 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Prerequisite: Undergraduate optical physics and Communications fundamentals

Content: Overview of optical communication systems. Review of optics, Characteristics of optical fibres. Optical waveguides. Optical sources and transmitters Optical detectors and receivers. Optical amplifiers DWDM networking components, Photonic switching. Routing and Wave-length Assignment (RWA); and Wavelength Conversion. Wavelength Routed Networks: Ring networks. Traffic matrix and allocation. The optical layer. Wavelength routing. Net-wrok design issues. Scaling, modelling, blocking, light paths. Estimates of numbers of wave-lengths.Fault Management (Protection and Restoration in WDM Optical Networks). Future generation all-optical networking. QoS considerations.

Assessment: Class mark 25% Exam mark 75%.

DP Requirement: Class mark of 40%.

Hydro Electric Plant Technology

ENEL831 W1 (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: Hydro-electric plant technology is becoming feasible for the African continent since Africa has large rivers that are not being optimally utilised. This module will explore the fundamental design and operation of Hydro-electric plants around the world with a special focus on environmental issues. The module is thus well balanced between technology, social and environmental concerns.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

Power System Stability

ENEL832 (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: Transient stability studies and voltage stability are important subjects for a typical power systems engineer to consider. This module will demonstrate to the student the significance of these two subjects. Where appropriate practical case studies will be utilised.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

Fundamentals of Asset Management

ENEL835 W1 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Asset management is fundamental to the long-term sustainability of any capital intensive industry. The module will start with the basic theory of asset management and introducing students to the importance of asset management. Practical case studies will be used to demonstrate the impact on asset management including human issues. The unique nature of the cost structure of the electric power industry and the implications for the management of electric generation and delivery infrastructure. A practical definition of the asset management problem and a logic framework for addressing the multi-dimensions of the problem will be discussed.

The science of engineering economic decision making will be included with special focus on scientific principles underlying decision making (decision science methods), and risk analysis fundamentals. These topics will provide a foundation for addressing the remaining topics in this strand.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Environmental Engineering

ENEL836 W2 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

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 organisation of natural resources development and public health. Land use planning and landscape design. Course will explore interactions between human activities and natural and made systems, linking them to the concept of environmental sustainability and to environmental impact assessment (EIA), Environmental Management Plan (EMP) and Strategic Environmental Assessments (SEA)
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Reliability Analysis & Risk Mitigation

ENEL837 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: Reliability covers two distinct asset decision making issues, namely (1) How to manage and control normal or expected variations in reliability and (2) How to evaluate the likelihood and appropriate design and operational responses to low probability but catastrophic failures. The identification and assessment of the potential for catastrophic events; as well as the strategies for mitigating the risk of catastrophic events will be considered. Understanding how to approach the issue of managing normal or expected variations in reliability cannot be ignored. The course will also look at how to use prioritisation methods for implementing normal reliability control strategies (the module on prioritisation will emphasize, among other things, how prioritisation can be used to guide decisions that affect changes in reliability). How the refurbishment decision problem interacts with the normal reliability control problem as well as state of the art probability concepts for assessing the likelihood of rare, high cost events are critical to consider.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class marks 40%.

Refurbishment

ENEL838 W1 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Identification of the lowest life-cycle cost in terms of repairing or replacement of plant will be explored. Asset performance forecasting is critical to this and depends on factors such as age and historic behaviour. Equipment diagnostics and testing will also be included to give a holistic view to the student. The student will gain a fundamental understanding of the repair/replace decision and understand the major aspects of the problem including; optimal management of asset type (e.g. wood poles, transformers, etc); optimal policy for entire asset population; forecasting cash flows for repair/replace for a specific asset population; and the role of diagnostics tests. The available analytical tools for solving the problem cannot be ignored. This involves, understanding the concepts necessary for using the analytical models including hazard functions and the role of testing, developing and applying models for forecasting the cash flows associated with an asset population, and being able to apply repair/replace decision models for developing optimal (least life-cycle cost) policies associated with a single class of assets.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Project Prioritisation

ENEL839 W2 (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: This module will cover capital budgeting and project prioritisation demonstrating to the student the implication of limited budgets for policies related to reliability, refurbishments, environment and safety. Software tools will be utilised to prioritise projects based on certain boundary conditions, which can be customised to the specific company requirements. The module will clearly show which projects will be undertaken and which projects will be deferred based on financial constraints and the value provided by each project. Understanding the scope of the electric utility capital budgeting problem to be solved as well as the objectives of using a prioritisation system and what should be expected in terms of benefits must be considered. The student will understand the technical details that underlie priority systems including; the fundamentals of developing value models; the data requirements of priority systems; the five value assessment principles; and the required implementation steps. The technical aspects of prioritisation systems including inputs, outputs and transformation processes are important. The student will be required to use actual utility priority systems and understand how to use priority systems to achieve the multiobjectives of the corporation (e.g. costs, reliability, public safety and so on).
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%

Power Electronics

ENEL852 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: Single-phase, controlled and uncontrolled AC-DC converters and the step-down, step-up and Cuk DC-DC converter configurations. The operation of these converters by drawing time waveforms for voltages and currents in all parts of the circuit. The significance of inductance in converter circuits both on the load side and the supply side; to explain commutation overlap, discontinuous conduction, harmonic filtering. Calculations showing the affects of commutation overlaps, load regulation, phase-angle control characteristics. The practical problems of ratings, protection and the interaction of the converter and its supply transformer. Voltage source inverters in a unified way which relates single phase, three phase and m-phase inverters. Complex Fourier Analysis for the purpose of evaluating and analysing inverter waveforms. Harmonics in three phase inverters and quantification of their use in increasing inverter output voltages. The principles of pulse-width modulation by means of a generic strategy based on volt-second equivalents; basic calculations related to depth of modulation and minimum pulse widths. Practical pulse-width modulation strategies and their relative merits and drawbacks. The effect of dead time on inverter waveforms; to calculate its effect on output voltage and low order harmonics and be aware of its impact on inverter output characteristics in UPS and drives. Inverter behaviour by means of a simulation workshop. The basic features of current source inverters, and comparison with voltage source inverters. The design of DC link filter and its role in controlling harmonic produced by the inverter.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Engineering Project Planning

ENEL854 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Project planning – planning techniques, risk assessment and analysis, project management and commissioning. Time, cost, performance and innovation. Case studies from relevant industries will form part of the coursework. Capital project financing.
Assessment: Class mark 25% Exam mark 75%.
DP Requirement: Class mark of 40%.

Advanced Network Architectures

ENEL855 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Review of basic computer networks. Modern network systems (Ethernet, ATM) and protocols (IP, TCP, RSVP, DiffServ, MPLS, RTP, H.323, MGCP, SIP) Modelling of packet switched networks. Network Simulations. Network convergence issues (Voice, Video & data; latency, QOS etc). Wireless & wire line network technologies (GPRS, EDGE, UMTS, WLL, WiFi, WiMax, Bluetooth, xDSL). Network Security (Authentication, certification, encryption, verification). Network Performance (QOS, Speed, Efficiency). Network Management (SNMP, TMN).
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Advanced Embedded Systems

ENEL857 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Design matrix, (performance, power, cost). Unified HW /SW design methodology (synthesis, verification, testing, System re-use). Peripheral systems and high speed interfacing; Case study.
Assessment: Class mark 25% Exam mark 75%
DP Requirement: Class mark of 40%.

Optimal Estimation

ENEL858 HC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: Revision of probability, random variables and random signals. Response of linear systems to stochastic signals. Recursive and batch mode linear least squares solutions. The discrete Kalman filter. The continuous Kalman-Bucy filter. Wiener filtering and frequency domain interpretation. Engineering applications.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Power systems modelling and analysis

ENEL871 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: This module will start by the setting up of the electric model. Understanding of the mathematical principles and how to optimise the solution is critical. The learner will be shown how to interpret the results and the use of modern sophisticated software tools. Load flow, fault analysis, contingency planning and power system stability will also be explored in detail.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Power systems control and operations

ENEL873 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: Systems stability control; Adaptive, ruled based, fuzzy logic, neural network, hierarchical and decentralised control Automatic generation control real power and frequency control, voltage and reactive power control, SCADA and computer applications in systems control. Systems operation: Constraints management, economic load scheduling and dispatch, security assessment and reliability. Application of AI techniques in systems operation.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Components of protection systems

ENEL874 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: This will cover constituent components of protection system as well as the fundamental principles of protection. Fault calculations will be discussed with practical examples as well as instrument transformers and circuit breakers. Also the use of sequence components in balanced and unbalanced fault calculations as well as the basic theory and application of current transformers, voltage transformers and circuit breakers will be covered.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Protection systems design & application

ENEL875 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: This module will look at diverse protection schemes for power systems. The applications of relays in the protection of transformers, transmission lines, busbars and other plant will be covered.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class marks 40%.

Protection systems commissioning & performan.

ENEL876 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: Power systems commissioning as well as fault analysis will be discussed, the learner will study how a protection system should be commissioned as well as testing and probing operations that have occurred. Fault identification and analysis will also be explored in detail.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Metering and Tele-Control

ENEL877 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: This module will cover the basic application principles of the associated secondary plant equipment such as measurements, local and remote control, telecommunications and DC systems. The interfacing between the various secondary plant equipment will also be considered.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Gas insulated systems

ENEL878 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: This module will focus on Gas Insulated Substations and Gas Insulated Lines, which is a relatively new technology. Design of these systems will be discussed in detail as well as the advantages of using Gas Insulated Lines and Substations. Environmental issues relating to this technology will also be discussed such as SF6 leaks and leak detection.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Performance & Maintenance of transm. & distr.

ENEL879 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: This module looks at the performance of Transmission and Distribution systems and enables students to link performance to maintenance. Condition based maintenance as well as concepts such as reliability centred maintenance (RCM) will be covered.
Assessment: Class marks 25% Exam marks 75%.
DP Requirement: Class mark of 40%.

Financial analysis

ENEL883 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: The financial aspects cannot be ignored in terms of cost of the projects, cash flow analysis, and return on investment indicators as well as risk analysis.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Optimal power flow & economic dispatch

ENEL884 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: The module deals with optimal power flow and economic dispatch application in the power market. Students will learn how to determine the operating state of the power system in terms of generator outputs, line power flows, voltage and current levels. One- dimensional minimisation problems will also be covered in the module.
Assessment: Class marks 25%. Exam marks 75%.
DP Requirement: Class mark of 40%.

Electricity market design

ENEL885 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: In this module, a comprehensive overview of power market models will be presented. A background on electricity industry restructuring and highlights on some advanced topics in electricity markets will be covered. Other topics covered in the module include; reasons for restructuring, power market models, market participants and their functions, electricity contracts and market power concepts.
Assessment: Class marks 25% Exam marks 75%.
DP Requirement: Class mark of 40%.

Power network & electricity market operation.

ENEL886 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: The objective of this module is to provide the students with an understanding of market operation activities for the deregulated power system. Students will be trained in solving problems with regard to electricity market issues. The following topics will be covered: market operation, congestion management, financial transmission rights, multi-area power interchanges, power pools, uniform pricing vs. pay-as-bid pricing.
Assessment: Class marks 25% Exam marks 75%
DP Requirement: Class mark of 40%.

Tariff design & distribution economics

ENEL887 WC (0L-0T-0P-0S-0H-0R-0F-0G-0A-0W-0C)

Content: The aim of the course is to expose students to the concepts and theory of electricity pricing, tariffs and the operation of electricity markets. Students will gain an understanding of the theory underlying electricity pricing. This is particularly important in South Africa at the present time as the country moves towards the deregulation of the electricity industry. The module contents include: Load curve characteristics; basic tariff structures; rising-block tariffs for domestic users; methods of charging for reactive power; tariff case studies. Short-run and long-run marginal cost pricing; optimal plant mix; setting of time-of-use tariffs. Market case studies; market simulation exercise. Tradable renewable energy certificate systems; Regulatory considerations
Assessment: Class marks 25% Exam marks 75%.
DP Requirement: Class mark of 40%.

Energy trading & Risk Management

ENEL888 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: The objectives of this module include the following: Identifying the elements of risk; Understanding futures, options and derivatives contracts, and how these financial instruments used to hedge price risk; Modelling Options, forward and futures contracts; Contracts for Differences (CfDs); Strategies involving options, forward and futures contracts; Complex option strategies using vanilla options; Methods of valuing options – Black Scholes, Binomial Trees, and Monte Carlo simulation; Mean reversion model and the Black Scholes model; Volatility analysis and seasonality in prices; Greek letters delta hedging; Portfolio analysis and hedging; What is Value-at-Risk (VaR) and how is VaR used; How are the appropriate volatilities needed for VaR computation calculated; How to calculate VaR using the variance-covariance, historical simulation and Monte Carlo methods.
Assessment: Class marks 25% Exam marks 75%.
DP Requirement: Class mark of 40%.

High voltage Engineering

ENEL891 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: Generation and measurement of high voltages, fields evaluation and insulation systems design, high voltage tests and specifications, insulation coordination, shielding and earthing, EMC considerations.
Assessment: Class mark 25%. Exam mark 75%.
DP Requirement: Class mark of 40%.

Transmission systems:Planning & Design

ENEL892 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: This module will cover the philosophies associated with Transmission planning, including the use of modern software tools. The Planning process can be divided into six major activities, and each of these will be covered as part of this module. First is to determine the need for expansion or strengthening of the Transmission and Distribution network. Second is to formulate creative and innovative alternative plans to meet this need. Third, is analysing plans to ensure compliance with agreed technical limits and criteria, and justifiable reliability and quality of supply standards. Fourth is to cost plans on the basis of present day capital costs and using appropriate net discount rates, establish the annual cost of each plan and the most cost-effective solution that meets the technical requirements. Also included is life cycle costing in terms of Operating and Maintenance costs and costs of losses for each plan. Fifth is to investigate the economic justification. The Sixth and final step is to obtain approval of recommended plans and to initiate execution.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

Distribution systems:Planning & Design

ENEL893 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: This module will cover the philosophies associated with Distribution planning, including the use of modern software tools. The methodology is similar to the module on Transmission System Planning and Design although the focus here will be on Distribution Systems Planning and design where Distribution case studies will be used.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

HVDC Systems design and operation

ENEL895 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: This course will equip the participants with the necessary skills to design, plan, operate and address most problems relating to an HVDC system. Topics include: Converter stations: layout and design considerations. Transmission lines systems, insulators, corona and interference, ground return, ac and dc equipment. Harmonics, transients and insulation coordination. HVDC systems control, faults development and protection, interaction between ac and dc systems. New developments in HVDC technology.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

Transmission & distribution systems operation

ENEL896 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-0W-8C)

Content: This module will cover the operation and control of Transmission and Distribution systems. It will explore generation scheduling, system security, reactive power scheduling, restoration procedure following a system break up and other aspects associated with operation of an electrical network. Transmission limits, optimising power flow (OPF) using special protection schemes, state estimation, load forecasting, and load shedding schemes will also be discussed.

Assessment: Class mark 25%. Exam mark 75%.

DP Requirement: Class mark of 40%.

Substation design

ENEL897 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: The aim of this module is to firstly give the learner a good overview of the substation and the purpose it performs. The different components of the substation are then covered detailing the function each component fulfils. Practical case studies will be discussed during the lectures showing the learner the methodology adopted in substation design in terms of system design. The learner will be provided with the basic concepts to take important technical decisions such as the selection of transformers, switchgear and insulators. Gas insulated switchgear (GIS) will be discussed in detail and their advantages and disadvantages over traditional switchgear. Grounding systems in substations will be explored in great detail as well as step and touch potentials.

The material will also be developed into considering what the substation of 2020 will look like. Concepts such as compact substations, underground substations and portable substations will be brought into this module.
Assessment: Class marks 25% Exam marks 75%
DP Requirement: Class mark of 40%.

Overhead line design

ENEL898 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: This intensive module provides a solid introduction into the fundamental principles of overhead line design, which comprises of all Transmission and Distribution levels. It will cover an extensive range of topics such as environment, survey, line components (conductor, ground wire, optical ground wire, insulation and hardware, towers – or supporting structures in general, and foundation) design and line optimisation (including tower spotting). The module is aimed at line designers and utility engineers that require a working knowledge of overhead line design.
Assessment: Class marks 25%. Exam marks 75%

Underground cables

ENEL899 WC (0L-0T-0P-0S-80H-0R-0F-0G-0A-13W-8C)

Content: This module aims to give the learner a good understanding of underground cable both at Transmission and Distribution voltage levels. It covers basic electrical and material theory for design and application criteria for UG cables and GIL systems. It also considers constraints for conductor sizing and re-rating based on environmental and installation conditions, techniques for increasing current carrying capacity, terminations and stress control, earthing, installation and commissioning.
Assessment: Class marks 25% Exam marks 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 & auxiliary 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: Drawings: tutorials and tests – 25%, CAD: tutorials and test – 75% Final mark: 50% class mark & 50% exam
DP Requirement: Attendance at all tests, 50% for the CAD 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: Assignment, tutorials and steam car competition – 40%, Tests - 60%. Final mark: 30% classmark & 70% exam
DP Requirement: Attendance at all tests, a minimum of 50% for the CAD component, a working model of a steam car, attendance at four industrial visits

Introduction to Engineering Materials

ENME1EM H2 (20L-10T-0P-0S-25H-21R-0F-0G-4A-13W-8C)

Aim: The candidates will acquire a basic understanding of materials, their structure and its influence on the physical and mechanical properties; 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: Tests, assignments/tutorials and an exam. Classmark: 30% Final Exam: 70%
DP Requirement: Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

Computer Fundamentals

ENME2CF H1 (20L-30T-0P-0S-15H-12R-0F-0G-3A-13W-8C)

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: Tutorials, test and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests and to complete all tutorials satisfactorily, as specified in the module outline.

Design Methods

ENME2DM H2 (30L-30T-0P-0S-56H-36R-0F-0G-8A-13W-16C)

Prerequisite: ENME1DR, ENME1ED and ENCV2SA for BEEH
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. 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 and Assignments. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

Dynamics

ENME2DY H1 (20L-20T-6P-0S-15H-14R-0F-0G-5A-13W-8C)

Prerequisite: 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: Tests, assignments/tutorials and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests and to complete all assignments/tutorials satisfactorily, as specified in the module outline.

Fluids Mechanics 1

ENME2FM H1 (20L-10T-6P-0S-22H-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: Tests; practicals and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all class tests and to complete all practicals satisfactorily, as specified in the module outline.

Measurements & Experimental Methods

ENME2MM H2 (10L-0T-16P-0S-31H-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: Practicals, test and an exam. Classmark: 45% Final exam: 55%
DP Requirement: Students are required to attend the class test and to complete all practicals satisfactorily, as specified in the module outline.

Materials Strength

ENME2MS H1 (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: Tests and an exam Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests.

Fundamentals of Physical Metallurgy

ENME2PM H1 (20L-10T-0P-0S-22H-23R-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: Tests, assignment/tutorial and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests and to complete the assignment satisfactorily, as specified in the module outline.

Strength of Materials 1

ENME2SM H2 (30L-20T-0P-0S-65H-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 statically determinate structures, also form part of the syllabus.

Practicals: None

Assessment: Tests, assignment with formal report and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete the assignment satisfactorily, as specified in the module outline.

Thermofluids

ENME2TF H1 (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.

Practicals: None

Assessment: Tests and an exam Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Thermodynamics 1

ENME2TH H1 (20L-10T-0P-0S-25H-20R-0F-0G-5A-13W-8C)

Aim: An understanding of the fundamental properties of gases and condensable vapours needed for thermodynamic analysis. To be able to apply the conservation of energy and mass in closed and open systems which involve work transfer, expansion, compression processes, heating, cooling and velocity changes.

Content: Fundamental concepts such as the system, thermodynamic properties, work and heat transfer. The 1st law of thermodynamics (conservation of energy) for closed and open systems. Gas laws, adiabatic processes for gases. The 2nd law of Thermodynamics, basic heat engine performance, entropy. Thermodynamic processes: isochoric, isobaric, isothermal. Steam tables and charts.

Practicals: None

Assessment: Test and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Workshop Training

ENME2WS H2 (0L-0T-0P-0S-0H-0R-0F-0G-0A-2W-0C)

Aim: Candidates to acquire an appreciation and basic skills in common fabrication techniques, and familiarize themselves with the structure and function of common mechanical engineering and machine shop equipment items.

Content: 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.

Assessment: Students must earn a duly performed certificate.

DP Requirement: Satisfactory completion of training.

Design of Machine Elements

ENME3DM H1 (30L-30T-0P-0S-58H-34R-0F-0G-8A-13W-16C)

Prerequisite: ENME2DM, 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 loads. Stress intensity factors, high cyclic fatigue life prediction. Bolted joints subjected to fatigue loads. Welded joints under tri-axial loads. Spur, helical bevel and worm gear forces and static strength. Gear teeth surface fatigue strength analysis. Overall shaft design, material selection, fatigue considerations, coupling and bearings.

Practicals: None.

Assessment: Tests, design project assignment and report and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete the assignment satisfactorily, as specified in the module outline.

Fluids Mechanics 2

ENME3FM H2 (40L-10T-9P-0S-60H-36R-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. Introduction to numerical solution of fluid flow problems.

Practicals: 3

Assessment: Tests, practicals and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete the laboratory practicals satisfactorily, as specified in the modue outline.

Heat & Mass Transfer 1

ENME3HM H2 (30L-20T-6P-0S-59H-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.

Practicals: 2

Assessment: Tests and an exam Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete all practicals satisfactorily, as specified in the module outline.

Manufacturing Technology

ENME3MT H2 (20L-10T-0P-0S-30H-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: Tests and an exam Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all class tests.

Selection of Engineering Materials

ENME3SM H2 (20L-5T-12P-0S-20H-19R-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. Selection methodologies.

Practicals: Metallography - preparation of samples and observation of microstructures of metals, mechanical properties of materials, heat treatments of ferrous and non ferrous alloys, and the metallurgy of welding.

Assessment: Tests, assignment/tutorial, practical reports and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete the assignments and practical reports satisfactorily, as specified in the module outline.

Strength of Materials 2

ENME3ST H1 (30L-20T-9P-0S-65H-31R-0F-0G-5A-13W-16C)

Prerequisite: 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: 3

Assessment: Tests and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all laboratory practicals and tests, and to complete the laboratory reports satisfactorily, as specified in the module outline.

Thermodynamics 2

ENME3TH H2 (20L-10T-9P-0S-20H-16R-0F-0G-5A-13W-8C)

Prerequisite: ENME2TH

Aim: To apply basic thermodynamics to the operation and behaviour of real machinery such as gas compressors, piston engines, gas turbines, jet engines, refrigeration plant and steam power plant.

Content: Vapour power cycles. Piston engine cycles, Otto & Diesel cycles. Gas turbines, jet engines, refrigeration cycles and steam plant.

Practicals: 3

Assessment: Test and an exam Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete the practicals satisfactorily, as specified in the module outline.

Theory of Machines

ENME3TM H2 (20L-10T-3P-0S-26H-16R-0F-0G-5A-13W-8C)

Prerequisite: 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: 3

Assessment: Tests, assignments and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

Advanced Manufacturing Systems

ENME4AM H1 (20L-5T-8P-0S-28H-15R-0F-0G-4A-13W-8C)

Prerequisite: 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.

Practicals: 2

Assessment: Tests, practical reports and an exam. Classmark: 30% Final exam: 70%.

DP Requirement: Students are required to attend all tests and to complete all practicals satisfactorily, as specified in the module outline.

Engineering Computational Methods

ENME4CM H1 (10L-20T-0P-0S-23H-15R-0F-0G-13A-13W-8C)

Prerequisite: ENME3ST, ENME3FM

Aim: To provide the students with an ability to analyse, design and synthesize complex engineering systems using computational techniques.

Content: An introduction to finite element method, including analysis of plane trusses and frames and the solution of continuum mechanics problems. Analysis of fluid mechanics and heat transfer problems with finite elements. An introduction to commercial FEM software. The application of these packages for the analysis and solution of problems in solid mechanics, fluid mechanics and heat transfer.

Practicals: None.

Assessment: Assignments: 50% Tests: 20% Final Exam: 30% - 2 hour. Sub-minimum for exam will be 40%.

DP Requirement: Students are required to obtain an average of 50% for all assignments and tests.

Design & Analysis of Manufacturing Processes

ENME4DM H1 (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Corequisite: ENME4AM

Aim: The design and analysis of manufacturing processes and design problems related to the manufacturing processes, structures and systems.

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.

Practicals: None.

Assessment: Tests and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Design & Research Project 2

ENME4DP H2 (9L-0T-0P-26S-198H-0R-0F-0G-7A-13W-24C)

Prerequisite: 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; poster presentation (open day); Final report: 60% Oral/Poster presentations: 20% Discretionary mark: 20%

DP Requirement: As per faculty rules.

Mechanical Engineering Design

ENME4ED H2 (20L-10T-0P-0S-30H-15R-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: Tests, assignment and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Energy Management

ENME4EM H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Aim: To enable students to manage large scale energy systems

Content: Energy resources. Energy production distribution. Renewable and non-renewable energy. New processes, process change, new methods. Energy conservation approaches, energy conservation through process integration. Case studies in the food, petrochemical, power, and metallurgical industries.

Practicals: None.

Assessment: Tests and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Alternative Energy Systems

ENME4ES H1 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Prerequisite: 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.

Practicals: None.

Assessment: Test and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Fracture & Fatigue of Engineering Materials

ENME4FF H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Prerequisite: 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: Tests, tutorials, assignment and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests, tutorials, lab demonstrations and to complete all assignments satisfactorily, as specified in the module outline.

Design of Fluid Power Systems

ENME4FP H1 (20L-10T-0P-0S-30H-16R-0F-0G-4A-13W-8C)

Prerequisite: ENME3FM

Aim: To provide students with an understanding of the operation of equipment used in fluid power systems and to develop the ability to design such systems.

Content: Design and operation of centrifugal and axial flow pumps: Impeller blade and guide vane geometry, velocity triangles, dynamic and Euler heads. Efficiencies and net positive suction head. Pumps in systems: Series and parallel operation, application of commercial pump curves, similarity of rotodynamic machines. Design and operation of impulse and reaction turbines: Pelton, Kaplan and Francis turbines, velocity triangles, power losses and efficiencies. Design and operation of double- and single-acting positive displacement pumps, pressure indicator diagrams, separation and air vessels.

Practicals: None.

Assessment: Tests and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Mechanics of Composite Materials

ENME4MC H1 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Prerequisite: 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: None.

Assessment: Tests and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Selected Topics in Mechanical Engineering 1

ENME4ME H1 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Aim: Candidates will demonstrate: An ability to understand a topic of engineering importance and to be able to apply it in theory or in practice. A broader perspective of engineering activities which may facilitate progression into postgraduate studies in this field.

Content: Lectures and seminars involving elements of experimentation, computing, analysis and design in traditional areas of Mechanical Engineering such as thermodynamics, fluid mechanics, manufacturing and solid mechanics.

Practicals: None.

Assessment: Tests and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests.

Selected Topics in Mechanical Engineering 2

ENME4MN H2 (20L-10T-0P-0S-30H-15R-0F-0G-5A-13W-8C)

Aim: Candidates will demonstrate: An ability to understand a topic of engineering importance and to be able to apply it in theory or in practice. A broader perspective of engineering activities which may facilitate progression into postgraduate studies in this field.
Content: Lectures and seminars involving elements of experimentation, computing, analysis and design in traditional areas of Mechanical Engineering such as thermodynamics, fluid mechanics, manufacturing and solid mechanics.
Practicals: None.
Assessment: Tests and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests.

Mechatronic Engineering

ENME4MT H2 (20L-10T-0P-0S-27H-20R-0F-0G-3A-13W-8C)

Prerequisite: 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: Tests and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests.

Mechanical Vibrations

ENME4MV H1 (20L-10T-0P-0S-30H-15R-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: Tests and an exam. Classmark: 30% Final exam: 70%
DP Requirement: Students are required to attend all tests and to complete the assignment satisfactorily, as specified in the course outline.

Design & Research Project 1

ENME4PD H1 (9L-0T-0P-0S-155H-0R-0F-0G-0A-13W-16C)

Prerequisite: ENME2WS, ENME3DM, student must be in a position to complete the degree within 3 semesters.
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: 70%. Discretionary mark:30%
DP Requirement: As per faculty rules.

Thermodynamics 3

ENME4TD H1 (20L-10T-0P-0S-26H-20R-0F-0G-4A-13W-8C)

Prerequisite: ENME3TH

Aim: To introduce students to the methods of analysis of mixtures of gases and condensable vapours, combustion processes, the high speed flow through nozzles and diffusers and their application to the thermodynamics of turbines and compressors.

Content: Mixtures of perfect gases and condensable vapours, specific and relative humidity, the psychrometric chart, evaporative cooling towers. High speed flows, total temperature and enthalpy, Mach number, convergent/divergent ducts, normal shock waves. Energy exchanges and pressure changes in axial impulse and reaction turbines, axial compressor blading and the boundary layer limitation on stage pressure rise.

Practicals: None

Assessment: Tests, assignments and an exam. Classmark: 30% Final exam: 70%

DP Requirement: Students are required to attend all tests and to complete all assignments satisfactorily, as specified in the module outline.

Vacation Work

ENME4VW H2 (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.

Practicals: None.

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

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-5[a]-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 either of CHEM161 or CHEM195.

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 either of CHEM171 or CHEM196.

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 either of CHEM110 or CHEM195.

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 either of CHEM120 or CHEM196.

Chemistry & Society 2

CHEM173 P2 (18L-9T-18P-0S-24H-8R-0F-0G-3A-13W-8C)

Aim: To provide students with an overview of the role chemistry plays in everyday life.
Content: The Periodic Table - elements, trends and classification; bonding - covalent, ionic and metallic; chemical and physical properties arising from bonding - some specific examples; polymers - PVC, Teflon, Nylon-6,6, silicones, polyethylene, additives, physical properties; explosives.
Practicals: Qualitative analysis.
Assessment: Tests (7%), practical reports (26%), 2 h exam (67%).
DP Requirement: Class mark 40%; 80% attendance at practicals.
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.
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% (at least 2 theory tests (25%), at least 1 practical test (10%), practicals/assignments/tests (15%)), 3 h exam (50%), with a sub minimum of 40% on both.
DP Requirement: 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: Continuous assessment 25% (at least 2 tests (20%), practicals/assignments (5%)), 3 h exam (75%), with a sub minimum of 40% on both.
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 WC (0L-0T-16P-30S-91H-20R-0F-0G-3A-13W-16C)

Prerequisite: Entry into an appropriate Honours or Coursework Masters' programme.
Aim: To explore the relationship between people and Environment using sustainability as a conceptual framework.
Content: This module explores the concepts and principles of sustainability. It is divided into four main sections: theory and philosophy of environmentalism; defining sustainability; principles and management tools for sustainability: such as sustainability indicators, environmental economics, public participation, and policy processes and sustainability.
Practicals: Fieldwork project
Assessment: Class mark (33%), 3 h exam (67%).
DP Requirement: 80% attendance at all academic contact activities; 40% class mark.
Offered in either Semester 1 or Semester 2. Students may be required to contribute to the costs of the fieldtrip.

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 theory tests (20%), prac laboratory reports & tutorial reports (13%), 2 h exam (67%).

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: 2 theory tests (17%), laboratory & field reports & tutorials (16%), 3 h exam (67%).

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: 2 tests (20%), & project reports (20%), 3 h exam (60%).

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 H2 (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: Course work, practical exercises, assignments and tests (33%). One 3-hour written exam (67%); There is no practical examination.
DP Requirement: 40% Class mark, 80% attendance at both lectures and practicals.
Offered in Semester 2. 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 or NSC Level 6 Maths.
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, 195 or 197. 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 or NSC Level 6 Maths.
Aim: To introduce basic methods of vector and matrix algebra, statics 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 B for Matric Mathematics or NSC Level 4 Maths.
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, 195 or 197.

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 & 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%), 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.

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)
Aim: To develop basic aspects of the modern theory of Cryptography.
Content: Entropy, block ciphers, stream ciphers, public key systems, signature schemes, key management.
Assessment: 3 h exam (100%).
DP Requirement: 80% attendance.
Offered in either Semester 1 or 2.

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 & 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 for Matric Mathematics or NSC Level 3 Maths.
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: Class mark (30%), 2 h exam (70%).
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 class mark of 40%, attendance of 80% of tutorials and the submission of 80% of homework exercises.

Accounting 103
ACCT103 P2 W2 H2 (39L-19T-0P-0S-71H-25R-0F-0G-6A-13W-16C)
Prerequisite: A minimum mark of 50% 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.

IN THE FACULTY OF MANAGEMENT STUDIES

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