

# **CORRESPONDENCE**

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## **VISION & MISSION STATEMENT**

### **VISION**

The University of Venda aspires to be at the centre of tertiary education for rural and regional development in Southern Africa.

### **MISSION**

The University of Venda, anchored on the pillars of excellence in teaching, learning, research and community engagement, produces graduates imbued with knowledge, skills and qualifications which are locally relevant and globally competitive.

## **THE CALENDAR IS OBTAINABLE IN THE FOLLOWING SEPARATE PARTS:**

- |     |   |         |
|-----|---|---------|
| 1.  | GENERAL INFORMATION                                   | PART 1  |
|     | Academic Year Plan                                    |         |
|     | Mission Statement                                     |         |
|     | Officers of the University                            |         |
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| 9.  | SCHOOL OF MATHEMATICAL AND NATURAL SCIENCES           | PART 9  |
| 10. | STUDENT FEES  | PART 10 |

## OFFICERS OF THE SCHOOL OF ENVIRONMENTAL SCIENCES

Dean	JO Odiyo, BSc (Hons) (Egerton), MSc (Dar-es-Salaam), PhD (Wits), MWISA, MGSSA
Deputy Dean	NS Nethengwe, BA UED (Univen), BA (Hons) (UCT), MA (Wits), PhD (West Virginia), Cert. (GIS) (Univ. of Southern Mississippi, USA)
Executive Secretary	N Mulovhedzi, N.Diploma Management Assistant (CTC)
School Administrator	NP Khakhu, BA, HED (Univen)
Typist/Messenger	MA Mudzusi N.Diploma Management Assistant (SBS)

## ACADEMIC STAFF AND DEPARTMENTS

Heads of Departments are indicated by means of an asterisk\*

Departmental Coordinator indicated by means of #

### Ecology and Resource Management

Senior Lecturer	*EM Stam, MSc (Univ. Amsterdam), PhD (Free Universito. Amsterdam)
Professor	WM Gitari, B.ED (Kenya Univ.), MSc (Univ. Nairobi), PhD (UWC), Pr. Nat. Sc
Senior Lecturer	T Dalu, BSc Hons (UZ), MSc (UZ), PhD (Rhodes), Cert. Aquatic Ecosystems: Processes and Applications (UNESCO-IHE), Cert. Project Management (Rhodes), MRSSaf, SAYAS Fellow, Pr.Nat.Sc. Aquatic Science
Lecturers	JN Steyn, BSc (Agric) (UOFS), BSc (Hons) (UP), MEnvM (UOFS) R Mulaudzi, B.Envsc (Hons) (Univen), BA Development studies (Hons) (UNISA), MEnvsc (Univen) M Mukundamango, BENVM. (Univen), BSc. (Hons), MSc. ConsEcol (Stell) F.M Murungweni, BSc. (ZOU), MSc. (University of Twente, Netherlands), Dip. Geo-information (ITC, Netherlands), SACNASP, AARSE

### Geography and GEO-Information Sciences

Senior Lecturer	*NS Nethengwe, BA UED (Univen), BA (Hons) (UCT), MA (Wits), PhD (West Virginia), Cert. (GIS) (Univ. of Southern Mississippi, USA)
Associate Professor	BDO Odhiambo, BSc. (Hons), MSc. (Univ. Nairobi), PhD (Waterloo), PGDip. Geomorphology (ITC, Netherlands), Cert. Remote Sensing (GDT/CNES Toulouse, France).
Senior Lecturer	TM Nelwamondo, BPEd, BPEd BSc (Hons) (Fort Hare), MA (Univ. PE); PhD (UP)
Lecturer	H Chikoore, BSc (UZ), MSc and PhD (Zululand), Grad.Dip Meteorology (Aus) NV Mudau, BA (Hons), MEnvSc (Univen), PhD (NWU), UED (Univen) MJ Mokgoebo, BPEd, BA (Hons) (Durban-Westville), MEnvSc, (Univen), PGDip.HE (UKZN) E Kori, BSc (Hons) (Midlands State, Zimbabwe), MEnvSc (Univen), PGDip.HE (UKZN) KH Netshisaulu, BEnvSc, BEHGEO, MEnvSc (Univen).
Technician	Vacant

### Hydrology and Water Resources

Professor	JO Odiyo, BSc (Hons) (Egerton), MSc (Dar-es-Salaam), PhD (Wits), MWISA, MGSSA
Lecturer	#R Makungo, BESHWR, MESCH (Univen), MWISA FI Mathivha BESHWR, MESHWR (Univen) TR Nkuna, BESHWR, MESHWR (Univen), Pr. Sci. Nat, MIAH, MGSSA JN Edokpayi, B.Tech (LAUTECH), Postgrad.Diploma (NTI), MSc (ABU), PhD (Univen) MI Mutoti, BESHWR (Univen), MSc EWS (UWC)
Lab Technician	E Malima, BESHWR (Univen)
Postdoctoral	A Enitan, BSc & MSc (Ibadan), PhD (DUT) TE Volenzo, BSc. (Nairobi), MSc, PhD (MMUST), MEIK, LEEIA

### Mining and Environmental Geology

Senior Lecturer	*MO Kataka, BSc (Hons), MSc (Unv. Nairobi), PhD (Wits), Cert. (IISEE, Tsukuba), Cert. (UPPSALA), Cert. (Potsdam), Cert. (NIAG, Cairo), Cert.
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	(Strata Control)
Emeritus Professor	JS Ogola, MSc. PhD, Postgrad. Dip. (Moscow); Dip.Ed (Nairobi), MKNAS (Kenya), MIAGOD, MGSA, MGSK, MGSSA
Senior Lecturer	FA Dacosta, BSc (Hons) (KNUST), MSc (Wits), PhD (Wits), MIECA L Diko, BSc (Hons), MSc (Buea), PhD (UL), Cert. Post Graduate Supervision (RU), MIMGA, MCMS, MGSA, MYES, MACCMRG, MMIWSA
Lecturers	A Mudau, BESMEG (Univen), MSc, PhD (Wits) HR Mundalamo, BSc (Unin), BSc (Hons), MESC (Univen), MGSSA NA Mahlaule, BESMEG, MESC (Univen), MGSSA N Rembuluwani, BESMEG, MESMEG (Univen), MGSSA, MSEG SE Mhlongo, BESMEG, MESMEG (Univen), PGDip.HE (RU), MGSSA, MLaRSSA
Junior Lecturer	EM Nengovhela, BESMEG (Univen), SANIRE (Ass. Member), MGSSA
Chief Technician	C Muzerengi, BESMEG, MESMEG (Univen), PGDip.HE (Stellenbosch), Nat. Dip, Nat. Cert (Harare Polytec.), MGSSA, SAMI
Lab Technician	N Nemapate, BESMEG, MESC (Univen), MGSSA
Postdoctoral	K Banda, BSc (UNZA), MSc. (UNZA & DTU), PhD (DTU)

### **Urban and Regional Planning**

Senior Lecturer (Head)	*J Chakwizira, BSc (Hons) and MPhil RUP (Univ. of Zimbabwe), PhD (Univen), PGDip.Trans. (CIT&L) (UK), PGDip.Urban Planning (Netherlands), Cert.PMUE (Intan Malaysia), Cert. GIS&RS (Univ.of Zimbabwe), M.ZIRUP, M.IFRT&D, M.CIT&L, SACPLAN, SAPI
Professor	P Bikam, BSc (Univ. of Tours, France), MSc (Univ. of Tours, France), MPhil (Univ. of Paris Sorbonne, France), PhD (Univ. of Paris Sorbonne, France), Diploma in Cartography (Kaduna Polytechnic Kaduna, Nigeria), SACPLAN, SAPI
Senior lecturer	I Ingwani, BEd (Univ. of Zimbabwe), MSc (Univ. of Zimbabwe), PhD (Stellenbosch), Diploma (project planning) (Univ. of Zimbabwe), Diploma Ed (Univ. of Zimbabwe), SAPI
Lecturer	T Gondo, BSc (Hons) and MRUP (Uni.Zim), PGDip. HE (Stellenbosch) MT Makumule, BA, BA (Honours), Dip. ED (Univen), MSc. (Wits), SACPLAN, SAPI J Akola, BSc (Makerere University), Masters (Netherlands)
Teaching Assistant	S.A. Nyamwanza, B.URP, MURP (Univen), SAPI
Senior Technologist	FV Mushiana, B.Arch (Hons) (Denmark), M.Arch (London), N. Diploma Arch (TUT), Cert. Arch (DDA), CAD Cert. (TUT), SAID, SAIAT, SACAP.
Junior Lab. Technician	SG Tshikunde, N.Dip Town and Regional Planning (UJ), SACPLAN
Secretary	A Mashangu, Secretarial Diploma (NTTC), Comp. Literacy (NT), BBA (SBS)

### **GIS Resource Centre**

Chief Technician,	F Dondofema, BSc. (Hons), MSc. (Univ.Zim), BSc (Hons), MSc. (Fort Hare), PGDip.HE (RU), Pr.Nat.Sc.Ecologist
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### **Environmental Advisory and Assessment Unit**

Project Co-Ordinator	JN Steyn, BSc. (Agric) (UOFS), BSc. (Hons) (UP) MEnvM (UOFS).
Institute of Semi-Arid Environment and Disaster Management	
Vacant	

# SCHOOL OF ENVIRONMENTAL SCIENCES

## RULES FOR THE SCHOOL

### ES1 VISION AND MISSION OF THE SCHOOL

#### ES1.1 VISION

To be a centre of excellence in environmental and applied sciences through active generation and dissemination of knowledge and skills for rural and regional development in Southern Africa.

#### ES1.2 MISSION

The School is to provide professional training in environmental and applied sciences at all levels of university education and to undertake applied research that links the University to the needs of the region, nation and international community.

The School's Vision and Mission support rural and regional development. The students undertake research projects in areas aimed at solving community problems.

### ES2 GOALS OF THE SCHOOL

The specific aim of the School is to develop strategies and policies that will restore, enhance and maintain resources in such a quality and quantity that resources will remain beneficial to the present and future generations. By adopting an interdisciplinary approach, the major goals of the School are manpower training and applied research in environmental and engineering sciences. The objective of manpower training and applied research is first to understand the nature and characteristics of the "natural" and "human environment" and second to apply that understanding to analyse and evolve strategies and policies that promote sustainable development of resources.

### ES3 SCHOOL RULES

#### 1. Admission requirements

**Certificate:** The minimum admission requirement is a National Senior Certificate (NSC) as certified by Umalusi. Note: Admission to certificates is subject to availability of staff and enrolment numbers.

**Diploma:** The minimum admission requirement is a NSC or four recognized 20-credits subjects as certified by Umalusi.

**Degree:** The minimum admission requirement is a National Senior Certificate (NSC) as certified by the Council for Quality Assurance in General and Further Education (Umalusi) with an achievement rating of 4 (adequate achievement, 50-59%) or better in four subjects chosen from the recognized 20 average percentage score (APS) of NSC subjects. In addition, applicants must have a minimum APS of 32. A grade 12 certificate with exemption is required if grade 12 has been achieved before 2008. A student must have achieved an E in English Higher Grade or a D in English Standard Grade to be admitted in the School. However, specific programme requirements are stipulated in the departmental admission requirements.

Specific requirements for *Bachelor of Environmental Science* degree: Specific requirements for Bachelor of Environmental Science degree: 40% pass for Mathematics, English and Physical Science and 50% for either Life Science, Geography or Agriculture.

**Professional Degrees:** For all professional (four-year) degrees, admission requirements are symbol D (HG) or C (SG) in the respective subjects.

*Bachelor of Earth Sciences in Hydrology and Water Resources:* Matric passes at D=50% (HG) or C=60% (SG) or 60% pass in NSC in both Physical Science and Mathematics, and 50% in English.

*Bachelor of Earth Sciences in Mining and Environmental Geology:* Matric passes at D=50% (HG) or C=60% (SG) or 60% pass in NSC or 6 points in both Mathematics and Physical Science, and 50% in English.

*Bachelor of Earth Sciences in Mine Surveying:* Matric passes at D=50% (HG) or C=60% (SG) or 60% pass in NSC or 6 points in both Mathematics and Physical Science, and 50% in English.

*Bachelor of Urban and Regional Planning:* Matric passes at symbol E (HG) or D=50% (SG) or 50% pass in NSC in Mathematics and 60% in English and four of the following matric subjects at symbol D=50% (HG) or C=60% (SG) or 60% pass in NSC in: Accounting; Agricultural Sciences; Biology or Life sciences; Economics; Geography; Physical Science; or Technical Drawing.

### **1.1. Postgraduate admission rules**

Students who are applying for postgraduate studies from other universities should submit their application forms together with the status recognition form. Those who are from the universities outside the country should also submit a copy of the SAQA certificate for evaluation of qualification.

**Honours Degrees:** An applicant for an Honours degree programme must normally have obtained a Bachelors degree with an average mark of 60% in related modules/subjects where the honours programme is to be taken unless otherwise approved by the HOD.

**BEHERM** - Requirement of 60% for both modules ERM3541 and ERM 3641 in the third year. There is a limited number of places and therefore meeting the minimum entry requirement does not guarantee a place. Applicants will be selected by a committee based on merit. Admission of students from other universities will be done through the approval by the HoD.

**Master's Degrees:** For admission to a Master's programme, a candidate must be in possession of an Honours degree/4-year degree, or equivalent, in the same subject, or a related discipline as approved by the School Board with an average pass mark of 60% unless otherwise approved by the HOD.

**Doctoral Degrees:** For admission to a Doctoral programme, a candidate must be in possession of a Master's degree in the same field or a related discipline as approved by the School Higher Degree Committee.

## **2. Recognition of Prior Learning**

In addition to the admission requirements for the bachelor's degree stipulated by the University, the School of Environmental Sciences will admit students on the basis of the university RPC Policy. The Schools Admission Committee will evaluate the academic background and acquired experience based on the merit of each case but strictly adhering to the University RPL Policy. The committee after evaluation will arrange either an oral or written interview for each applicant under this option if necessary. The committee may require testimonials and certificates.

## **2.1 Post-graduate Degrees**

- Masters students should defend their proposals within six months of first registration and PhD students defend their proposals within one year of first registration.
- If a student fails to defend the proposal within the specified minimum period, the student will be notified in writing of 3 months extension for master's proposal defence and 6 months for PhD proposal defence.
- In circumstances where the student fails to comply after the extension, the School Higher Degrees committee will write a recommendation to the University Higher Degrees committee to consider recommending the student to the Registrar for deregistration.
- That the student be allowed to appeal to Higher Degrees Committee within 2 months of deregistration.

## **3. Compulsory Courses**

On admission to the School, first-year students must take core (i.e. compulsory) modules from the Department of Ecology and Resource Management, namely ERM 1541 and ERM 1641. In addition, all first-year students do two University-wide modules, namely ECS 1541 and ECS 1646.

## **4. Subject Combinations**

Students studying for BA or BEd or majoring in either BA or BSc general degree may register for modules in the School provided that they passed Matric Mathematics at F (HG) or E (SG) or 50% pass in NSC or they take MAT0543/0643 and MAT 0544/0644.

Modules from the other schools may be taken provided they combine beneficially with modules in the School. The modules from the following fields of study may combine beneficially with modules in the school:

- Biology; Chemistry; Economics; Physics; Environmental Law; Agriculture; Mathematics; Sociology; Statistics; Anthropology; English and Public Administration

## **5. Progression**

Students with outstanding modules from previous level of study will only be registered for a maximum of 1 FTE in the next level of study.

Students who are registered for professional degrees in the School can change to and graduate with Bachelor of Environmental Sciences provided they meet the requirements.

### **5.1 Bachelor of Environmental Sciences (BENVSC)**

#### **Year 1**

60% pass of all modules registered in order to proceed to second year level.

#### **Year 2**

60% pass of all modules registered in order to proceed to third year level.

### **5.2 Bachelor of Urban and Regional Planning (B.URP)**

#### **Year 1**

60% pass of all modules registered in order to proceed to second year level.

#### **Year 2**

60% pass of all modules registered in order to proceed to third year level.



### **Year 3**

Passed all modules in previous years unless exempted by the Dean.

### **Year 4**

Passed all modules in previous years unless exempted by the Dean.

## **5.3 Bachelor of Earth Sciences in Mining and Environmental Geology (BESMEG)**

### **Year 1**

60% pass of all modules registered in order to proceed to second year level.

### **Year 2**

60% pass of all modules registered in order to proceed to third year level.

### **Year 3**

Passed all modules in previous years unless exempted by the Dean.

### **Year 4**

Passed all modules in previous years unless exempted by the Dean.

## **5.4 Bachelor of Earth Sciences in Hydrology and Water Resources (BESHWR)**

### **Year 1**

60% pass of all modules registered in order to proceed to second year level.

### **Year 2**

60% pass of all modules registered in order to proceed to third year level.

### **Year 3**

Passed all modules in previous years unless exempted by the Dean.

### **Year 4**

Passed all modules in previous years unless exempted by the Dean.

## **6. Credit requirements**

To obtain a BENVSC degree, students are required to obtain a total of 360 credits in 3 years or 120 credits per year (Minimum). Selection of modules at all levels of study must include at least one Core Module from the Department of Ecology and Resource Management and a Core Module from at least one other Department of the School. Consultation with the Dean of the School is a pre-requisite for module selection at all levels of study.

To obtain a four-year degree, students are required to obtain 480 credits plus a mini-dissertation with at least 30 credits. The other requirements for a four-year degree are as stipulated in the corresponding departmental regulations. However, at the third and final year of a four-year degree programme, all students are trained in Research Methodology and a mini-dissertation is to be presented by each student before the award of the degree.

The four-year professional degrees are equivalent to Honours degrees; therefore, students who obtain a four-year degree can proceed to Masters degree without having to do an Honours degree provided they meet the requirements for Masters. Students who have obtained the three-year Bachelor of Environmental Sciences degree, can enroll for the Honours degree in the relevant department of the School e.g. BEnvSc graduates who majored in Urban and Regional Planning can enroll for the Honours in the Department of Urban and Regional Planning provided the prerequisites rule is met.

## 7. Programme Offerings

### ***Certificates***

CERT GIS Certificate in Geographical Information Systems

### ***Undergraduate Degrees***

BENVSC Bachelor of Environmental Sciences  
BESHWR Bachelor of Earth Sciences in Hydrology and Water Resources  
BESMEG Bachelor of Earth Sciences in Mining and Environmental Geology  
BESMS Bachelor of Earth Sciences in Mine Surveying  
BURP Bachelor of Urban and Regional Planning

### ***Honours Degrees***

BEHERM Bachelor of Environmental Sciences Honours in Ecology and Resource Management  
BEHGEO Bachelor of Environmental Sciences Honours in Geography  
BEHHWR Bachelor of Environmental Sciences Honours in Hydrology and Water Resources  
BEHMEG Bachelor of Environmental Sciences Honours in Mining and Environmental Geology  
BEHURP Bachelor of Environmental Sciences Honours in Urban and Regional Planning

### ***Master's Degrees***

MENVSC Master of Environmental Sciences (in Geography and in Ecology and Resource Management)  
MESHWR Master of Earth Sciences in Hydrology and Water Resources  
MESC Master of Earth Sciences  
MESMEG Master of Earth Sciences in Mining and Env. Geology  
MESCM Master of Earth Sciences in Mining  
MURP Master of Urban and Regional Planning

### ***Doctoral Degrees***

PhDENV Doctor of Philosophy in Environmental Sciences  
PhDH Doctor of Philosophy in Hydrology and Water Resources  
PhDM Doctor of Philosophy in Mining  
PhDMEG Doctor of Philosophy in Mining and Environmental Geology  
PhDURP Doctor of Philosophy in Urban and Regional Planning  
PhDGEO Doctor of Philosophy in Geography

## 8. Duration of Study

***Certificates:*** A period of six months to a year depending on the mode of delivery, for example, Block-Teaching.

### ***Postgraduate Programmes:***

Honours programmes: one year

Master's programmes: a minimum of one year postgraduate taught course work and 8-months mini-dissertation masters programme *or* a minimum of two years for Masters by Research and Dissertation.

Doctoral programmes: A minimum of 3 years full time or 4 years part-time.

## ES 4. PROGRAMME PACKAGES

### ES 4.1. UNDERGRADUATE BACHELORS DEGREE

# Bachelor of Environmental Sciences (BENVSC)

Year 1 - NQF Level 5		Year 2 - NQF Level 6		Year 3 - NQF level 7	
<i>Core Modules</i>					
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
<b>ERM 1541</b> (12) The Natural Environment as System <b>ECS 1541</b> (10) English Com Skills <b>GEO 1520</b> (8) Intro. to cartography, map analysis and aerial photograph interpretation <b>GEO 1541</b> (8) Integrated study of major World Environments 1	<b>ERM 1641</b> (12) Ecological Principles for Environmental Management <b>ECS 1646</b> (10) English Com Skills <b>GEO 1620</b> (8) Elements of Remote Sensing and Geomatics <b>GEO 1641</b> (8) Integrated study of major World Environments 2	<b>ERM 2541</b> (12) Principles of Resource Management <b>GEO 2541</b> (10) Spatial Organization of Society <b>GEO2542</b> (10) Quantitative and Qualitative	<b>ERM 2641</b> (12) Pollution & Environmental Quality <b>GEO 2641</b> (10) Patterns and processes in Physical Geography <b>GEO 2642</b> (10) Themes on the Geography of Africa	<b>ERM 3541</b> (13) Resource Evaluation & Info. Systems <b>ERM3542</b> (15) Climate Change	<b>ERM 3641</b> (13) Environmental Impact Assessment <b>ERM3642</b> (15) Environmental Economics and Green Economy
<b>GROUP A MODULES:</b> <i>Select any 2 of the following:</i>		<i>2 modules selected at first year level</i>		<i>Select 2 of the following modules</i>	
<b>BIO 1541</b> (16) Diversity of Life <b>CHE 1545</b> (16) General Chemistry for the Applied Sciences <b>MAT0543</b> (8) Basic service mathematics <b>STA 1549</b> (8) Basic statistics <b>ECO1541</b> (12) Basic Microeconomics	<b>BIO 1643</b> (16) Ecology, adaptation & evolution <b>CHE 1623</b> (8) & Inorganic Chemistry for the Applied Sciences <b>CHE 1624</b> (8) Organic Chemistry for the Applied Sciences <b>MAT 0644</b> (8) Service mathematics <b>STA 1649</b> (8) Basic statistical inference <b>ECO1641</b> (12) Basic Macroeconomics	<b>BIO 2542</b> (20) Ecology <b>MAT 1543</b> (10) Mathematics for Biological, Earth and Life Sciences <b>CHE 2521</b> (10) Inorganic Chemistry <b>CHE 2522</b> (10) Organic Chemistry <b>ECO2541</b> (15) Intermediate Microeconomics	<b>BIO 2646</b> (20) Conservation Biology I <b>MAT 1643</b> (10) Mathematics for Biological, Earth and Life Sciences <b>CHE 2620</b> (10) Analytical Chemistry <b>ECO 2641</b> (15) Intermediate Macroeconomics	<b>GEO 3541</b> (16) Geography of South Africa <b>GEO 3542</b> (16) Geomorphology <b>GEO 3543</b> (16) Biogeography <b>GEO 3544</b> (16) Population and Demography	<b>GEO 3641</b> (16) Remote Sensing and Geographic Information Systems A <b>GEO 3642</b> (16) Climatology <b>GEO 3643</b> (16) Geography of Tourism <b>GEO 3644</b> (16) Rural Geography and Development
<b>GROUP B MODULES:</b> <i>Select any of these to increase credits up to 120</i>		<i>Any 1 of the following selected from year 1</i>			
<b>MEG 1541</b> (10) Intro. to Geology <b>URP 1541</b> (8) Intr. to Society and Planning <b>HWR 1541</b> (10) Intro. Hydrology & Meteorology <b>PAD1541</b> (12) Intro. to Public Administration I: Concept and Context	<b>MEG 1641</b> (10) Intro. to Hydrogeology & Soil Science <b>URP 1641</b> (8) Principles & Techniques of Planning <b>HWR 1641</b> (10) S. A. Weather & Water Resources <b>PAD1641</b> (12) Intro. Public Administration II: The South African Context	<b>MEG 2541</b> (12) Sedimentology, Stratigraphy & Basin Analysis <b>URP 2543</b> (12) Intro. to Urban Planning <b>HWR 2541</b> (12) Rural Water Supply & Sanitation <b>PAD2541</b> (15) Policy-making, Organizing and Financing <b>PEL2541</b> (12) Planning & Environmental Law 1	<b>MEG 2641</b> (10) Intro. to Photogeology & Remote Sensing <b>URP 2643</b> (12) Quantitative methods in planning <b>HWR 2641</b> (12) Water Law & Institutions <b>PAD2641</b> (15) Staffing, Determining Work Procedures and Control <b>PEL2641</b> (12) Planning & Environmental Law 2		
<b>TOTAL 12 – 14 MODULES</b>		<b>TOTAL 10 - 12 MODULES</b>		<b>TOTAL 8 MODULES</b>	

## Bachelor of Earth Sciences in Hydrology and Water Resources (BESHWR)

Year 1 - NQF Level 5		Year 2 - NQF Level 6		Year 3 - NQF level 7		Year 4 - NQF level 8	
Core Modules							
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2		
<b>HWR 1541</b> (10) Intro. Hydrology & Meteorology <b>HWR 1542</b> (8) Intro. to Groundwater <b>ERM 1541</b> (12) The Natural Environment as System <b>MEG 1541</b> (10) Intro. to Geology <b>MAT 1543</b> (8) Math for Life and Earth Sciences <b>CHE 1540</b> (16) General Chemistry <b>PHY 1527</b> (6) Physics for environmental & agricultural sciences I <b>ECS 1541</b> (10) English Com Skills	<b>HWR 1641</b> (10) Southern African Weather & Water Resources <b>HWR 1642</b> (8) Water Quality Principles <b>ERM 1641</b> (12) Ecological Principles for Environmental Management <b>MEG 1641</b> (8) Intro. to Hydrogeology & Soil Science <b>MAT 1643</b> (8) Mat for Biology, Earth and Life Sciences <b>PHY 1627</b> (6) Physics for environmental & agricultural sciences II <b>ECS 1646</b> (10) English Com Skills	<b>HWR 2541</b> (16) Rural Water Supply & Sanitation <b>HWR 2542</b> (16) Data Information Systems <b>ERM 2541</b> (12) Principles of Resource Management <b>CHE 2521</b> (10) Inorganic chemistry I <b>MEG 2541</b> (12) Sedimentology, Stratigraphy & Basin Analysis	<b>HWR 2641</b> (16) Water Law & Institutions <b>HWR 2642</b> (16) Drought Preparedness & Management <b>ERM 2641</b> (12) Pollution & Environmental Quality <b>CHE 2620</b> (10) Analytical Chemistry <b>MEG 2641</b> (10) Intro. to Photogeology & Remote Sensing	<b>HWR 3541</b> (16) Hydrologic Measurements <b>HWR 3542</b> (16) Atmospheric Dynamics <b>HWR 3543</b> (16) Fluid Mechanics <b>ERM 3541</b> (12) Resource Evaluation & Info. Systems	<b>HWR 3641</b> (16) Hydrologic Analysis <b>HWR 3642</b> (16) Hydrogeology <b>HWR 3643</b> (16) Water Quality Management <b>ERM 3641</b> (12) Env. Impact Assessment and Modelling	<b>HWR 4541</b> (16) Applied Hydrology <b>HWR 4542</b> (16) Applied Hydrogeology <b>HWR 4543</b> (16) Water Supply Systems <b>HWR 4990</b> (32) Research Techniques and Project	<b>HWR 4641</b> (16) Water Resources Management <b>HWR 4642</b> (16) Applied Meteorology <b>HWR 4643</b> (16) Water Treatment Processes
<b>Elective Modules – 8 credits taken from:</b>							
		<b>CHE 1641</b> (8) Inorganic Chemistry I or <b>CHE 1643</b> (8) Organic Chemistry I					
<b>Total: 13 modules</b> <b>Total credits = 118 (those doing PHY)</b> <b>Total credits = 130 (those doing CHE)</b>		<b>Total: 08 modules</b> <b>Total credits (PHY) = 110credits</b> <b>Total credits (CHE) =108 credits</b>		<b>Total: 08 modules</b> <b>Total credits = 120</b>		<b>Total: 07 modules</b> <b>Total credits = 128</b>	

**NB:** Students must take Chemistry or Physics from the School of Mathematics and Natural Sciences in their first year. Chemistry continues to second year while those who are doing Physics are to continue with MEG to the end of second year.

## Bachelor of Earth Sciences in Mining and Environmental Geology (BESMEG)

Year 1 - NQF Level 5		Year 2 - NQF Level 6		Year 3 - NQF level 7		Year 4 - NQF level 8	
<i>Core Modules</i>							
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
<b>MEG 1541</b> (10) Intro. to Geology <b>MEG 1542</b> (8) Intro. to Mining & Mineral Economics <b>HWR 1541</b> (10) Intro. Hydrology & Meteorology <b>ERM 1541</b> (12) The Natural Environment as System <b>ECS 1541</b> (10) English Com Skills <b>MAT 1543</b> (8) Math for Life and Earth Sciences	<b>MEG 1641</b> (8) Intro. to Hydrogeology & Soil Science <b>MEG 1642</b> (10) Intro. to the Strength of Materials & Rock Mechanics <b>HWR 1641</b> (10) Southern African Weather & Water Resources <b>ERM 1641</b> (12) Ecological Principles for Environmental Management <b>ECS 1646</b> (10) English Com Skills <b>MAT 1643</b> (8) Mat for Biology, Earth and Life Sciences	<b>MEG 2541</b> (12) Sedimentology, Stratigraphy & Basin Analysis <b>MEG 2542</b> (12) Mineralogy, Igneous & Metamorphic Petrology <b>MEG 2543</b> (12) Geochemistry & Mineral Processing <b>HWR 2541</b> (16) Rural Water Supply & Sanitation <b>ERM 2541</b> (12) Principles of Resource Management	<b>MEG 2641</b> (10) Intro. to Photogeology & Remote Sensing <b>MEG 2642</b> (8) Int. to GIS <b>MEG 2643</b> (8) Intro. to Geomedicine <b>MEG 2644</b> (10) Intro. to Surveying <b>MEG 2645</b> (8) Mine Water Generation & SA Policies & Guidelines <b>HWR 2641</b> (16) Water Law & Institutions <b>ERM 2641</b> (12) Pollution & Environmental Quality	<b>MEG 3541</b> (10) Economic Geology & Mineral Resources of SA <b>MEG 3542</b> (8) Env. Geology & Mine Rehabilitation <b>MEG 3543</b> (10) Int. to Geophysics <b>MEG 3544</b> (10) Mine Development & Mining Operations <b>MEG 3547</b> (8) Integrated Mine Water Management <b>ERM 3541</b> (12) Resource Evaluation & Info. Systems	<b>MEG 3641</b> (10) Exploration & mining geology <b>MEG 3642</b> (6) Geological Field Mapping <b>MEG 3643</b> (10) Surface Mining & Mine Management <b>MEG 3644</b> (10) Surface Surveying <b>MEG 3645</b> (10) Geotechnical Engineering <b>MEG 3600</b> (6) Industrial Attachment <b>MEG 3646</b> (8) GIS & Map Production <b>MEG 3647</b> (8) Geo-environment & Health <b>ERM 3641</b> (12) Env. Impact Assessment and Modelling	<b>MEG 4541</b> (10) Mineral Exploration & Advance Mineral Economics <b>MEG 4542</b> (10) Exploration Geophysics <b>MEG 4543</b> (10) Underground Mining <b>MEG 4544</b> (10) Mine Safety and Health <b>MEG 4545</b> (10) Engineering & Transport System <b>MEG 4546</b> (10) Non-Entry Mining	<b>MEG 4641</b> (10) Hydrogeology <b>MEG 4642</b> (10) Advanced Mine & Env. Management <b>MEG 4644</b> (8) Small-Scale Mining <b>MEG 4647</b> (10) Underground Mine Surveying <b>MEG 4990</b> (30) Research Project & Dissertation
<b>Elective Modules</b>							
<b>PHY 1527</b> (6) Physics for environmental & agricultural sciences I <b>Or</b> <b>CHE 1545</b> (12) General Chemistry for Applied Sciences	<b>PHY1627</b> (6) Physics for environmental & agricultural sciences II <b>Or</b> <b>CHE1623</b> (6) Inorganic Chemistry for the Applied Sciences <b>AND CHE 1624</b> (6) Organic Chemistry for the Applied Sciences						
<b>Total: 14 modules (PHY) = 128 credits</b> <b>Total: 15 modules (CHE) = 140 credits</b>		<b>Total: 12 Modules</b> <b>Total credits = 136</b>		<b>Total: 15 modules</b> <b>Total credits = 138</b>		<b>Total: 11 modules</b> <b>Total credits = 128</b>	

## Bachelor of Earth Sciences in Mine Surveying (BESMIS)

Year 1 - NQF Level 5		Year 2 - NQF Level 6		Year 3 - NQF level 7		Year 4 - NQF level 8	
<i>Core Modules</i>							
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
<b>MIS 1541</b> (16) Plane Surveying 1 <b>MEG 1542</b> (8) Intro. to Mining & Mineral Economics <b>ERM 1541</b> (12) The Natural Environment as System <b>ECS 1541</b> (10) English Com Skills	<b>MIS 1641</b> (16) Plane Surveying 2 <b>MEG 1642</b> (10) Intro. to the Strength of Materials & Rock Mechanics <b>ERM 1641</b> (12) Ecological Principles for Environmental Management <b>ECS 1646</b> (10) English Com Skills	<b>MIS 2541</b> (16) GPS and Astronomy <b>MIS 2542</b> (16) Cartography <b>MIS 2543</b> (12) Law of Real Property <b>ERM 2541</b> (12) Principles of Resource Management	<b>MIS 2641</b> (18) Engineering Surveying 1 <b>MIS 2642</b> (18) Surveying Computation & adjustment 1 <b>MIS 2643</b> (18) Computer Aided Cartography <b>MEG 2644</b> (10) Intro. to Surveying <b>MEG 2642</b> (8) Int. to GIS <b>ERM 2641</b> (12) Pollution & Environmental Quality	<b>MIS 3544</b> (20) Geodesy <b>MIS 3546</b> (20) Advanced Engineering Surveying <b>MEG 3544</b> (10) Mine Development & Mining Operations <b>ERM 3541</b> (12) Resource Evaluation & Info. Systems	<b>MIS 3609</b> (12) Industrial Attachment <b>MEG 3642</b> (6) Geological Field Mapping <b>MEG 3643</b> (10) Surface Mining & Mine Management <b>MEG 3645</b> (10) Geotechnical Engineering <b>MEG 3646</b> (8) GIS & Map Production <b>ERM 3641</b> (12) Env. Impact Assessment and Modelling	<b>MIS 4546</b> (20) Cadastral Surveying <b>MEG 4545</b> (10) Engineering & Transport System <b>MEG 4544</b> (10) Mine Safety & Health <b>MIS 4990</b> (35) Research Project & Dissertation	<b>MIS 4647</b> (20) Underground Surveying <b>MEG 4642</b> (10) Advanced Mine & Env. Management <b>MEG 4644</b> (8) Small-Scale Mining
<b>Elective Modules</b>							
<b>MAT 1543</b> (8) Math for Life & Earth Sciences or <b>STA 1549</b> (8) Basic Statistics <b>PHY 1521</b> (8) Mechanics	<b>MAT 1643</b> (8) Mat for Biology, Earth & Life Sciences or <b>STA 1649</b> (8) Basic Statistical Inference <b>PHY1627</b> (6) Physics for environmental & agricultural sciences II						
<b>Total: 12 modules</b> <b>MAT Total credits = 110</b> <b>STA &amp; PHY Total Credits= 124</b>		<b>Total: 09 modules</b> <b>Total credits = 138</b>		<b>Total: 11 modules</b> <b>Total credits = 120</b>		<b>Total: 07 modules</b> <b>Total credits =113</b>	

## Bachelor of Urban and Regional Planning (BURP)

Year 1 - NQF Level 5		Year 2 - NQF Level 6		Year 3 - NQF level 7		Year 4 - NQF level 8	
<i>Core Modules</i>							
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2		
<b>URP 1541</b> (8) Intr. to Society and Planning <b>URP 1540</b> (8) Studio1 <b>ERM 1541</b> (8) The Natural Environment as System <b>ECS 1541</b> (8) English Com Skills	<b>URP 1641</b> (8) Principles & Techniques of Planning <b>URP 1640</b> (8) Studio 2 <b>MAT 1649</b> (8) Mathematics for Planners <b>ERM 1641</b> (8) Ecological Principles for Environmental Management <b>ECS 1646</b> (8) English Com Skills	<b>URP 2542</b> (12) Settlement forms & Urban History <b>URP 2543</b> (12) Intro. to Urban Planning <b>URP 2544</b> (12) Site Planning & Design (studio) <b>ERM 2541</b> (12) Principles of Resource Management	<b>URP 2641</b> (12) Rural Settlement Planning <b>URP 2643</b> (12) Quantitative methods in planning <b>URP 2644</b> (12) Planning for Infrastructure Development (Studio) <b>URP 2645</b> (12) Computers in planning(studio) <b>ERM 2641</b> (12) Pollution & Environmental Quality	<b>URP 3544</b> (14) Land - Use Planning & Development Management <b>URP 3545</b> (14) Planning theories & philosophy <b>URP 3546</b> (14) Urban design (studio) <b>URP 3548</b> (14) Spatial planning (Studio)	<b>URP 3644</b> (14) Planning law <b>URP 3645</b> (14) GIS in Planning (Studio) <b>URP 3646</b> (14) Research Methods for Planners <b>URP 3647</b> (14) Transportation Planning <b>URP 3648</b> (14) Regional development planning	<b>URP 4740</b> (32) Dissertation & Research Project <b>URP 4541</b> (14) Integrated Development Planning (Studio) <b>URP 4542</b> (14) Professional Planning Practice & Ethics <b>URP 4544</b> (14) Theories & Discourses in Urban & Regional Planning	<b>URP 4644</b> (14) Housing Studio <b>URP 4648</b> (14) Participation, Mediation & Conflict Resolution
<b>Elective Modules – 16 credits taken from:</b>		<b>Elective Modules – 20 credits taken from:</b>				<b>Elective Modules – 28 credits taken from</b>	
<b>GEO 1520</b> (8) Intro. to cartography, map analysis & aerial photograph interpretation <b>SOC 1541</b> (8) Sociology <b>PAD 1541</b> (8) Public Administration <b>ECO 1541</b> (8) Economic Principles	<b>GEO 1620</b> (8) Elements of Remote Sensing & Geomatics <b>SOC 1641</b> (12) Sociology <b>PAD 1641</b> (8) Public Administration <b>ECO 1641</b> (8) Basic Economics	<b>ECO 2541</b> (10) Intermediate Macroeconomic Theory <b>PAD 2541</b> (10) Public Administration <b>SOC 2541</b> (10) Sociology <b>GEO 2541</b> (10) Spatial Organization of Society	<b>ECO 2641</b> (10) Financial economics <b>PAD 2641</b> (10) Public Administration <b>SOC 2641</b> (10) Sociology <b>GEO 2641</b> (10) Patterns & processes in Physical Geography			<b>URP 4543</b> (14) Transportation & Energy Planning <b>URP 4545</b> (14) Local, Social and Economic Development <b>URP 4546</b> (14) Project Design & Management	<b>URP 4641</b> (14) Case Studies in Sustainable Settlement Planning <b>URP 4642</b> (14) Key Issues in Contemporary Planning <b>URP 4647</b> (14) Planning Small & Medium Sized Towns
<b>Total: 13 modules Total credits = 96</b>		<b>Total: 11 modules Total credits = 128</b>		<b>Total: 09 modules Total credits = 126</b>		<b>Total: 08 modules Total credits = 130</b>	

### ES 4.3. HONOURS DEGREES

#### ***Bachelor of Environmental Sciences (Honours) (BEHERM)***

Seven (7) modules should be passed plus mini-dissertation (ERM 5740)

<b>Semester 1</b>	<b>Semester 2</b>	<b>Both semesters</b>
<b>ERM 5541</b> (15) Land Information Technology <b>ERM 5542</b> (15) Pollution Modelling and Control <b>ERM 5543</b> (15) Resource and Environmental Economics <b>ERM 5544</b> (15) Rangeland Management	<b>ERM 5641</b> (15) Habitat and Biodiversity Management <b>ERM 5642</b> (15) Ecotoxicology <b>ERM 5643</b> (15) Energy Resource Management	<b>ERM 5740</b> (30) Research Methods and Mini-Dissertation
<b>Total modules = 04</b> <b>Total credits = 60</b>	<b>Total modules = 3</b> <b>Total credits = 45</b>	<b>Total modules = 1</b> <b>Total credits = 30</b>

#### ***Bachelor of Environmental Sciences Honours (Geography) (BEHGEO)***

A maximum of seven (7) modules should be passed plus mini-dissertation (GEO 5720)

<b>Semester 1 (Compulsory modules)</b>	<b>Semester 2 (read note below)</b>
<b>GEO 5520</b> (16) General Research Methodology <b>GEO 5521</b> (16) Geographical Thought and Methodology <b>GEO 5522</b> (16) Advanced Quantitative and Qualitative Research Techniques <b>GEO 5720</b> (30) Research project and Report/ Dissertation	<b>GEO 5620</b> (16) Applied Geomorphology <b>GEO 5621</b> (16) Applied Climatology <b>GEO 5622</b> (16) Applied Biogeography <b>GEO 5623</b> (16) Sustainable Tourism, Tourism Policy and Management <b>GEO 5624</b> (16) Land Tenure and Rural Land Use <b>GEO 5625</b> (16) Advanced Population Dynamics and Demography <b>GEO 5626</b> (16) Urbanisation and Rural Studies <b>GEO 5627</b> (16) Geographical Information Systems & Remote Sensing
<b>Total modules = 04</b> <b>Total credits = 78</b>	<b>Total modules = 03</b> <b>Total credits = 48</b>

NB. Students should select three of the modules offered in the second semester: one should be from Physical Geography and another from Human Geography. The third module can be selected from either Physical or Human Geography.



***Bachelor of Environmental Sciences Honours in Hydrology and Water Resources (BEHHWR)***

A maximum of seven (7) modules should be passed plus mini-dissertation (HWR 5990)

First semester	Second semester
HWR 5541	HWR 5641
HWR 5542	HWR 5643
HWR 5990	HWR 5990
HWR 5543	HWR 5642

***Bachelor of Environmental Sciences Honours Mining and Environmental Geology***

A maximum of Eleven (11) modules should be passed plus mini-dissertation (MEG5990) (BEHMEG)

First semester	Second semester
MEG 5541	MEG 5641
MEG 5542	MEG 5642
MEG 5543	MEG 5644
MEG 5544	MEG 5647
MEG 5545	
MEG 5546	
MEG 5547	
MEG 5980 : Compulsory	

***Bachelor of Urban and Regional Planning Honours (BEHURP)***

First semester	Second semester
URP 5740: Compulsory	URP 5661
URP 5561	URP 5662
URP 5562	URP 5663
URP 5563	URP 5664
URP 5564	
<b><i>Electives (Choose 1)</i></b>	<b><i>Electives (Choose 1)</i></b>
URP 5565	URP 5667
URP 5566	URP 5668

**ES 4.4. MASTERS DEGREES**

***Master of Environmental Sciences (MENVSC) by research***  
ERM 6990: Research and Dissertation 6990

***Master of Environmental Sciences in Geography (MENVSC (Geog)***  
GEO 6990: Research and Dissertation 6990

***Master of Earth Sciences in Hydrology and Water Resources (MESHWR)***  
HWR 6990: Research and Dissertation 6990

***Master of Earth Sciences in Mining and Environmental Geology (MESMEG)***  
MEG 6990: Research and Dissertation 6990

***Master of Urban and Regional Planning (MURP)***  
URP 6990: Research and Dissertation 6990

## ES 4.5. DOCTORAL DEGREES

PhDENVSc	: Doctor of Philosophy in Environmental Sciences
PhDENVM	: Doctor of Philosophy in Environmental Management
PhDES	: Doctor of Philosophy in Earth Sciences
PhDMEG	: Doctor of Philosophy in Mining and Environmental Geology
PhDM	: Doctor of Philosophy in Mining
PhDURP	: Doctor of Philosophy in Urban and Regional Planning
PhDGEO	: Doctor of Philosophy in Geography
PhDHWR	: Doctor of Philosophy in Hydrology and Water Resources

## ES5. DEPARTMENT OF ECOLOGY & RESOURCE MANAGEMENT

### ES5.1 Introduction

The Department of Ecology and Resource Management was established as an anchor for the diverse academic programmes in the School of Environmental Sciences. It offers core modules that all students in the School have to take and pass irrespective of the type of degree being pursued.

Its teaching and research activities are geared towards integrating the geographical, geological, hydrological, planning and ecological perspectives on the environment and its management. Through its teaching and research activities, the Department seeks to impart knowledge and skills, and to develop sound strategies for restoring, sustaining and enhancing environmental quality for sustainable development.

### ES 5.2 Our Mission and Vision

#### *Vision*

The Department will pursue excellence in ecology and resource management by being a community of critical and imaginative thinkers, well versed in established principles and sound research practices, and up-to-date with the latest developments in our field.

#### *Mission*

To take centre stage in up-to-date, socially relevant ecological research and to equip its students with all the knowledge and skills they require to be leaders in the field of environmental science and its applications.

### ES5.3. Curriculum for Programmes

The Department's programmes offered are outlined below.

#### ES5.3.1. Bachelor of Environmental Sciences (BENVSC)

##### *Curriculum Structure*

Students take all core modules in Ecology and Resource Management (ERM) and in another one Department in the School at all levels of study as a minimum. Thus, we have the following streams of Bachelor of Environmental Science (BEnvSc) students:

Ecology and Resource Management + Geography Modules as Majors (At third year level a total of four Geography need to be taken one Physical and three Human or vice versa.

Ecology and Resource Management + MEG Modules as Majors

Ecology and Resource Management + Hydrology Modules as Majors

Ecology and Resource Management + URP Modules as Majors

#### ES5.3.2 Bachelor of Environmental Sciences (Honours) (BEHERM)

##### *Curriculum Structure*

Three core modules and four electives all from Ecology and Resource Management as minimum. Students may opt to add more electives from sister Departments in the School.

### **ES5.3.3 Master of Environmental Sciences (MENVSC) by research**

#### *Curriculum Structure*

A fully research-based degree leading to a dissertation. Current students on this programme are working in the following research fields:

Wetland Management and Rehabilitation  
Ecology and Management of Alien Plant Species  
Mining Impacts on the Environment

### **ES 5.3.4 Doctor of Philosophy in Environmental Sciences (PHD-ENVSC)**

#### *Curriculum Structure*

A fully research-based programme. Prospective students are urged to make prior contacts with the Department to see if their research can be supported in terms of supervision expertise and other research facilities available in the Department.

## **ES5.4 GENERAL FEATURES OF MODULES**

*Duration:* In conformity with international pattern, and as recommended by the APC and Senate, the bulk of the modules are a semester long in duration. There will be only one year-long module, namely the *Research Methodology and Mini-Dissertation* module at the Honours/Fourth Year level.

*Module Presentation:* The modules will have to be presented in a very interactive and learner-centred approach. Emphasis will be put on unlocking and stimulating the intellectual abilities of students. Topics within a module will have to be problem-based; and local examples will constitute the bulk of lecture illustrations. Tutorials and group discussions will be among the tools for soliciting student participation. The technical oriented modules will put emphasis on "hands-on" approach type of training whereby students will "learn by doing" it themselves.

## **ES5.5 COMPETENCIES PROMOTED IN THE MODULES**

*Scientific Knowledge and Skills:* All the modules have an element of provision of students with the chance to acquire and assimilate new sets of scientific knowledge and skills.

*Critical Thinking and Analysis:* The module presentation approach elaborated above will ensure that students learn to think and analyse matters in a critical manner.

*Innovativeness and problem-solving:* Most of the modules relate to real world problems such as pollution; deforestation; land degradation and others. The modules will pose challenges to students to become innovative in finding solutions to such problems. The guiding principle will be "*finding local solutions to local problems*" rather than trying to impose the often unworkable "text book" solutions developed in some far off foreign lands.

*Communication skills:* By encouraging interactive type of delivery, students will be stimulated to participate fully and in so doing they will be learning to express themselves either in full class, tutorial class or in group discussions. Properly structured written assignments will assist students to learn writing skills.

*Research skills:* The students will be introduced to research as early at the second Year of their study during which they will be given group projects relating to investigation of local resource problems, or pollution and environmental quality conditions, and how to develop strategies to alleviate such problems. At the Third Year, students will undertake individual mini-projects on techniques of resource analysis, whereas at the Fourth Level/Honours level there will be a full semester-long module on research methodology

followed by the submission of a mini-dissertation reporting original pieces of research work. Thus, on completion of the degree programme, research would have completely been de-mystified.

*Community service and promotion of leadership qualities:* The group and/or individual projects mentioned above will be of a nature that has direct bearing of the betterment of the lives of people in local communities. Thus, whilst serving an academic purpose, such projects will also serve community service purpose. Similarly, by encouraging students to interact with the communities, leadership qualities will be nurtured.

*Environmental impact assessment (EIA):* It is now mandatory under South African law that any project that is likely to have impacts on the environment should be subjected to EIA before the project takes off. There is a full EIA module in the curriculum in addition to having aspects of EIA in the other modules as well. The final effect is that graduates of this Department will be well conversed with EIA principles and practices.

*Computer-based analysis and manipulation of environmental data:* This forms a main component of the third Year School-wide core module **Resource Evaluation and Information Systems**, and, the Fourth Year/Honours modules on Fundamentals of Land Information Technology and Applications of Land Information Technology.

## **ES5.6 CREDIT WEIGHTS FOR THE MODULES**

Each semester is roughly 15 weeks in duration. Of these, 13 weeks will be for actual teaching and learning and the last 2 weeks are for examination. Each module will have 4 instructional hours a week and 2 practical/tutorial hours a week. These translates into 52 instructional hours and 26 practical/tutorial hours in a semester. The School made 1 instructional/practical hour to be equivalent to 2 notional study hours. Thus, the total 52 instructional hours and 26 practical/tutorial hours in a semester convert into 104 and 52 notional hours respectively. The whole semester-long module therefore has a total of 156 notional hours. As per SAQA stipulation, 1 credit is obtained from 10 notional hours, and thus a module with 156 notional study hours is worth 16 credits. It is based on this that each semester-long ERM module will be worth 16 credits.

## **ES6. DEPARTMENT OF GEOGRAPHY AND GEO-INFORMATION SCIENCES**

### **ES6.1 INTRODUCTION:**

The Department of Geography and Geo-Information Sciences is one of the five departments in the School of Environmental Sciences. The other departments of the School are: Hydrology and Water Resources; Mining and Environmental Geology; Ecology and Resource Management and Urban and Regional Planning. Within the School, the niche of the Department is its emphasis on the analysis of spatial organization of both the human and the physical environments. The processes that influence this organization are analyzed as the basis of understanding major issues in the environment in all the disciplines relevant to the School.

The Department's major focus is spatial science providing mapping services, education and training in Geographic Information Systems (GIS) and remote sensing (RS), Surveying and Geomatics. The Department serves the School, the University and the northern region (Vhembe District) of the Limpopo province and South Africa as a whole.

Three-year undergraduate, Honours, Master's and Ph.D. degree programmes are offered. The main objective of the undergraduate programme is to provide students with a strong background to work as environmental and geo-information scientists. The structure of the modules that constitute the programme provide for a broad-based introduction to major world environments and associated techniques in the first year. In the second-year students are introduced to theoretical thrusts and methodology. In

the third-year students begin to specialize. Masters and doctoral programmes are mainly geared towards research and applied work.

Students are also prepared to pursue career areas in line with the South African education policy that puts emphasis on career-oriented training and one that combines knowledge with skills training. Tourism Geography, Rural Development Planning, Population and Demography, Industrial and Settlement Studies, Applied Geomorphology, Climatology, Biogeography, Geography and Geo-Information Science are specific fields of study.

**FIRST YEAR MODULES:** A student should pass at least two compulsory first year modules in order to register for any second-year modules

**SECOND YEAR MODULES:** A student should pass all compulsory second year modules in order to register for any third-year module.

**THIRD YEAR MODULES:** A total of four modules should be taken at this level. Students should select at least one module from Group A and another from Group B. The two other modules can be selected from any three of the groups

<b>GROUP A</b>	<b>GROUP B</b>	<b>GROUP C</b>
GEO 3542: Geomorphology GEO 3543: Biogeography GEO 3642: Climatology	GEO 3544: Population and Demography GEO 3545: Settlement and Industrial development GEO 3643: Geography of Tourism GEO 3644; Rural Geography & Development	GEO 3541: Geography of South Africa GEO 3641; Remote sensing & Geographic Information Systems

#### **HONOURS MODULES:**

**FIRST SEMESTER MODULES:** Students should register all first semester modules and GEO 5720: Research Project and Report/Dissertation

**SECOND SEMESTER MODULES:** Students should select three modules. Of the three modules selected one should be from Physical Geography and another from Human Geography. The third module can be selected from either Physical or Human Geography. Pre-requisites apply.

#### **GEO 5620**

Pre-requisite: GEO 3542 or third year equivalent in a related area.

#### **GEO 5621**

Pre-requisite: GEO 3642 or third year equivalent in a related area.

#### **GEO 5622**

Pre-requisite: GEO 3543 or third year equivalent in a related area.

#### **GEO 5623**

Pre-requisite: GEO 3643 or third year equivalent in a related area.

#### **GEO 5624**

Pre-requisite: GEO 3644 or third year equivalent in a related area.

#### **GEO 5625**

Pre-requisite: GEO 3544 or third year equivalent in a related area.

**GEO 5626**

Pre-requisite: GEO 3545 or third year equivalent in a related area.

**GEO 5627**

Pre-requisite: GEO 3641 or third year equivalent in a related area.

**ES6.2 THE UNDERGRADUATE PROGRAMME**

The Department only offers modules at undergraduate level.

**ES6.3 POSTGRADUATE PROGRAMMES**

***Bachelor of Environmental Sciences Honours in Geography (BEHGEO)***

***Master of Environmental Sciences by Research in Geography (MENVSC)***

**ES6.4 MODULAR STRUCTURE AND FEATURES**

All undergraduate modules are one semester in duration, research modules will run for two semesters. Each module consists of 32 contact periods of 50 minutes each or 4 contact hours per week and 2 tutorial periods/practical hours every week. Each module will carry 16 credits or 160 notional hours Geography is a major programme and students are expected to take at least 120 credits in total. For each year of study students will take a minimum of 3 modules from Geography. The first year of study provides the foundation for the other years hence the proportion of core courses to electives will be inversely proportional to the year of study.

**ES6.4.1 Module Presentation**

A learner/project centred approach is adopted in the teaching of the modules. All topics will be problem based in order to stimulate the intellectual capacity of students and promote critical thinking in solving practical problems. Tutorials and practical groups will emphasize and promote the participation of each student.

*Competencies and outcomes promoted in Geography modules:*

*Scientific knowledge and skills:* Each module incorporates the enhancement of a student's capacity to understand and use spatial scientific knowledge and skills.

*Critical thinking and analysis:* The module content and presentation ensures the development of critical thinking through the use of different, comparative, evaluative and contrasting scenarios in addressing geographical problems.

*Innovative problem solving:* The modules are designed to address the persistent problem of spatial inequalities in development and identify issues of access to resources, population distribution, human environment interrelationships, tourism potential, rural infrastructure etc., and the role of spatial science in solving these problems.

*Communication skills:* Mapping, Geographical Information Systems, Surveying, Remote Sensing and other tools will be employed as communication and analytical tools. Good communication in the language of instruction will be emphasized.

*Research skills:* All modules will incorporate aspects of research. Students are expected to undertake individual research projects at the third year and Honours levels.

*Community service and promotion of leadership qualities:* All modules will emphasise relevance to local communities' development needs in particular, and to regional and international perspectives in general.

*Spatial analysis and techniques:* Development skills in Computing, Cartography, Surveying, Geographical Information Systems and Remote Sensing will form the core technical skills outcomes of the Geography programme.

## **ES7. DEPARTMENT OF HYDROLOGY & WATER RESOURCES**

### **ES7.1 INTRODUCTION**

The department offers a four-year degree programme in Hydrology and Water Resources leading to the award of Bachelor of Earth Sciences Degree in Hydrology and Water Resources, BESHWR.

This Department was created in 1999 to focus on training in the vital areas of hydrology and water resources, including considerable emphasis on the closely-related and intricately intertwined areas of hydrogeology and meteorology. The central objective of the Department is to produce, following a 4-year degree programme, Earth Scientists with a major in Hydrology and Water Resources, who are then able to work as team-playing professionals in industry, the public service and academic institutions, or as self-employed professionals.

In particular, the 4-year degree programme leads to an equivalent of honours degree, with classification as Distinction or Pass. The material covered in the 4<sup>th</sup> year includes project work and mini-dissertation, aside from advanced and applied treatment of important topics in the areas of focus. The fourth year of study or honours equivalent level training is designed to allow for the pursuit of specialization in aspects of surface-water hydrology, groundwater hydrology (hydrogeology), meteorology, and water resources management and supply.

In addition, therefore, the Department will offer opportunities for Master's degree by research, as well as Ph.D. studies in hydrology and water resources.

In pursuit of the Department's objective, the curriculum of the undergraduate modular programme that follows, attempts to provide an intensely relevant, non-conventional grounding in wide-ranging subject areas encapsulated in semester-long modules. Whilst introducing students to important subject areas that directly address pressing national and community needs, sufficient material is retained in modules targeting a thorough comprehension of the principles (and practice) of hydrology, hydrogeology, meteorology, fluid mechanics, water supply and the quality and management of water as a resource.

### **ES7.2 Vision**

To be a centre of excellence in hydrological and water resources education for the development of rural and regional water supply and water resources planning and management in Southern Africa.

### **ES7.3 Mission**

To impart hydrological and water resources knowledge and skills through tertiary teaching, research and community engagement in order to develop a highly intellectual and skilled human capacity in the fields of hydrology and water resources for the benefit of the environment and the society.

#### **ES7.4 Rules of Module Combination**

1. First and second year students must do all the core modules, fundamental modules and university wide modules.
2. Third year, fourth year and honours students must do all the core modules
3. The environmental sciences modules form part of the core modules and must be taken every semester up to the end of third year.
4. Students take chemistry as part of fundamental modules from the School of Mathematics and Natural Sciences up to the end of second year.  
The students take first year Physics as part of the fundamental modules but are expected to also take second year physics in future when such modules become available
5. No student will be allowed to register for a module before passing its pre-requisite.

#### **ES7.5 Exit Levels**

Students of Hydrology and Water Resources (HWR) can change and graduate with Bachelor of Environmental Sciences degree (BEnvSc.) so long as they qualify.

The students registered in HWR programme exit at the end of the fourth year of study with Bachelor of Earth Sciences in Hydrology and Water Resources

#### **ES7.6 Major Streams of Study**

HYDROLOGY (surface-water emphasis)

HYDROGEOLOGY (groundwater emphasis)

METEOROLOGY (including climate change)

WATER SUPPLY & MANAGEMENT (including resource quality and treatment)

### **ES8. DEPARTMENT OF MINING AND ENVIRONMENTAL GEOLOGY**

#### **ES8.1 INTRODUCTION**

The Department of Mining and Environmental Geology was established in 2000 in response to a challenge posed by the Limpopo Provincial Government to the two universities in the Province. In spite of the fact that mining is one of the top economic nodes of the province, there was no training programme in mining in the province at that time. This challenge coupled with viability and high demand for the programme led to the birth of the Department.

The Department of Mining and Environmental Geology offers two undergraduate programmes in mining and environmental geology and mine surveying. It also offers postgraduate studies (research only). Our degree programmes focus on understanding and management of the earth's natural processes, resources and the environment. The curriculum was designed to develop the critical, creative, intellectual and analytical abilities of students; evaluate market and community-related problems and offer solutions.

The learning and teaching process encourage the students to relate their academic studies to the practicalities of the profession; equip them with a broader vision to fulfill a meaningful role in other disciplines; and give them confidence to engage in continued study and research to meet future market and community needs. Mine visits and experiential training are essential components of our degree programmes and are aimed at enabling the students to develop a realistic understanding of the profession they have chosen and to explore and validate their career interests. These key elements of the curriculum provide an excellent basis for careers in geology, mining, geotechnics, mine surveying, and environmental management. There are many



opportunities for our graduates because the industry we serve continue to grow and our programmes provide top quality graduates.

The Department has been very successful in responding to the challenge posed by the Limpopo Provincial Government and by creating high-paying job opportunities for our graduates. It has linked the youth to a profession that their forbearers patronized merely as unskilled mine workers.

### **ES8.2 Vision**

The Department will provide comprehensive, interdisciplinary curriculum with an emphasis on economic development through teaching and community-based research. We will foster disciplinary excellence in mining, mine surveying and geoscience, which will emphasize proficiency in critical thinking, quantitative reasoning, technology, and professional communication in all our students.

### **ES8.3 Mission**

The mission of the Department is to advance the community of learning by engaging in scientific research; provide a high quality educational experience to undergraduate students in a diverse learning environment; and partnership with communities to provide educational, technical and cultural support to increase their livability.

### **ES8.4 Goals**

In all our endeavors, we will; aim high, strive to control our destiny, be accountable for our actions and exercise responsible stewardship, be inclusive, treat each other with dignity, value excellence, quality and service, and foster innovation and creativity.

### **ES8.4 Career path**

- Medium and small-scale mining
- Mineral exploration and mineral economics
- Mining impacts and mine management
- Mine water management
- Mine surveying
- Integrated Environmental Management

## **ES9. THE DEPARTMENT OF URBAN AND REGIONAL PLANNING**

### **ES9.1. INTRODUCTION**

The purpose of this presentation is to review the Bachelor of Urban and Regional Planning Programme (BURP) in line with recommendations emanating from SAPI, SACTRP (now SACPLAN) and DLA visitation teams as we prepare for accreditation of the programme in terms of the Planning Professions Act (2002)

### **ES9.2 VISION**

The Department of Urban and Regional Planning (DURP) focused on teaching and future research initiatives towards addressing the issues of planning in a predominantly rural setting, the Limpopo and Mpumalanga Provinces.

The Department devises planning with a bias to rural/countryside planning as opposed to its generalist coverage of planning as a discipline. We believed that the Department would best approach this paradigm shift through research centered on the catchment area, i.e. the Limpopo and Mpumalanga Provinces of South Africa.

We foresee the evolution of a Development Planning Consultancy Wing tied in with the overall interests of the School of Environmental Sciences (through the Environmental Assessment and Advisory Unit) and the University at large.

### **ES9.3 MISSION**

The department offers problem-oriented, project designed programmes which are designed to provide students who wish to pursue career in the built environment with specific focus on urban and regional planning. Students are exposed to physical, economic, social cultural and political forces that shape urban and rural environments.

The programme explores the role of communities, local and national governments as well as the activities of non-governmental and international agencies in the process of development and land use and the impact of these on sustainable use of resources and the environment. The ultimate goal of the programme is to forge functional and intellectual linkage between theory and practice (knowledge and skills) at all levels of planning education).

### **ES9.4 BACKGROUND**

The Department of Urban and Regional Planning offers courses/modules leading to the following qualifications.

**B URP.** (Bachelor of Urban and Regional Planning). This is a four year full-time professional planning programme;

**M URP.** (Master Urban and Regional Planning). A two-year full time professional degree programme for graduates of environmental sciences; the built environment, economic and management sciences; social and behavioural sciences, and other relevant disciplines or equivalent training.

**Ph D.** A program of a minimum duration of three years.

**Certificate and Diploma** or Postgraduate Diploma/ Certificates.

### **ES9.5 EXPECTED OUTCOMES OF THE PROGRAMME**

The detailed modules and expected competencies are an outcome of inputs from guidelines for the town planning profession by the South African Council for Town and Regional Planning (SACPLAN).

The following critical skills are embedded and underpin all the critical outcomes;  
Problem definition, gathering information and proffering alternatives and collaborative problem solving.

Written, oral and graphic communications.

Understanding strategic and synoptic dimensions and the interconnections between different facets of planning.

Aesthetic dimensions and design awareness.

The use of information technology (CAD, GIS, 3D and the use of the Internet among others).

Furthermore, that the knowledge of a planner must encompass a sound theoretical and applied base of the following areas;

The nature, purpose and method of planning.

The environment and development.

The political and institutional context of planning.

The Department of Urban and Regional Planning has taken into consideration and adopted the above SACPLAN discussion guidelines in the new course modules presented in the following pages.

## ES9.6 REVIEW OF MINIMUM ENTRY REQUIREMENTS FOR THE BURP PROGRAMME.

The need to review the minimum entry requirements for the BURP programme arose from the following:

low student throughput rates experienced in the last three years; quality of entering students into the programme especially in the areas of numeracy and communication skills competencies; exceptionally low entry requirements for the programme at UNIVEN and; recommendations emanating from SAPI, SACPLAN and DLA visitation teams.

An assessment of minimum entrance requirements of similar professional programmes was carried out within the SADC region revealed that UNIVEN's BURP programme had the lowest entry requirements. The following table shows the respective entry requirements for planning programmes within the sub-region.

### MODULES OFFERED IN THE SCHOOL

#### Department of Ecology and Resource Management

Code	Module Title	Credits	Prerequisite(s)
ERM 1541	The Natural Environment as System	12	
ERM 1641	Ecological Principles for Environmental Management	12	
ERM 2541	Principles of Resource Management	12	ERM 1541
ERM 2641	Pollution and Environmental Quality	12	ERM 1641
ERM 3541	Resource Evaluation and Information Systems	12	ERM 2541
ERM 3641	Environmental Impact Assessment and Modelling	12	ERM 2641
ERM 5740	Research Methods and Mini-Dissertation	30	ERM 3541
ERM 5541	Land Information Technology	15	ERM 3541
ERM 5542	Pollution Modelling and Control	15	ERM 3541
ERM 5543	Resource and Environmental Economics	15	ERM 3541
ERM 5544	Rangeland Management	15	ERM 3541
ERM 5641	Habitat and Biodiversity Management	15	ERM 3641
ERM 5642	Ecotoxicology	15	ERM 3641
ERM 5643	Energy Resource Management	15	ERM 3641
ERM 5644	Wildlife Management	15	ERM 3641
ERM 6740	Research and Mini-Dissertation		
ERM 6990	Research and Dissertation: ERM 6990		
ERM 7990	Research and Thesis		

#### Department of Geography and Geo-Information Sciences

Code	Module Title	Credits	Prerequisite(s)
GEO 1541*	Integrated study of major World Environments 1	16	
GEO 1520	Introduction to cartography, map analysis and aerial photograph interpretation	16	
GEO 1641	Integrated study of major World Environments 2	16	
GEO 1620	Elements of Remote Sensing and Geomatics	16	
GEO 2541	Spatial Organization of Society	16	GEO1641
GEO 2542	Quantitative and Qualitative	16	GEO1520
GEO 2641	Patterns and processes in Physical Geography	16	GEO1541
GEO 2642	Themes on the Geography of Africa	16	
GEO 3541	Geography of South Africa	16	GEO2642
GEO 3542	Geomorphology	16	GEO2641
GEO 3543	Biogeography	16	GEO2641

GEO 3544	Population and Demography	16	GEO2541
GEO 3545	Settlement and Industrial Development	16	GEO2541
GEO 3641	Remote Sensing and Geographic Information Systems A	16	GEO1620
GEO 3642	Climatology	16	GEO2641
GEO 3643	Geography of Tourism	16	GEO2541
GEO 3644	Rural Geography and Development	16	GEO2541

**\*All GEO modules are compulsory for students who are taking geography as a major. Students who are taking GEO as an additional module should take two continuous modules at each level.**

### Honours Geography and Geo-Information Sciences

Code	Module Title	Credits	Prerequisite(s)
GEO 5520	General Research Methodology	16	
GEO 5521	Geographical Thought and Methodology	16	
GEO 5522	Advanced Quantitative and Qualitative Research Techniques	16	
GEO 5720	Research project and Report/ Dissertation	30	
GEO5620	Applied Geomorphology	16	GEO 3542
GEO 5621	Applied Climatology	16	GEO 3642
GEO 5622	Applied Biogeography	16	GEO 3543
GEO 5623	Sustainable Tourism, Tourism Policy and Management	16	GEO 3643
GEO 5624	Land Tenure and Rural Land Use	16	GEO 3644
GEO 5625	Advanced Population Dynamics and Demography	16	GEO 3544
GEO 5626	Urbanisation and Rural Studies	16	GEO 3542
GEO 5627	Geographical Information Systems & Remote Sensing	16	GEO 3641
GEO 6990	Research and Dissertation		
GEO 7990	Research and Thesis		

### Department of Hydrology and Water Resources Management

Code	Module Title	Credits	Prerequisite(s)
HWR1541	Introductory Hydrology & Meteorology	10	
HWR1542	Introduction to Groundwater	8	
HWR1641	Southern African Weather & Water Resources	10	
HWR1642	Water Quality Principles	8	
HWR2541	Rural Water Supply & Sanitation	16	
HWR2542	Data Information Systems	16	
HWR2641	Water Law & Institutions	16	
HWR2642	Drought Preparedness & Management	16	HWR 1641
HWR3541	Hydrologic Measurements	16	
HWR3542	Atmospheric Dynamics	16	HWR 1541
HWR3543	Fluid Mechanics	16	
HWR3641	Hydrologic Analysis	16	HWR 3541
HWR3642	Hydrogeology	16	HWR 1542
HWR3643	Water Quality Management	16	HWR 1642
HWR4541	Applied Hydrology	16	HWR 3641
HWR4542	Applied Hydrogeology	16	HWR 3642
HWR4543	Water Supply Systems	16	HWR 3543
HWR4641	Water Resources Management	16	
HWR4642	Applied Meteorology	16	HWR 3542
HWR4643	Water Treatment Processes	16	HWR 3643
HWR4990	Research Techniques and Project	32	
HWR5541	Applied Hydrology	16	HWR 3641
HWR5542	Applied Hydrogeology	16	HWR 3642
HWR5543	Water Supply Systems	16	HWR 3543
HWR5641	Water Resources Management	16	
HWR5642	Applied Meteorology	16	HWR 3542
HWR5643	Water Treatment Processes	16	HWR 3643
HWR5990	Research Techniques and Project	32	
HWR6990	Research and Dissertation: HWR 6990		
EAS7990	Research and Thesis		

### Bachelor of Earth Sciences in Mine Surveying (BESMIS)

Code	Module Title	Credits	Prerequisite(s)
MIS 1541	Plane Surveying 1	16	
MIS 1541	Plane Surveying 2	16	
MIS 2541	GPS and Astronomy	16	
MIS 2542	Cartography	16	
MIS 2543	Law of Real Property	12	
MIS 2641	Engineering Surveying 1	18	MIS 2542
MIS 2642	Surveying Computation and adjustment 1	18	MIS 2541
MIS 2643	Computer Aided Cartography	18	MIS 2542
MIS 3544	Geodesy	20	
MIS 3546	Advanced Engineering Surveying	20	
MIS 3609	Industrial Attachment	12	
MIS 4546	Cadastral Surveying	20	
MIS 4647	Underground Surveying	20	
MIS 4990	Research Project and Dissertation	35	

### Bachelor of Earth Sciences in Mining and Environmental Geology

Code	Module Title	Credits	Prerequisite(s)
MEG 1541	Introduction to Geology	10	
MEG 1542	Introduction to Mining and Mineral Economics	8	
MEG 1641	Introduction to Hydrogeology and Soil Science	8	
MEG 1642	Introduction to the Strength of Materials and Rock Mechanics	10	
MEG 2541	Sedimentology, Stratigraphy and Basin Analysis	12	MEG 1541
MEG 2542	Mineralogy, Igneous and Metamorphic Petrology	12	MEG 1642
MEG 2543	Geochemistry and Mineral Processing	12	MEG 1542
MEG 2641	Introduction to Photogeology and Remote Sensing	10	MEG 1641
MEG 2642	Introduction to GIS	8	
MEG 2643	Introduction to Geomadicene	8	
MEG 2644	Introduction to Surveying	10	
MEG 2645	Mine Water Generation & S. African Policies & Guidelines	8	
MEG 3541	Economic Geology & Mineral Resources of Southern Africa	10	MEG 2542
MEG 3542	Environmental Geology and Mine Rehabilitation	8	MEG 2541
MEG 3543	Introduction to Geophysics	10	MEG 2642
MEG 3544	Mine Development and Mining Operations	10	MEG 2543
MEG 3547	Integrated Mine Water Management	8	MEG 2645
MEG 3641	Exploration and mining geology	10	MEG 2542
MEG 3642	Geological Field Mapping	6	
MEG 3643	Surface Mining and Mine Management	10	
MEG 3644	Surface Surveying	10	MEG 2644
MEG 3645	Geotechnical Engineering	10	
MEG 3600	Industrial Attachment	6	
MEG 3646	GIS and Map Production	8	MEG 2642
MEG 3647	Geo-environment and Health	8	MEG 2641
MEG 4541	Mineral Exploration and Advance Mineral Economics	10	MEG 3541
MEG 4542	Exploration Geophysics	10	MEG 3543
MEG 4543	Underground Mining	10	MEG 3544
MEG 4544	Mine Safety and Health	10	MEG 3647
MEG 4545	Engineering and Transport System	10	MEG 3643
MEG 4546	Non-Entry Mining	10	MEG 3645
MEG 4641	Hydrogeology	10	MEG 3641
MEG 4642	Advanced Mine and Environmental Management	10	MEG 3542
MEG 4644	Small-Scale Mining	8	

MEG 4647	Underground Mine Surveying	10	MEG 3644
MEG 4990	Research Project and Dissertation	30	

### Department of Urban and Regional Planning

Code	Module Title	Credits	Prerequisite(s)
URP 1541	Introduction to Society and Planning	8	
URP 1540	Studio 1	8	
URP 1641	Principles and Techniques of Planning	8	
URP 1640	Studio 2	8	
MAT 1649	Mathematics for Planners	8	
URP 2542	Settlement forms and Urban History	12	URP 1541
URP 2543	Introduction to Urban Planning	12	
URP 2544	Site Planning and Design (studio)	12	URP 1640
URP 2641	Rural Settlement Planning	12	
URP 2643	Quantitative methods in planning	12	MAT 1649
URP 2644	Planning for Infrastructure Development (Studio)	12	URP 2544
URP 2645	Computers in planning(studio)	12	
URP 3544	Land - Use Planning and Development Management	14	
URP 3545	Planning theories and philosophy	14	URP 2543
URP 3546	Urban design (studio)	14	URP 2644
URP 3548	Spatial planning	14	
URP 3644	Planning law	14	
URP 3645	GIS in Planning (Studio)	14	URP 2645
URP 3646	Research Methods for Planners	14	URP 2643
URP 3647	Transportation Planning	14	URP 2641
URP 3648	Regional development planning	14	
URP 4541	Integrated Development Planning (Studio)	14	URP 3548
URP 4542	Professional Planning Practice & Ethics	14	URP 3544
URP 4544	Theories & Discourses in Urban & Regional Planning	14	URP 3545
URP 4543	Transportation & Energy Planning	14	
URP 4545	Local Economic Development	14	
URP 4546	Project Design and Management	14	
URP 4641	Case Studies in Sustainable Settlement Planning	14	
URP 4642	Key Issues in Contemporary Planning	14	
URP 4647	Planning small and medium sized towns	14	
URP 4644	Housing Studio	14	URP 3546
URP 4648	Participation, Mediation & Conflict Resolution	14	URP 3547
URP 4740	Dissertation and Supervised Research Project	32	URP 3646

### Honours Mining and Environmental Geology

Code	Module Title	Credits	Prerequisite(s)
MEG 5541	Mineral Exploration and Advance Mineral Economics	10	MEG 3541
MEG 5542	Exploration Geophysics	10	MEG 3543
MEG 5543	Underground Mining	10	MEG 3544
MEG 5544	Mine Safety and Health	10	MEG 3647
MEG 5545	Engineering and Transport System	10	MEG 3643
MEG 5546	Non-Entry Mining	10	MEG 3645
MEG 5641	Hydrogeology	10	MEG 3641
MEG 5642	Advanced Mine and Environmental Management	10	MEG 3642
MEG 5644	Small-Scale Mining	8	
MEG 5647	Underground Mine Surveying	10	MEG 3644
MEG 5990	Research Project and Dissertation	30	

## Honours Urban and Regional Planning

Code	Module Title	Credits	Prerequisite(s)
URP 5541	Integrated Development Planning Studio	14	URP 3548
URP 5542	Professional Planning Practice & Ethics	14	URP 3544
URP 5543	Transportation & Energy Planning	14	URP 3545
URP 5544	Theories & Discourses in Urban & Regional Planning	14	
URP 5545	Local Economic Development	14	
URP 5546	Project Design and Management	14	
URP 5641	Metropolitan planning	14	
URP 5642	Key Issues in Contemporary Planning	14	
URP 5647	Planning small and medium sized Town	14	
URP 5644	Housing Studio	14	URP 3546
URP 5648	Participation, Mediation & Conflict Resolution	14	URP 3547
URP 5740	Dissertation and Supervised Research Project	32	URP 3646
URP 6990	Research and Thesis: URP 6990	240	
URP 7990	Research and Thesis	360	

## MODULE DESCRIPTION

### DEPARTMENT OF ECOLOGY AND RESOURCE MANAGEMENT

#### **ERM 1541: The Natural Environment as a System**

The content of this module introduces the students to environmental science. Through the module, awareness of the social, economic and political dimensions of environmental science will be raised. Students will also be taught to critically evaluate the state of the South African environment.

#### **ERM 1641: Ecological Principle for Environmental Management**

In this module, a number of basic ecological principles are outlined, using practical approaches that are widely applicable.

#### **ERM 2541: Principles of Resource Management**

*Prerequisite: ERM 1541*

This module outlines the discipline of resource management, covering the rationale for resource management; the foundation of resource management; controls on resource development; concepts and approaches to resource management and integrated resource management. The principles are applied by designing resource management strategies for specific environments, such as drainage basins, mountain ecosystems, arid and semi-arid environments etc.

#### **ERM 2641: Pollution and Environmental Quality**

*Prerequisite: ERM 1641*

**This module covers the following:** definition of pollution; development and scope of pollution science; effect of foreign bodies and substance in living things; source, pathways and sinks of main air and water pollution ; atmospheric conditions that influence transport, dispersal and reactions of air pollutants; the geopolitics of pollution; externalities and economic of pollution; introduction of environmental standards and environmental quality analysis; measure of environmental quality; issues and techniques for determining environmental quality standards; *global versus* national or regional environmental standards; introductory water quality analysis; air quality analysis; environmental health.

#### **ERM 3541: Resource Evaluation and Information Systems**

*Prerequisite: ERM 2541*

**This module covers:** the following: overview of techniques of resource evaluation; land system mapping; ecological surveys; soil surveys; land capability classification; land suitability evaluation; spatial data analysis; manual and computer-based generation of resource maps; environmental

impact assessment; remote sensing; land information systems; development project evaluation; mini-project.

**ERM 3542: Climate Change**

*Prerequisite: GEO 2641*

**This module covers:** introduction to climate change; the physics of climate change (Milankovitch cycles, atmospheric and oceanic circulation, greenhouse effect, convections, etc); paleoclimate and climate model scenarios; biodiversity and vulnerability; ecosystem-based adaptation; ecosystem services; oceans and sea levels (mangrove forests, coral reefs); potential SA vegetation biome shifts and extinctions.

**ERM 3641: Environmental Impact Assessment and Modelling**

*Prerequisite: ERM 2641*

**This module covers:** origins of EIA; characteristics of environmental impacts; projects screening; scoping; baseline studies; impact prediction assessment methods; impact mitigation; impact monitoring and auditing; preparation of environmental impact statement; EIAs for the atmosphere; EIAs for land resources; EIAs for water resources; EIAs in South Africa; environmental risk assessments; environmental modelling.

**ERM 3642: Environmental Economics and the Green Economy**

**This module covers:** aspects of environmental economics and green economy.

**ERM 5541: Land Information Technology**

*Prerequisite: ERM 3541*

**This module covers:** remote sensing; ground truthing; land information systems; spatial analysis and modelling; applications.

**ERM 5542: Pollution Modelling and Control**

*Prerequisite: ERM 3541*

**This module covers:** environmental impact assessment of pollution; techniques for modelling air, water and land pollution; pollution abatement technologies; legal control of pollution; economic policies for the control of pollution; mechanical, chemical and biological control strategies; cost-benefit analysis of pollution control strategies; pollution control in South Africa; reclamation/rehabilitation of polluted environments; case studies of reclamation of polluted environments in South Africa.

**ERM 5543: Resource and Environmental Economics**

*Prerequisite: ERM 3541*

**This module covers:** basic principles of economics; market allocation; capitalism; supply and demand; economic efficiency and market failure; cartels; externalities; common pool resources; equity; property rights; cost and benefit analysis; net present value; non-market benefits; valuation methods; direct and indirect costs; regulatory processes; fisheries; special topics.

**ERM 5544: Rangeland Management**

*Prerequisite: ERM 3541*

**This module covers:** scope and goals of rangeland management; range carrying capacity evaluation; range improvement strategies; paddocking and grazing management system; strategies of water supply in rangeland management; ranch establishment and management; use of fire in manipulating successional process in rangeland ecosystems; range problem and possible solutions in arid and semi-arid lands; traditional range management system in Eastern and Southern Africa; problems and solutions.

**ERM 5641: Habitat and Biodiversity Management**

*Prerequisite: ERM 3641*

**This module covers:** patterns in biodiversity; species-area relationships; species abundance distributions; measuring biodiversity; diversity indices; rarity; endemism;  $\alpha$ ,  $\beta$  and  $\gamma$  diversity;



small population effects; island biogeography; metapopulations; reserve selection and management; the SLOSS debate; types of reserves; wetlands case study.

**ERM 5642: Ecotoxicology**

*Prerequisite: ERM 3641*

**This module covers:** introduction to toxicology and ecotoxicology; categorisation of substances on the basis of toxicity, persistence and bioaccumulation; consent level sets; assessment of toxicity risk; risk of pollutants in contaminated lands; risk of pollution in drinking water; risk of pollution in gases and vapours; teragenesis, mutagenesis, carcinogenesis and immune system defects; analysis of ecotoxicity of pesticides and heavy metal.

**ERM 5643: Energy Resource Management**

*Prerequisite: ERM3641*

**This module covers:** analysis of renewable and non-renewable energy sources; patterns of demand and supply of energy; prospecting, exploitation and marketing of oil and coal energy resources; conservation of fossil fuels; fuel-wood and biomass energy; geothermal energy; solar energy; wind energy; hydro-electric energy and nuclear energy; strategies for the promotion and maintenance of sustainability of energy resource; analysis of world energy policies and trade; energy policies and trade in SADC countries, the fuel-wood crisis in Africa.

**DEPARTMENT OF GEOGRAPHY AND GEO-INFORMATION SCIENCES**

**GEO 1520: Introduction to Cartography, map analysis & aerial photograph interpretation**

**Module Content:** The module combines science, aesthetics, and technique that build on the premise that reality can be modeled in ways that communicate spatial information effectively. At the end of the module, students are able to acquire an understanding of different maps and remotely sensed images; interpret maps and aerial photographs; analyses key environmental and socio-economic issues using maps and aerial photographs; integrate map and aerial photograph data and use it for learning processes and projects; and reproduce maps at different scales.

**GEO 1541: Integrated Study of Major World Environments 1**

**Module Content:** The module introduces students to the atmosphere: atmospheric processes, weather and geographic patterns of climate; the biosphere: soil and vegetation processes and resulting geographic patterns; the hydrosphere: water in all its phases, movement and geographic distribution; the lithosphere: the formation, modification and geographic distribution of various landforms.

**GEO 1620: Elements of Remote Sensing & Geomatics**

**Module Content:** The module covers the introduction to remote sensing (the composition of the atmosphere and electromagnetic energy, remote sensing techniques); introduction to GIS (advantages and functions); and geomatics and surveying. At the end of the module, students are able to acquire an understanding of different remotely sensed images (aerial photographs, satellite images); interpret maps and remotely sensed images; analyse key environmental and socio-economic issues using remotely sensed images; and integrate map and aerial photograph data and use it for learning processes and projects.

**GEO 1641: Integrated Study of Major Worlds Environments 2**

**Module Content:** Growing pressures on the natural environment through intensification of human land use may compromise ecosystem functions that are central to both the human and the natural world. This module introduces students to human environment relationship. It focuses on the relationship between people, development, space and the natural environment. The module also examines key themes such as population, urban studies, migration and their theoretical and empirical importance within geography. The module content will examine how humans across the world are part of, and create, unique locations that have issues such as resource depletion. This module focuses on human induced factors responsible for environmental

deterioration, theories linking human beings and the environment to solve environmental problems.

**GEO 2541: Spatial Organisation of Society**

**Module Content:** Geography is presented as a socio-spatial science. Concepts and methodologies in the study of the spatial organisation of society are presented emphasising location, distribution, spatial patterns of the human environment, relations and interactions, the concept of the region and the new global perspectives, the dimension of space of space, including (cost, distance, time-time, social-distance); spatial process as it relates to diffusion and interaction, spatial pattern in relation to lines, points and areas.

**GEO 2542: Quantitative & Qualitative Research Methods**

**Module Content:** This module aims to provide students with introduction to the range of qualitative and quantitative research methods that are applicable in geography. The module addresses various types of qualitative and quantitative research terminology such as research design, population, sampling etc. The module provides students with the knowledge of the different research methodologies and research process.

**GEO 2641: Patterns & Processes in Physical Geography**

**Module Content:** This module covers a study of the patterns and processes of the physical environment focusing on biogeography, climatology and geomorphology. Topics that are covered include the Biosphere, Hydrosphere and the Lithosphere. These include the world global circulations, earth-atmosphere interactions, adiabatic processes and forms of precipitation, global weather patterns, denudation processes and landforms, tectonic processes and landforms, biodiversity and global distribution patterns, major world vegetation types, ecosystem processes and biological invasions.

**GEO 2642: Themes on the Geography of Africa**

**Module Content:** The course covers Regional Geography of Africa; contemporary map of Africa; physical environment as a resource; land degradation and desertification; tourism development and resource conservation; agricultural development; industrialization in Africa; population dynamics; urbanization; transport & settlement patterns; trade and trading organizations and change and challenges in Africa.

**GEO 3541: Geography of South Africa**

**Module Content:** Students will understand various issues or events taking place in South Africa particularly with themes in physical and human geography. The module focuses on the geography of South Africa, including issues dealing with the environment, history, society and the economy.

**GEO3542: Geomorphology**

**Module Content:** The nature, purpose and scope of geomorphology; Structure and materials of the earth; Global tectonics; Tectonic and volcanic landforms; Weathering and mass-wasting processes; fluvial processes and landforms; Climate and denudation; Geological structures and land-forms; Glacial landforms; Wave action and coastal geomorphology; Arid, Semi-arid and Desert landscapes; Karst processes, sinkholes and landforms. Course-based field trips will be conducted.

**GEO3543: Biogeography**

**Module Content:** Module covers current theoretical approaches, biological productivity and nutrient cycling, biotic interactions, natural and managed ecosystems, natural and anthropogenic disturbances, vegetation description, animal studies, quantitative and qualitative approaches to vegetation and animal studies. The module further provides a comparative analysis of natural populations and communities in terms of geographic variation, distribution density and disturbances, community stability, natural disturbances, human modifications of ecosystems and their possible consequences and resolutions

**GEO3544: Population & Demography**

**Module Content:** The module covers the nature and differences between population geography and demography and Variables in the study of population. At the end of this module, students are able to differentiate between population and demography; identify variables studied in population and demography; use theories to explain fertility, mortality and migration patterns; identify population issues that are of global concern; and use statistical techniques to measure population patterns and processes.

**GEO3545: Settlement Geography & Industrial Development**

**Module Content:** The module covers the patterns of rural African settlements-indigenous, colonial, post-colonial and these are examined at the micro-, meso- and macro scale. The basic historical model of urban evolution is related to the African context focusing on the interplay between indigenous' pre-industrial, colonial, and industrial cities. The rank-size and central place theory introduce the students to theories of size and spacing of urban centres. The spatial organisation of the city and urban problems are also studied as centres of industrial growth. Industrial location theory and regional development forms a major component of the last part of this module.

**GEO3641 Remote Sensing & Geographical Information System**

**Module Content:** The module covers knowledge and skills to be able to interpret and read information on satellite images and be able to integrate GIS data for decision support. Students are introduced to the concept of electromagnetic energy and remote sensing (definitions, waves and photons, sources of EM energy, electromagnetic spectrum, active and passive remote sensing); energy interactions in the atmosphere and earth surface; Platforms; image data characteristics; multispectral scanners; Earth observation systems; radiometric and geometric corrections; image enhancements; digital image interpretation. The syllabus also includes: GIS overview; geographic/spatial data; attribute data management; data input and editing; data analysis; spatial data modelling; map design and decision-making support.

**GEO3642: Climatology**

**Module Content:** This course serves as an introduction to the climate system of the Southern Hemisphere with particular focus on southern Africa. The course is aimed at developing a thorough understanding of the African climate system: its seasonality, intra-seasonal and inter-annual dynamics, and responses to tropical Atlantic and Indian Ocean influences. The emphasis is on the tropical atmosphere and oceans. The planetary-scale circulation of the atmosphere and oceans are discussed as backgrounds and subsequent topics with focus on the African climate. A climatology of tropical, subtropical and mid-latitude weather systems is discussed with focus on the structure, distribution, seasonal characteristics, and their role in the regional climates and inter-annual climate variability. The associated environment and societal consequences are also covered in detail.

**GEO3643: Geography of Tourism**

**Module Content:** The module deals with the study and analysis of tourism dynamics at the national, regional and international level. Topics covered include: the concept of tourism, tourism resources, geographical expansion of tourism, the nature of international tourism, the relationship between tourism and development and the impact of the industry to the economy, environment and society. The module further looks at ecotourism covering topics such as ecosystem dynamics and change, tourism principles, practices and philosophies, ecotourism resources in relation to carrying capacities and the role of the protected area, ecotourism and government policy and institutional arrangements for management.

**GEO3644: Rural Geography & Development**

**Module Content:** The module examines the main influences on changes in the geography of rural livelihood. In this module, rural development is about progress and change in the rural areas of developing countries. It is concerned with the factors that affect rural change, how we define progress, and what can be done to bring about the intervening objective of rural development, which is to reduce rural poverty. The module also scrutinizes the concepts of rurality and rural

development and considers a variety of approaches that have been anticipated in South Africa and elsewhere for the maintenance of rural communities and the protection of the rural landscape.

### **GEO 5520: General Research Methodology**

**Module Content:** The module exposes students to the concept of research; research tools; proposal writing and the whole research process. The students are exposed to the logic of the dissertation / thesis; its structure, graphical presentation of data; discussion and analysis.

### **GEO5521: Geographic Thought & Methodology**

**Module Content:** Introduction; Environmental determinism and possibilism, Quantitative Revolution. Khun's conceptualization of scientific revolution, Positivism, scientific nomological methods. Spatial theory and planning in South Africa before and after 1994. Marxist Science and structuralism influence on geography. Behavioral & Welfare Geography; Structuralism and Post Modernism, critical realism and neo-realism. Contributions of MBK Darkoh to geography and Env Sciences; Conservation or Development? A case of Lake Victoria. Transformation and decline of Miombo Woodlands in Eastern Tanzania; Global Warming and Potential Threats to Tourism. The realms of Physical Geography; Cognitive and Mental Maps; The Nature of Geographic Knowledge, Philosophical Concept in Physical Geography; The Science of Physical Geography, hypothesis formulation, Form and Process philosophy; Introduction to Systems Theory and Gaia Hypothesis.

### **GEO5522: Advanced Qualitative & Quantitative Research Techniques**

**Module Content:** The Advanced Qualitative and Quantitative Research Techniques (GEO5522) course is designed to enable students to collect data sensibly, manipulate and analyse the data, and interpret and draw conclusions based on qualitative and quantitative data. Candidates completing the course will become competent in methods of data collection, from the research design, sampling techniques, field interviews, including secondary data. The course also focuses on several important methods of analysing qualitative and quantitative data that are relevant to geographic problems. A variety of geographical problems in both the physical and cultural environments are used to illustrate course content. Several practical activities are arranged to demonstrate the use and application of each research technique. The course is meant to complement the Research Project (GEO5720) and prepare students for independent research and graduate programs.

### **GEO5620: Applied Geomorphology**

**Module Content:** The module aims at assisting students to acquire advanced level understanding of analytical techniques for studying geomorphic processes. Introduction, perspectives and historical development and scope of applied geomorphology. Aspects of applied geomorphology: land systems mapping, remote sensing, data sources for geomorphology in surveying and mapping: topographic and thematic (resource) mapping. Geomorphology and environmental/earth science: structural geomorphology, geomorphology and vegetation mapping (Geobotany), geomorphology and development: geomorphology in site investigation and site planning, geomorphology in civil engineering, analytical and holistic geomorphologic mapping.

### **GEO5621: Applied Climatology**

**Module Content:** Climatology has evolved into a major field with far reaching scientific and societal applications. The Applied Climatology course is designed for the advanced student with a sound background of the Atmospheric Sciences, Climatology and/or related disciplines. The course is divided into 6 main units. Firstly, the course deals with theoretical aspects governing atmospheric motions and the climate. Major weather systems and climate controls over southern Africa are also discussed next. The gathering of climate data from various observing platforms including their spatial and temporal resolutions are discussed with regards data quality. The later units deal with the science of climate change, observed trends and projections of the future climate. Practical applications of Atmospheric Science and Climatology to weather-sensitive sectors are explored extensively throughout the module. We will investigate the many faces of Applied Climatology, both from physical and cultural perspectives. Climate models will be used as a tool to answer some of the important questions about our climate.

**GE05622: Applied Biogeography**

**Module Content:** The module content intends to promote scientific inquiry through quantitative and qualitative research approaches to solve biogeographical problems, critical evaluation of the physical environment, develop group work and leadership skills. The content focuses on tropical biogeography and species diversity, conservation of natural resources, nature reserves, man and the environment.

**GE05623: Sustainable Tourism, Tourism Policy & Management**

**Module Content:** The module is designed to provide an overview of sustainable tourism practices from a global perspective. The first part of the module deals with tourism development from three main priority areas (i.e. economic, environmental and socio-cultural perspectives). Tourism policy and management principles are addressed from strategies analysis and evaluation. Students are trained to develop persuasive argument that displays independent thinking in responsible tourism development practices from different stakeholders (governments, Agencies, host communities, tour operators, tourists, Funding bodies and private sectors). Tourism's status is critically evaluated in terms of creation of job employment, utilisation of resource, community development, tourism policies and legislation, destination marketing and promotion, tourism impact and service industry.

**GE05624: Land Tenure & Rural Land use**

**Module Content:** The module aims at studying and appraising the system of land ownership in South Africa and its role in rural development. The module covers the historical background and land ownership in South Africa; Indigenous African Land Tenure systems; Private ownership of land; land reform in South Africa-policy and implementation; Evaluation of the drivers of land reform; Land reform as part of comprehensive rural development programme; Strategies for rural development.

**GE05625: Advanced Population Dynamics & Demography**

**Module Content:** The module covers various ways of studying population, conceptual frameworks, models and theories. At the end of the module, students are able to identify the various ways of studying population; formulate conceptual models of population related issues; distinguish between conceptual frameworks, models and theories; apply models and theories used in studies of the interrelationships between population and the environment; and apply population and demographic knowledge to explain spatial problems and relating to social development.

**GE05626 Urbanisation & Rural studies**

**Module Content:** The module provides an overview of the rapid urbanisation process. First part of the module looks at the global distribution of the world cities in terms of their sizes and development paths. Theoretical perspectives on sustainable urban development and the applicability of classical theories of sizes and spacing is put in perspective. Urban sprawl and social/ rural transformation constitute the critical part of the module. Particular emphasis is placed on strategies to deal with urbanisation related challenges from the global south while exposing students to the broader understanding of spatial/ geographic disparities between the global south and the global north countries. Local government mandate and their constraints are mainly dealt with from a south African perspective to strengthen student capacity to integrate theory with practices.

**Geo 5627: Geographical Information Systems & Remote sensing**

**Module Content:** The module is designed to enable students to acquire GIS and Remote sensing skills within the GIS and Image Processing software. *Specifically, the module covers* GIS basic concepts and understanding of GIS data structures and Database design; Geostatistical and Spatial data modelling; participatory GIS; GIS implementation and project management and GIS applications. The module also deals with Remote sensing systems; spectral signatures and their interpretation; image processing and interpretation; remote sensing applications.

**GEO 5720: Research Project & Report/Dissertation**  
(Not a taught module)

**DEPARTMENT OF HYDROLOGY AND WATER RESOURCES MANAGEMENT**

**HWR 1541: Introductory Hydrology & Meteorology**

**Module Content:** Definition and scope of hydrology as an area of study; the hydrologic cycle; energy transformations and the water budget equation; the catchment and human interference; precipitation as a process; types of precipitation; artificially induced precipitation; measurement of precipitation; effective depth of precipitation; potential and actual evapo-transpiration and their measurements; factors influencing evaporation; increased water supplies through reduced evaporation; the runoff process; measurement of streamflow; the infiltration process; soil moisture, moisture storage and measurement; factors and elements of climate; impact of people on climate and the influence of climate on historical events; the atmosphere, its structure and composition; radiation, temperature, pressure, wind, humidity, precipitation, clouds, air masses and fronts; measurements; weather maps.

**HWR 1542: Introduction to Groundwater**

**Module Content:** Definition of hydrogeology; origin and occurrence of groundwater; porosity and hydraulic conductivity of earth materials; geologic formations as aquifers; types of aquifers; the water table and piezometric surface; definition of the terms hydraulic head, hydraulic gradient, transmissivity, storage coefficient, specific yield and groundwater reserve; introduction to the fundamental principles of groundwater movement; Darcy's law and its application; borehole and well design, siting, construction and operation; groundwater quality and pollution.

**HWR 1641: Southern African Weather & Water Resources**

**Module Content:** Weather and climate in relation to the physical structure of the atmosphere, radiation in the atmosphere, radiation laws, cloud micro-physics and precipitation processes; factors of climate and climatic classification; regional distribution of climate around the world; seasons and weather in southern Africa; introduction to the analytical methods of climatology; nature and extent of the major surface-water and groundwater basins in southern Africa; introduction to cross-border water resources issues in the region; South Africa's water sources and their quality and availability, including rainwater as a resource.

**HWR 1642: Water Quality Principles**

**Module Content:** The importance of water chemistry and microbiology in the management of water quality; units of chemical measurement; types of chemical reactions in water; redox reactions; gas and mass transfers; law of mass action; ionization and ion exchange; introduction to isotope hydrology; physical, chemical and microbial characteristics of water; water sampling techniques, laboratory and field analyses of physical, chemical and microbiological characteristics of water; fundamental principles of the microbial transformations of matter in natural processes and in biological treatment systems; South African's guidelines (SABS) for the physical, microbiological and chemical quality of drinking water and aquatic ecosystems, within the context of the global guidelines of the World Health Organization (WHO) and possibly USEPA.

**HWR 2541: Rural Water Supply & Sanitation**

**Module Content:** The role of water in the community; the role of community in the water sector forum and planning meetings; water, sanitation, hygiene and human health; participatory planning and management of user-choice schemes; integrated development plan regional and strategic infrastructure planning; alternative rural water supply sources and selection of source; roof and ground catchments of rainwater, their storage and quality preservation; tapping gravity and artesian springs; methods of groundwater withdrawal, including dug wells and infiltration galleries; typical stream-water intake structures, small dams and village ponds; pumps for raising water, including hand-pumps, wind-pumps, hydraulic rams and solar pumps; common water treatment methods; water transmission, storage and distribution; technical and economic options of sanitation systems; participatory hygiene education.

**HWR 2542: Data Information Systems**

**Module Content:** General data considerations in hydrology and water resources, their evaluation and associated data processing; introduction to computer hardware and software; data types and functional requirements for database management; basic statistical concepts for analysis and applications of statistical packages in the analysis of hydrological and water resources data; elementary numerical methods and their applications relevant to hydrology and water resources; use of computer software in the analysis of water resource survey data.

**HWR 2641: Water Law & Institutions**

**Module Content:** Legal concepts and the legal framework relating to water as a resource; the property of water and the right to use; regulation of the quantity of surface-water and groundwater; protection of water quality; definition of the concepts and issues in the management of the resource; Water Policy and Law in South Africa; traditional institutional arrangements and alternative institutional structures; decentralization and user participation in technical, financial and administrative operations.

**HWR 2642: Drought Preparedness & Management**

**Module Content:** The concept of drought; frequency and causes of drought; different types of drought; local, regional and global climate variability; climate-related disasters, emphasizing droughts and wind erosion; major drought-afflicted areas; impacts of droughts on water availability and water uses; vulnerability and adaptability to drought; agricultural production in arid and semi-arid zones; long-term planning and early warning systems; drought monitoring and analysis; mitigation measures, possibility of cloud seeding and rehabilitation and mitigation activities; local capacity building for community-level preparedness for, and management of, drought; and local and global reactions.

**HWR 3541: Hydrologic Measurements**

**Module Content:** Hydrometric gauging networks and design considerations; rainfall storage gauges and rainfall recorders; siting the rain-gauge; radar measurement; interpretation of precipitation data and estimation of missing data; double mass analysis; depth-area and depth-area-duration analyses; global geographic variations in precipitation; factors affecting evaporation and transpiration; measurement and computation of reservoir evaporation, transpiration and potential evaporation; stream gauging using manual and recording methods; current-metre measurements of discharge and computations; dilution gauging, modern gauging techniques; stage-discharge relationships and extension of rating curves; soil moisture retention, movement and measurement.

**HWR 3542: Atmospheric Dynamics**

**Module Content:** In-depth treatment of gas laws; hydrostatic equation and its application, equations of motion on rotating earth (including coriolis force, geostrophic wind, and gradient wind), thermal wind equation and thickness relation; atmosphere thermodynamics and stability; cloud dynamics and adiabatic charts; planetary and secondary circulation; jet streams; vorticity; cyclogenesis; meteorological instruments and their operations; weather maps and data exchange; codes and plotting of charts.

**HWR 3543: Fluid Mechanics**

**Module Content:** Physical properties of water; hydrostatic pressure and forces; measurement of pressure differences, hydrodynamic concepts including continuity and Bernoulli principles and their applications; flow in pipes and resistance to flow; total head losses and energy gradient lines; closed pipe flow measurements; flow in pipe networks.

**HWR 3641: Hydrologic Analysis**

**Module Content:** Relationships between precipitation and runoff; surface retention and runoff mechanisms and components; estimation of the volume of storm runoff; hydrograph analysis and separation; the concept of the unit hydrograph and its derivation; conversion of the unit hydrograph duration; application of unit hydrographs; waves in natural channels and their movement; non-storage routing; flood routing through level-pool reservoirs and river channels;

hydraulic routing, its governing equations and numerical solution techniques; types of deterministic models; conceptual catchment modelling; model input parameters, calibration and predictive simulation; limitations of the modelling process.

#### **HWR 3642: Hydrogeology**

**Module Content:** Groundwater occurrence; properties of aquifers and their determination; heterogeneity and anisotropy as aquifer characteristics; Darcy's Law and its applicability; equations describing groundwater movement; flow lines and flow nets; equilibrium and non-equilibrium hydraulics of wells; geological, GIS, remote sensing and geophysical field investigation techniques; hydrogeologic site evaluation; aquifer potential, its safe yield, artificial recharge, and the possibilities of saline intrusion and subsidence; groundwater model types and their use and misuse; water well drilling, completion and development; groundwater regions of South Africa; groundwater resource protection.

#### **HWR 3643: Water Quality Management**

**Module Content:** Chemical, physical and microbiological characteristics of water and wastewater; water quality variables and monitoring; water quality requirements; erosion and sediment yield; solute transport; types, sources and classification of pollutants; legal and institutional framework for water pollution control; local and global standards, regulations and management practices; public health and environmental impacts of water pollution; pollution remediation, surface-water and groundwater quality modelling.

#### **HWR 4541/5541: Applied Hydrology**

**Module Content:** Probability distributions, parameter estimation and probability plotting; probability as a hydrologic planning tool; probability of hydrologic events, including flood, runoff volume and precipitation; derivation of return period and regional flood frequency; hydrologic time series; time series analysis and synthesis, and their application; stochastic analysis of rainfall and streamflow; reservoir siting and yield analysis, practical problems in hydrologic practice, including floodplain mapping and flood regulation, and the design of urban storm drainage, highway culverts, spillways and cooling ponds.

#### **HWR 4542/5542: Applied Hydrogeology**

**Module Content:** Principles of groundwater flow; solutions to equations of flow in confined and unconfined aquifers; computation of drawdown due to well pumping in various aquifer settings; determination of aquifer parameters from time-drawdown data under steady-state and non-equilibrium flow conditions; effect of partial well penetration; regional groundwater flow systems under steady-state and transient conditions; computation of travel time for pollutants in groundwater; groundwater management; surface-groundwater interactions; groundwater modelling and types of published numerical simulation models; finite difference and finite element approaches; data requirements and the accuracy of models; application of groundwater models; general application of hydrogeology to human concerns.

#### **HWR 4543/5543: Water Supply Systems**

**Module Content:** Water uses and quantities; water characteristics, quality and treatment; bulk water supply systems, siting and zoning; water demand and design period; types of water transmission conduits; transmission design considerations and hydraulic design; water transmission by pumping; types of distribution systems; design considerations and distribution system design; pipe materials for transmission and distribution; leak detection and control; software packages for design and simulation.

#### **HWR 4641/5641: Water Resources Management**

**Module Content:** Traditional institutional approach of fragmented water resources management; principles of integrated water resources management as a comprehensive approach to resource management; conjunctive use schemes; rainfall partitioning; catchment planning and management processes; water allocation; social, institutional, environmental and financial considerations; calculation of demand (rural, urban and environmental), demand management; water as an economic good and pricing of urban and peri-urban water; market



conditions and failures, and public policy in resource management; competing uses of water; conflict resolution; private sector participation; conditions and challenges in managing the resource; key elements of integrated management emphasizing inter-generational and intra-generational equity (sustainability); privatization and user stakeholder participation in resource management; case studies, especially from the southern Africa region; transboundary issues (conventions, treaties and protocols).

**HWR 4642/5642: Applied Meteorology**

**Module Content:** Principles of radar operation and radar remote sensing techniques; types of radar and their applications in meteorology; use of atmospheric data and cloud imagery from satellites for understanding the atmosphere and for weather forecasting.

**HWR 4643/5643: Water Treatment Processes**

**Module Content:** Water storage and offtake structures; water aeration, chemical precipitation and ion exchange; storage, preparation and dosing of reagents; rapid and slow mixing; coagulation and flocculation; sedimentation; rapid and slow sand filtration; removal of dissolved organic and inorganic solids through ion exchange, membrane technologies, adsorption and chemical oxidation; water stabilization; treatment, disposal and reuse of backwash water and sludge; operation and management of water treatment plants; community-level water purification on a domestic scale; disinfection and decontamination of aquifer.

**DEPARTMENT OF MINING AND ENVIRONMENTAL GEOLOGY**

**MEG 1541: Introduction to Geology**

**Module Content:** The nature and scope of geology, nature of the universe and the solar system, theories on the formation of the earth, internal structure of the earth, earth materials, earth processes, structure and composition of the earth, economic importance of selected mineral, plate tectonics, geological structures, basic principles of stratigraphy, types of stratigraphy. Practical: Identification of minerals, identification of rocks, map interpretation, drawing of geological section and reading and understanding of simple geological maps.

**MEG 1542: Introduction to Mining & Mineral Economics**

**Module Content:** Introduction to mining – basic principles of mining; mining terms and safety; mining techniques and the history of mining; significance of mining; underground versus open pit mining; infrastructure needed by mines; environmental problems of mining. Introduction to mineral economic: Classification of mineral commodities, mineral resources and reserves, energy resources, physical and social infrastructure, taxes, tariffs and incentives, mineral processing, company mineral policies, national mineral policies, mineral marketing, trade and pricing, monopolies, cartels, embargoes and stockpiles, forecasting in the mineral industry, commodity studies.

**MEG 1641: Introduction to Hydrogeology & Soil Science**

**Module Content:** Hydrogeology: principles of water movement and storage; permeability, porosity, classification of aquifers; groundwater flow, velocity and barriers; classification of South Africa's aquifers; quality of groundwater; groundwater exploration, role of geology and the use of geophysics; drilling methods; evaluation of groundwater potential (quality and quantity); groundwater in mines. Soil Science: soil and soil formation; rock weathering; products of weathering; soil formation and soil profiles; soil properties; soil physics and chemistry; colloidal fraction of soil; the organic and biological fractions; soil conditioner, physical problems of soils; soil classification and use; soil types in South Africa; engineering classification of weathered rock and soils; weathering grade and rock properties; engineering properties of soils.

**MEG 1642: Introduction to the Strength of Materials & Rock Mechanics**

**Module Content:** Strength of materials – mechanical properties of materials; analysis of stress; triaxial stress; Mohr's representation of stress. Theories of failure; elastic strain energy; fatigue strength; theory of elasticity. Laboratory test of materials behaviour and mechanical properties, stress-strain measurements; experimental analysis of tension, instruments and measuring devices. Rock mechanics: Concepts of rock mechanics; and earth materials. Rock behaviour and properties (strain and stresses properties of rocks), types and source of stresses, plastic and elastic behaviour of rocks, excavation design in elastic rocks. Rock mass characteristics: major types of structural features; geo-mechanical properties of discontinuities and collection and interpretation of structural data. Rock mass failure criteria. Rock mass classification: nature and use of rock mass classification scheme, rock behaviour in different tests. Effects of excavation on rock mass. Rock supporting and reinforcement material.

**MEG 2541: Sedimentology, Stratigraphy & Basin Analysis**

**Module Content:** Sedimentology – Rock cycle, weathering and types of weathering, types of sediments, erosion and transportation of sediments, deposition, diagenesis. Types of sedimentary rocks: clastic sedimentary rocks and classification, sandstones, conglomerates, mudrocks: chemical sedimentary rocks: evaporites, carbonates, other chemical sedimentary rocks. Basin analysis. Stratigraphy: Stratigraphic classification; lithostratigraphy units, principles of stratigraphy, stratigraphic sections, unconformities, Walther's Law of Facies, transgressions and regressions, biostratigraphy units, index fossils, problems in biostratigraphy, magnetostratigraphy units, earth's magnetic field, normal or reversed polarity: chronostratigraphic units, chronostratigraphy and geochronology, the geologic time scale, subdivision of chronostratigraphic units, stratigraphic correlation, paleoenvironment: absolute age dating techniques, radiocarbon dating, radioactive dating, dendrochronological dating.

**MEG 2542: Mineralogy, Igneous & Metamorphic Petrology**

**Module Content:** Mineralogy – Fundamentals of mineralogy, chemical elements, chemical bonding, crystal structure, crystallography and crystal growth. Mineralogical principles such as isostructuralism and polymorphism. Mineral stability, solid solution, exsolution and phase diagrams. Physical and optical properties of minerals, Identification techniques using hand specimen, microscopy and geochemical methods. Importance of physical, chemical and optical properties of rock forming minerals in the classification of groups of rock forming minerals and the formation of rocks (igneous and metamorphic). Igneous petrology: igneous structure and textures, chemistry and mineralogy of igneous rocks, classification of igneous rocks, phase rule and phase diagrams, petrogenesis, movement and modification of magmas, basalts and ultramafic volcanic rocks, rhyolites and pyroclastic rocks, andesite, ultramafic intrusive rocks, granodiorites, granites and pegmatites, alkaline igneous rocks, composition of meteorites and variation diagrams. Metamorphic petrology: Metamorphism and metamorphic rocks, textures and structures, metamorphic conditions, mineralogy, protoliths, facies, and facies series, metamorphic phase diagram, Low to medium P/T metamorphism facies, High P/T metamorphism facies, Eclogites, Dynamic metamorphism.

**MEG 2543: Geochemistry & Mineral Processing**

**Module Content:** Geochemistry – Definitions; physical properties of minerals; systematic mineralogy; main groups of silicate minerals; fundamental laws of chemistry; crystal chemistry; rules governing atomic substitution; structure and composition of the crust, mantle and core; geochemical classification of the elements; element associations in key ore deposit types; geochemical composition of igneous, metamorphic and sedimentary rocks; normative composition; phase diagrams; partitioning of trace elements during magmatic processes; distribution of trace elements in sedimentary and metamorphic rocks; mobility of elements in the surface environment; applications of mineralogy and geochemistry; isotope geochemistry; biogeochemistry; organic geochemistry; regional and environmental geochemistry. Mineral processing: mineral liberation by crushing, grinding, screening, and classification. Mineral concentration using gravity, dense medium, magnetic and high-tension separators. Froth flotation and flotation circuits. Use of reagents - collectors, frothers, depressants, and activators. Precious metals recovery methods - cyanidation, carbon-in-pulp, carbon-in-leach, metal recovery methods.

Heap leaching technology for precious metals and base metals. Dewatering techniques - thickening, filtering, drying, flocculants, and filter aids. Flowsheet analysis. Material balances. Measures of efficiency of mineral separations.

### **MEG 2641: Introduction to Photogeology & Remote Sensing**

**Module Content:** Photogeology – Electromagnetic spectrum and image characteristics; aerial photographs- types, handling and ordering; geometrical properties of aerial photographs; use of stereopairs and stereoscopes; elements of aerial photographs interpretation; direct and indirect ways of interpretation of geological structures and lithologies from aerial photographs; basic concepts of photogrammetry. Remote sensing: Remote sensing systems. Basic concepts of remote sensing. Properties of electromagnetic energy. Atmosphere scattering: Mie and Rayleigh scattering processes. Reflection and emission. Wavelength regions and bands. Types of resolution of satellite images/systems (spatial, spectral, radiometric, and temporal resolution). Framing and scanning remote sensing systems. Landsat Mosaic: Analogue and Digital Mosaic. The structure of digital images. Image analysis: visual interpretation, digital image analysis. Overview of image processing: image restoration, image enhancement, image transformation, linear contrast stretching, edge enhancement. Image classification: supervised and unsupervised classification.

### **MEG 2642: Introduction to GIS**

**Module Content:** Geographical Information Systems (GIS) – Definition and application of GIS. Spatial data and attribute data. Georeferencing and map attributes. Map scale and projections, coordinate systems. Spatial data analyses: query, reclassification, buffering and neighbourhood analysis, integrating data-map overlay, spatial interpolation, analysis of surface, and network analysis, edge matching and rubber sheeting. GIS Data Model: vector and raster data model. Getting the map into the computer: digitizing and scanning, field and image data. Database management: search by attribute and geography, query interface. Map production with GIS: map attributes, types of maps, designating the map. *Practical:* Use of ArcGIS for data processing; GIS based geological map production (ArcGIS); Interpretation of spectral signatures of different earth materials.

### **MEG 2643: Introduction to Geo-medicine**

**Module Content:** Definitions, concepts, history and scope. The geochemical circulation of nutritional and toxic elements. Health risk exposure pathways; dose-response curves. Essential elements and their deficiency and excess: Iodine deficiency disorders (IDD); role of goitrogens in I activity and elimination of IDD. Public health conditions attributed to fluoride deficiency/excess; defluoridation techniques. Arsenic and dermatosis; psoriasis. The role of Se as a co-factor in HIV-AIDS diffusion, Keshan disease, Kashin-Beck disease, and cancer. Distribution and mining of uranium in Africa; natural radiation emission and radon gas. Mercury emission in small-scale gold panning and health effects. Cardiovascular disease, cancer and the geochemical environment. Geophagia, Kaposi's sarcoma and podoconiosis. Endomyocardial fibrosis Mseleni joint disease (MJD). Volcanic gas chemistry, health spas and mineral waters. Balneology of peat deposits. The African dust plume: sources, composition, propagation and health effects. The health impact of mining and mineral processing; geogenic dust (silicosis, tuberculosis, coal workers pneumoconiosis and asbestosis); health effects of leachates, emissions and other waste from mining; acid mine drainage. Health and the geology of energy. Trace elements in soils and plants: implications for wildlife nutrition. Environmental epidemiology. Environmental and medical data sources. Analytical techniques in environmental geochemistry. Africa geochemical database. Medical Geology in Africa: Future perspectives and prospects

### **MEG 2644: Introduction to Surveying**

**Module Content:** History of Surveying; classification of surveying according to purpose, methods and instruments; chain surveying principles and methods; use of basic surveying instruments. Compass traversing: use of prismatic compasses, magnetic bearing, magnetic declination, whole circle and quadrant bearing and errors affecting compass observations. Height determination by spirit levelling. Practical: survey of a plot of land by chain and compass; graphical adjustment of compass surveying; computational adjustment of traverse by Bowditch's rule; conversion of map distance to ground distance and vice versa.

**MEG 2645: Mine Water Generation & South African Policies and Guidelines**

**Module Content:** Mine water – Types/classifications of mine water; extent of water contamination from mines, factors influencing water contamination; negative impacts of water contamination at mine sites; types of water pollution from mining; beneficial uses of mine water; principles of water quality management; water quality management instruments; and water quality monitoring. Policies and guidelines: Aims, objectives, purpose and principles of the National Water Act; Water Services Act; water use license and types of water use authorisations.

**MEG 3541: Economic Geology & Mineral Resources of Southern Africa**

**Module Content:** The principal ore minerals and their identification. The mineralogy, morphology and origin of the major types of mineral deposit, industrial minerals, coal, petroleum and natural gas. The periodic table; Goldschmidt's classification of the elements. Classification: association of elements in ore deposits. Plate tectonics and the global distribution of ore deposits. Occurrence and mode of formation of ore deposits. Igneous, Sedimentary and Metamorphic deposits. Hydrothermal deposits (mesothermal lode gold deposits; epithermal stockwork vein deposits). IOCG (iron oxide, copper, gold) deposits. Archaean conglomerate hosted gold-uranium deposit: sole example is Witwatersrand. Porphyry copper deposits. Carbonatite, alkaline igneous-related deposits. Banded Iron Formation iron ore deposits. Mississippi Valley-Type (MVT) zinc-lead deposits. Epigenetic deposits, syngenetic deposits, sedimentary exhalative deposits, volcanogenic massive sulphide deposits, placer deposits, lateritic deposits, etc. Case study of classic ore deposits with emphasis on Southern African and South African mineral deposits.

**MEG 3542: Environmental Geology & Mine Rehabilitation**

**Module Content:** Environmental geology – The scope of environmental geology: Metallic, non-metallic and industrial minerals. Renewable and non-renewable energy resources. Hydrocarbons: Petroleum, coal, natural gas and greenhouse gas emissions. Geochemical distribution of elements in the geosphere. Pathways of nutritional and toxic elements into the food chain; health implications. Chemistry and pollution of natural waters, soils and air; point and non-point sources of pollution; economics of environmental degradation. Geogenic dust and other emissions from ore processing operations; the ozone layer; acid rain. Geo-hazards: volcanism, earthquakes, landslides, mud-pools, potholes, floods (avalanche). Geological aspects of waste disposal. Climate change impacts on geological processes and management of the African coastal zone. Mine rehabilitation: Environmental challenges of mining: Air and water quality issues, land disturbance, social impacts. Minesite rehabilitation – Objectives of rehabilitation; benefits of progressive rehabilitation; planning, components, methods and techniques of mine rehabilitation; rehabilitation project feasibility studies; criteria for assessing rehabilitation alternatives; development and content of rehabilitation plan.

**MEG 3543: Introduction to Geophysics**

**Module Content:** Introduction – Geophysics and its role in exploration; physical properties of the target and the host rocks; geophysical exploration methods and techniques. Magnetic method: magnetic properties of rocks and minerals; geomagnetic field; airborne and ground magnetic surveys, reduction of magnetic data, processing of magnetic data, data enhancement: presentation of magnetic map, interpretation of magnetic anomaly map. Electrical method: electrical conductivity in minerals and rocks; electrical resistivity survey; electrical resistivity equipment; presentation and interpretation of field data, application of electrical sensitivity method. Self-potential method; electro-kinetic potential; liquid junction potential; shale potential; mineralization potential; self-potential field equipment; interpretation of self-potential data; application of self-potential method. Polarization method: IP parameters; chargeability, spectral IP; source of the IP effect; membrane polarization; time and frequency domain IP; frequency effect and metal factor in IP Survey; phase shift and phase compensation; IP Equipment; interpretation of combined IP and resistivity data; application of IP method. Electromagnetic method: Principles of EM method; EM equipment; primary and secondary fields; frequency and time domain EM systems; measurement of apparent resistivity, conductivity measurement.

**MEG 3544: Mine Development & Mining Operations**

**Module Content:** Land acquisition and environmental impact assessment; mine planning and design; primary and secondary development; drilling techniques and rock penetration; chemistry and properties of explosives; blasting methods/patterns and rock fragmentation; design and support of underground openings; mine transport; haulage and hoisting; auxiliary operations – ventilation, drainage; mine management and security. Practical: Exercises in mine planning and design and unit mine operations.

**MEG 3646: GIS & Map Production**

**Module Content:** Introduction to GIS, components of GIS, spatial and non-spatial queries and its applications; Spatial and non-spatial data and models in GIS; Vectors and Raster models, their advantages and disadvantages, intro ARCVIEW GIS; Attribute tables and data (Entity, Objects and Data models); Measurement scale; Data organization; Geodatabase; a Database Management System (DBMS) ; Relational Database Management System (RDBMS); Primary key and foreign key; Feature classes; Feature datasets; Topological relationship; Building relationship between Features and Tables. Database management: Spatial data analysis; search by attribute and geography, query interface (SQL (Structured Query Language); Boolean algebra, General arithmetic operations; General statistical operations; Geometric operations); Classification and reclassification and overlay and display; Special interpolation; Data capture; Getting the map into the computer: digitizing and scanning, field and image data. Map projects in GIS; Coordinate conversion; Geometric distortions Global positioning system (GPS); Map production with GIS: map attributes, types of maps, designating the map (georeferencing); Spatial data analysis; Edge matching and rubber sheeting; GIS Data Quality; Source of inaccuracies and impression (obvious sources or errors, errors from natural variations or from original measurement, errors. *Practical:* Use of ArcGIS for data processing; GIS based geological map production (ArcGIS); Interpretation of spectral signatures of different earth materials.

**MEG 3547: Integrated Mine Water Management**

**Module Content:** Evolution of mine water management in South Africa; Environmental sound water management; Legal framework; Mining, water and environmental legislation in South Africa; Policies, strategies and guideline documents that govern water management in South Africa; Causes of water pollution: Point and non-point pollution; Water management areas in South Africa, Water management hierarchy: Pollution prevention, storm water management, Water reuse and reclamation; overview of Water treatment and discharge, pollution prediction from mining sites; water and salt balances; water monitoring system; Integrated water quality management (IWQM) model; Plan, do, act and check system; Principles of integrated mine water management: Compliance with water management decision-taking hierarchy, Life cycle approach, Plan for closure, Cradle to grave principle, Precautionary principles; Water conservation and water demand management (WC/WDM); Consideration of temporal variation of water quality and quantity; Risk-based approach; Continual improvement management commitment and Integrated mine water and waste management plan (IMWWP).

**MEG 3641: Exploration & Mining Geology**

**Module Content:** Identification of target minerals – key stages of mineral exploration process; area selection; criteria controlling the choice of sites for geological prospecting; field documentation and basic field procedures; geological logging; mineralogical, structural, stratigraphical and geomorphological guides to ore search. Exploration techniques: Geological surveying or sampling of rocks; limitations and applications of various exploration methods; principle, types, origin, instruments, field procedure and interpretations of exploration methods. Theory and field procedures of geochemical exploration; sampling of stream sediments for geochemical analysis; application of geochemistry in mineral exploration – explorations for gold, copper and base metals. Ore reserve estimation techniques: Reserves and resources; theories and review of elementary statistics; methods and applications of traditional ore reserves estimation techniques; merits and drawbacks of various estimation methods and relevance to specific mineral deposit types; use of computers in ore reserve estimation; volume/tonnage and grade calculations; problems relating to evaluation of ore reserves.

**MEG 3642: Geological Field Mapping**

**Module Content:** Mapping of specified areas by groups of students. The use of aerial photographs and topographic maps in obtaining geological information. Use of field equipment. Description of rocks from outcrops and hand-specimen. Collation of attitude data. Identification and description of geological structures. Construction of geological map from the data gathered during actual field work. Construction of the cross section. Scanning and digitizing of manually constructed geological map. Writing a scientific report that covers lithological description, lithostratigraphy (also biostratigraphy if applicable), paleoenvironment and economic considerations of the selected area.

**MEG 3643: Surface Mining and Mine Management**

**Module Content:** Surface Mining – comparison of surface and underground mining, classification of surface mining methods; mine planning and design; surface mine development; surface mine infrastructure; surface mining methods including open pit mining, open cast mining, quarrying, augering; highwall mining, hydraulicking, dredging, borehole mining, and leaching; comparison of surface mining methods. Surface mine rock drilling and blasting; surface mine material handling equipment; mine dewatering and auxiliary operations. Mine Management: key functions of management; management processes; types and elements of mine planning; management by objectives; characteristics, advantages and limitations of various types of organizational structures; centralisation and decentralisation; managerial leadership; decision-making and process of delegation; motivation and Maslow's Hierarchy of Needs and its applications. Practical: Design and planning of surface mining operations, calculations involving stripping ratios and pit limits, mining cost estimation, and review of mine management case studies.

**MEG 3644: Surface Surveying**

**Module Content:** Theory of traversing – open, closed, and link traverses; computation of traverse coordinates; determination of areas and volumes. Tacheometry: Subtense and stadia. Determination of distances by chain and Electromagnetic Distance Meter (EDM). Theory of error and adjustments. Concepts of standard error and standard deviation, rejection criteria. Method of Least Squares and Application. Transformation of plane coordinates. Elementary field astronomy and photogrammetry; GPS surveying. Practical: Detailed application of compass and theodolite for traversing. Use of planimeter to determine areas. Tacheometric surveying for spot heights. Use of Level Instruments for determination of elevation and contouring observation of azimuth by topographical method photo-identification, use of parallax bar for height determination.

**MEG 3645: Geotechnical Engineering**

**Module Content:** Soil mechanics: permeability and seepage, effective stress principle, consolidation, compaction, shear strength. Geotechnical site investigation: Principles, objectives and rationale of site investigation; stages of site investigation programme, design and implementation; laboratory and field-based methods. Stability of slopes: geological appraisal of slope behaviour; types and mechanics of slope failure; factors affecting slope stability; slope stability analysis. Rock mechanics: Definition of terms and importance of rock mechanics; classification and index properties of rocks; classification of rock masses for engineering purposes; rock strength and Failure Criteria Modes of failure of rocks; static and dynamic methods of rock testing in the laboratory.

**MEG 3647: Geo-Environment and Health**

**Module Content:** Diseases and geo-chemical environment; Geo-chemical circulation of nutrients and toxic trace elements; Impacts of mining and mineral processing on human health: Hg, As, Pb, Si and Cd poisoning; Bio-accessibility and bio-availability of toxic elements in soils, plants, water, humans and animals. Identification of geo-environmental impacts- levels of main and trace elements; geological emissions: volcanic ash and gases, radon gas, geothermal emissions and geysers; physiological functions of macro/micro elements; geology-water-food chain diseases: fluorosis, Se and As poisoning and Iodine Deficiency Disorders (IDD). Practical:

Field assessment within the community to identify possible signs of health problems related to mining and geo-environment.

#### **MEG 3600: Industrial Attachment**

**Module Content:** Training at an approved practical training placement sites in all aspects of mining including geology, surveying, mine planning, surveying, material handling, mineral processing, community services, supervision and administrations. The training forms an integral part of the cooperating organization's philosophy and practice and is to be of benefit to the organization's productivity, revenue, and staffing goals. Close communication with the students is a major factor in good training. In this regard, students are assigned supervisor/mentor to maintain close contact with the student's progress and respond directly to any concerns that may arise. At the end of the training, the reporting supervisor of the student in the company provides feedback on the student's performance. Writing of technical report on training experience is an essential component of the training programme.

#### **MEG 4541: Mineral Exploration and Advanced Mineral Economics**

**Module Content:** Mineral exploration – principles and methods; precious metals and minerals – classification and exploration; metallic ore deposit geology and exploration techniques; industrial minerals classification and exploration; exploration budget and management; feasibility studies for mine development of small mining enterprises. Mineral economics: importance of minerals in national economy; mineral resources availability; determinants of demand for mineral commodities; resource curse; mineral taxation, tariffs and incentives; mineral market structure; rent seeking; theory of depletion, company and national mineral policies; monopolies, mineral cartels, embargoes and stockpiles; forecasting in the mineral industry; mining feasibility studies; investment in minerals sector; and opportunity and risk.

#### **MEG 4542: Exploration Geophysics**

**Module Content:** Refraction seismic method – basic principles of refraction seismic; time, distance relationship; propagation of elastic waves beneath two-layer medium; propagation of seismic waves through three-layer earth; propagation through dipping layers. Field procedure: instrumentation; data acquisition; and data reduction and interpretation. Application of resistivity method for hydrogeological investigation, mineral exploration (Barberton Greenstone belt, the Wits and Karoo basins). Gravity method: data reduction and processing; presentation and interpretation of gravity anomaly map; isostasy; practical examples: gravity survey in the Bushveld Complex and the Wits Basin and implication of both surveys for mineral exploration. Ground penetration radar (GPR): basic principles of DPR; instrumentation; data acquisition; data processing and interpretation; practical example of GPR method: its application in diamond exploration; GPR application in characterization of construction site. Practical example of integrated geophysical method: kimberlite exploration (South Africa and Australia); precious metals and base metallic deposits (South Africa); characterization of water bearing formation (Karoo basin); characterization of construction site (South Africa).

#### **MEG 4543: Underground Mining**

**Module Content:** Underground mining methods – selection criteria; unsupported methods; supported mining methods; caving mining methods; comparison of underground mining methods. Underground mining and material handling operations; drilling pattern in tunnelling and sequence of detonation (short-hole and long-hole blasting), underground commnuation at its benefits, haulage systems and equipment/infrastructure, design of ore/waste passes and their uses, skipping operations. Basic concepts of underground ventilation and air-conditioning. Underground mine planning and design: open pit versus underground; unique characteristics of a mine planning and design project, steps in the nine-planning process (baseline assessment, reserve determination, pre-mine planning and subsystem design).

#### **MEG 4544: Mine Safety and Health**

**Module Content:** Concepts of health and safety – hazardous nature of the mining business; health and safety issues associated with mining; mine health and safety policies and legislations; enforcement of health and safety standards in mines; health and safety management system;

key elements of successful health and safety management; case for and against integration of mine health and safety management system and other systems. Health-related illnesses and diseases in the mining industry (including those involving coal dust, silica dust, diesel particulate matter, asbestos, noise, lead, welding fumes, and skin disorders; protection of miners from occupational illnesses and diseases). Accident causation, prevention and control: basic theories of accident causation; accident cases; recognition and assessment of occupational hazards; accident prevention and control measures; accident investigation procedure and reporting. Measurement of safety performance: Statistical parameters; accident data collection and statistical analysis; safety performance reporting; safety performance of South Africa mining industry. Risk assessment and management: concept of risk assessment; types of risk assessment; principles and process of risk management; and hierarchy of risk control.

#### **MEG 4545: Engineering and Transport Systems for Miners**

**Module Content:** Classification of material handling methods and equipment; principles of material handling; essentials of equipment selection; fundamentals of powering systems for machines (electrical, pneumatic, and hydraulic); surface and underground mine excavators. Haulage systems: development and trends, general applicability, and types of off-highway trucks; haulage road design considerations and construction; types, general applications, design and construction of belt conveyor systems; determination of load carrying capacity and power requirements; improved surface material haulage system; tracked and trackless transportation systems; performance and selection of locomotives to meet output requirements; traction and braking equations. Mine hoisting systems: basic hoisting systems and their special applications to different mine conditions; wire ropes and their use in winding and haulage systems; rope construction, performance characteristics, sizing and selection; types, speed control, and braking devices of winders; hoisting calculations.

#### **MEG 4546: Non-Entry Mining**

**Module Content:** Concepts and classification of non-entry mining; origin and types of novel and innovative mining techniques. Mine mechanization: developments in mine mechanization, drivers for mechanization, issues or barriers to technology implementation. Selection and introduction of mechanization to a mining operation. Rapid excavation machines: concept of rapid excavation; description and applications of continuous miners; tunnel boring machines; raise borer; shaft boring; and roadheaders. Remote-control and tele-operation applications in mining: status and description of tele-operation systems for mining; considerations for successful introduction of teleoperation into mining. Mining automation and robotics: attractive features, drawbacks, mining applications, and motivation for mining automation; major challenge in introducing automation technology to the mining industry; importance/benefits and characteristics of general and mining robots; application of robotics in mining; advantages of the use of robotics; and sources of robotic efficiency. Methane drainage and underground gasification.

#### **MEG 4641: Hydrogeology**

**Module Content:** Physical hydrogeology – Darcy's law and hydraulic conductivity; hydraulic properties of fractured rocks; Karst aquifers; groundwater potential and hydraulic head; interpretation of hydraulic head and groundwater conditions. Groundwater flow theory and its applications: transmissivity and storativity of confined aquifers; release of water from confined aquifers; transmissivity and specific yield of unconfined aquifers; equations of groundwater flow; analytical solutions of one-dimensional groundwater flow problems; groundwater flow patterns; groundwater and geology; measurement and interpretation of groundwater level data. Groundwater resources and environmental management: surface water-ground water interaction; land subsidence; sea water intrusion; flood control; groundwater and geotechnical engineering. Groundwater flow to wells and hydraulic testing: field determination of hydraulic properties; steady-state flow to a well; methods of images - boundary effects; transient flow to a well - the Theis method (confined, unconfined, and semi-confined aquifers); Slug test; horizontal well hydraulics. Groundwater quality and contaminant hydrogeology: transport of contaminants in groundwater (non-reactive and reactive dissolved contaminants, non-aqueous phase liquids); source of groundwater contamination



### **MEG 4642: Advanced Mine Management and Environmental Management**

**Module Content:** Mine Management – Forms of business organizations and organizational structure; design of organizational structure for mining enterprises. People and the profession: definition and methods of communication, media used, and importance and contents of a communication plan; teamwork and team development models; leadership styles; conflict management; negotiation; professionalism and ethics. Project management: characteristics of projects; project management processes; stakeholder management; project planning, key elements of successful project management; project management framework; project phases and project life cycles; organizational structure and culture; key general management and project management skills; CPM and PERT network construction and analysis; relationship between time-cost-quality/performance; use of current project management software in solving problems. Environmental Management: Laws and regulations of mine site environmental management; air and water quality management issues; acid mine drainage problems and management; characterisation and problems of mine waste, site selection, disposal methods, plan and design of waste containment systems, and waste management methods; mine reclamation planning, techniques, cost estimation, and management; site characterisation and rehabilitation of abandoned mines; mine closure and financial provision; computer applications of mine environmental management.

### **MEG 4644: Small-Scale Mining**

**Module Content:** Overview of artisanal and small-scale mining (ASM) – history of mining in Africa; concept and general characteristics of ASM; importance and negative perceptions of ASM; relationship between small-scale and large-scale miners. Mining and mineral processing methods: categories of small-scale mining; small-scale mining techniques. Mineral processing techniques; alluvial and primary ore processing techniques and equipment; mercury amalgamation. Constraints and barriers of small-scale mining: permitting/statutory requirements, lack of access to finance, lack of technical skills, lack of market access, lack of access to technology, administration delays, and presence of active anti-small-scale mining tradition; technology transfer and future technology interventions in ASM. Safety, health and environmental issues: safety and health issues; environmental pollution community health issues; improving the occupational health and safety of mineworkers and their communities. Social and labour issues: nature, extent, and constraints of women participation in ASM; overcoming constraints and offsetting barriers to women participation in ASM; causes of child labour; children involvement in ASM; consequences of child labour; ways of stopping child labour; ways of assisting small-scale miners; role of various stakeholders.

### **MEG 4647: Underground Surveying**

**Module Content:** Correlation surveys; underground extension of lines (grade and direction lines), surveys in steep and precipitous sights. Survey in vertical and inclined raises. Correlation surveys and methods. Mechanical correlation surveys: methods based on one wire in each of two vertical shafts and two or more wires in a single vertical shaft (exact alignment, approximate alignment, Weiss quadrilateral). Error analysis of Weisbach. Accuracy of correlation by wire methods. Gyroscopic Correlation: principle of the north seeking gyroscope, determining gyroscopic azimuth, applications of the gyroscope. Subsidence monitoring: classification of subsidence, effects of subsidence, subsidence over flat and inclined laying seams areas of extraction, importance of angle of draw in protection of surface properties, subsidence prediction, prevention and protection measures.

### **MEG 4990: Research Project & Mini-Dissertation**

**Module Content:** The module is designed to develop the research skills of students through the completion of a research project on an approved topic in the context of any of the niche areas of the Department. Students will be expected to develop a research proposal with the guidance of the supervisor, present this proposal both orally and in writing, collect and analyse data using appropriate tools, present the findings both orally and in the form of a research report; the report should include a statement of the research problem, literature review including recent journal resources, objectives and hypotheses, methodology, results and data analysis, and conclusion and recommendations.

## DEPARTMENT OF URBAN AND REGIONAL PLANNING

### **URP1540: Studio 1**

**Module Content:** Introduction to technical drawing, Architectural and Engineering skills, Design instruments and papers, drawing pencil, pen, board, set square, scale ruler, Cartridge A3, A2, A1, A0, free hand lettering, size and scale, geometric construction, ellipse, arch. Orthographic projection, first and third angle projection, Isometric projection, section and hatching, hexagon, sectional drawing of assembly, assembly drawing and detail drawings

### **URP 1640: Studio 2**

**Module Content:** Art of site planning, defining the problem, site planning process, site analysis, schematic design, detail costing, developed design, contract documents, bidding and contracting, construction, occupation and management. Coverage setback, dimension lines, colour (plan or section), letter symbols, locality, key and site plan, floor plan, foundation plan, elevations, sections, roof plan, door, window schedule and development.

### **URP 1541: Introduction to Society & Planning**

**Module Content:** Meaning of planning, planning typologies and related disciplines. Basic sociological concepts; cultural norms and values. Social change and development. Human settlement; people, resources and networks. Urbanization; definitions and conceptualization, urban development in Southern Africa. The planner and society, urban and regional development theories. Understanding planning as a social and political process. Planners and Plans, Planner as technocrat, advocate, educator, co-coordinator, mediator and social scientist. Participation in the planning process. Planning responses to rural and rural conditions in Africa.

### **URP1641: Principles & Techniques of Planning**

**Module Content:** Origins of planning, urbanization, economic development and the environment, urban/rural linkages. Urban trends, change and socio-political transformations. Evolution of planning principles, standards and concerns. Method of social, economic, and physical planning surveys, analytical and procedural techniques in the planning process. Quantitative, cartographic and planning graphics.

### **URP1649: Mathematics for Planners**

**Module Content:** Basic Concepts in mensuration, trigonometry, geometry, linear and matrix algebra, population growth models. Descriptive statistic: sampling and collection of data, dispersion. Probability and inference and statistical distribution. Sampling frames, techniques, distributions. Estimation theory and hypothesis testing of sampling averages of average and proportions.

### **URP 2542: Settlement forms & Urban History**

**Module Content:** History of settlements and urban forms of influence of settlement design and planning in different socio-political economic and geographical contexts. Visions of Utopian cities and settlements patterns; treatment of public and private space and functional relationships between organization of space and social structure

### **URP 2543: introduction to Urban Planning**

**Module Content:** Historical contexts of urbanization (pre-industrial, industrial and post-industrial periods and planning concepts and practices derived there from. Theories of urban growth (Chicago ecological school) and the urban economy (urban land market). Utopian/ideal city. Garden Cities, New towns, neighborhood concepts, smart growth concept, regeneration and redevelopment. Controls versus facilitation. Integrated approach to development planning (IDP). Sustainable Planning.

### **URP 2641: Rural Settlement Planning**

**Module Content:** the scope of regional and rural planning. History of regional planning in developed and developing economies. Theoretical bases for regional and rural development. Regional planning strategies in Africa and SADC: growth centres and points, rural services centres

river basin management, SDI, ISRDPs. Theories of land use in land use planning and development. Urban land economic and markets, property markets, Planning issues and activities related to economics and financing of public and private projects. Land service and delivery systems. How planning interventions or (lack thereof) influence land markets and economics. Processes in the zone of transition (densification and internal re-organization) and rural-urban fringe. IDP, empowerment.

**URP 2544: Site Planning & Design (Studio)**

**Module Content:** Principles of land surveys in preparation for land development, site selection and planning, layout design and development. Site analysis, base maps preparation and deriving site standards and design criteria for various land uses. Preparation of detailed site plans, taking into account cultural aesthetic, climatic, economic, physical, social and infrastructural factors which influence planning and the design process.

**URP 2644: Planning for Infrastructure Development (Studio)**

**Module Content:** Deriving design criteria and standards for the provision of basic physical and line infrastructure for different land use configurations and densities i.e. free-hand and automated design. This includes aspect of municipal engineering in relation to supply, reticulation and maintenance of water, storm-water drainage, electricity, sewage and roads.

**URP 2643: Quantitative Methods in Planning**

**Module Content:** Review of probability and descriptive statistics. Types and sources of basic planning data; Forecasting models in planning: continuous and discontinuous functions applied to planning forecast, population projection techniques, Cohort survival and other techniques, gravity and migration models. Practical uses and application of spreadsheets and statistical packages; testing of significance for multiple samples using nominal, ordinal and ration scale samples.

**URP2645: Computers in Planning (Studio)**

**Module Content:** Planning data base concepts: structure creating data bases, data entry and editing. Importing data-base from other applications. Spread sheet basics, making tables and graphic (Excel, SPSS). Adding pictures and to texts. Computer-based techniques for mapping and analysis of spatial data (GIS). CAD applications in Planning. Planning projects.

**URP 3544: Land Use Planning & Development Management**

**Module Content:** Land as a resource; land use types, land tenure, land classification. Theoretical underpinnings of land use planning, land value, accessibility, competition, environmental quality. Land Use surveys, Land fragmentation, Consolidation, space usage, Planning standards and principles of layout planning, Land use policies and controls, Problems of Land Redevelopment. Areas of land use conflict; the inner-city zone of transition and rural urban fringe. Problems of urban sprawl and reconstructing the apartheid settlements forms.

**URP 3644: Planning law**

**Module Content:** Planning laws and the legitimacy of planning activity. Values and the normative nature of planning legislation; ideologies of planning law. The legacy of apartheid spatial legislation; emerging statutory framework and processes for planning in South Africa: The development Facilitation Act, Municipal Systems Act, Wise land use Bill and those relating to transport, environment, land reform and water. Development control, development management and facilitation in South Africa, concepts, tools; the planning process. Principles and sub-principles for land development. Principles for decision making and conflict resolution.

**URP 3545: Planning Theory & Philosophy**

**Module Content:** Theories in planning and of planning, classification of planning theories (explanatory, substantive and procedural etc.). Examination of planning theory and intellectual contributions to planning thought and implementation. Analysis of economic, political, legal and institutional contexts within which particular planning theories are conceived.

### **URP 3645: GIS in Planning (Studio)**

**Module Content:** Introduction-overview and definition, GI data characteristics, IS components, data sources, IS an integration technology, IS versus CAD; GIS data structures-spatial data modeling, raster structure-characteristics, zone, value, location, vector data structure-nodes, arc, polygons, raster versus vector; Data Acquisition and Input- Overview of GIS data sources, Ground based data acquisition approaches-space borne, characteristics of each, examples of existing missions, maps, data inputs- different data inputs modes, map digitizing, point versus stream mode, digitizing problems, editing, edge matching, scanning; Data management systems-data base concepts, spatial databases, relational databases, ER modeling, Duplication and redundancy, cardinality ratios, obligatory and non-obligatory, 1:1 and 1: M relationships, Normalization; GIS analysis and reporting- retrieval, classification, measurement procedures, map calculations, overlays, neighborhood operations, data options; Application areas- rural resource planning and management, urban planning and management, Utility management, resource monitoring, environment impact assessment; trends in GIS-data standards, sharing, distributed GIS, legal issues

### **URP 3546: Urban Design (Studio)**

**Module Content:** Intensive studio, addressing both new and redevelopment planning design at community and higher scale. A problem-based exploration involving studio seminars, consultation and critiques that integrate design elements that provide socially viable and economically sustainable communities with a sense of place.

### **URP 3646: Research Methods for Planners**

**Module content:** Provision of an understanding of approaches to qualitative and quantitative research methods in the social sciences and in particular planning. Logic of social research methods related to planning and including analysis of demographic economic, economic land use and transportation data. Approaches to research design, proposal writing, setting of goals, objectives and research hypothesis and design methodology. Techniques of data collection, analysis and presentation; Review of research instruments, interviews, questionnaire preparation, coding and administration; land use surveys. Library research essay writing. Presentation techniques.

### **URP 3647: Transportation Planning**

**Module content:** Overview of transport planning, transport as derived demand, comprehensive transportation planning, transport modes and units of carriage, transport and movement of goods, transport economics, transport logistics and distribution management, integrating land use and transportation planning, route and network planning and analysis, transport corridor development, transportation studies and surveys, origin-destination surveys, transport demand surveys, transport modal split survey and analysis, traffic and road condition surveys, road design and improvement traffic audits, traffic accidents and traffic calming and management strategies, traffic engineering and planning, transport and demand management strategies, current transportation planning challenges-rural travel and transportation, transport and HIV/AIDS, transport and the disabled, Transport R & D, and transport S & T issues, Labor based technology.

### **URP 3548: Spatial Planning**

**Module Content:** Overview of spatial planning, role of spatial planning in development planning and management, professions in spatial planning, types and hierarchy of spatial plans, physical plans, regional/provincial plans, master plans, structure plans, local plans, subject, development and redevelopment plans, layout plans, neighborhood plans, spatial planning data and information requirements, techniques, techniques and methods in spatial planning, spatial planning information systems, spatial planning analysis and presentation techniques and methods, spatial planning processes, systems and institutions, spatial planning legislation specifications and requirements (spatial planning and planning law), spatial planning regulation, development control, development facilitation and development administration, spatial planning and contemporary planning challenges- environmental sustainability, poverty reduction, empowerment etc., the future of spatial planning.

**URP4740/5740: Dissertation/Supervised Research Project**

**Module Content:** Project Identification; proposal writing; problem identification; theoretical framework; project objectives; project methodology; field reconnaissance. Information gathering; primary and secondary data; surveys of people and objects; preliminary analysis; classification and forecasting. Modules; predictive and evaluative. Plan Design. Evaluation partial evaluation techniques; financial appraisal; cost effectiveness analysis. Dissertation writing and submission.

**URP 4541: Integrated Development Planning (Studio)**

**Module Content:** Approaches to integrated development planning. Characteristics and objectives of IDP and effectiveness as articulated within the South African context. Strategies for linking key sectors such as employment, land use, transportation, local economic development (LED) and environment. Overview of the unique planning and development dimensions of small communities in/and rural regions. Role of small towns in development; typologies of small towns: (resource frontier towns, limited resource bases, etc). Local economic development/facilitation in small towns; strategies for small town regeneration and sustainable growth and development, institutional arrangements for LED in SA. Urban redevelopment and ISRDP as local level IDP.

**URP 4542/5542: Professional Planning Practice and Ethics**

**Module Content:** The course examines the practice and theory aspects of current concern to the planning profession. It examines the evolution of the planning profession, the concept of professionalism, professional ethics; practice in both public and public sectors. Running a professional planning office: budgeting, staffing & tendering, responsibility to the public, to the profession, to client, the employer and the social sciences. The emerging statutory, administrative and institutional framework for land development and management; role of central provincial and local government; planning commissions and development tribunals. Public participation; EIA. Role of the planner (manager/facilitator/advocate). The evolving development planning framework.

**URP 4663/5543: Transportation & Energy Planning**

**Module Content:** Sources of energy, renewal and non-renewable energy; conservation and management strategies of renewable and non-renewable resources. Impacts of energy (and planning) on the environment, land use, transportation, socio-economy, political and life styles, ozone depletion; global warming. Energy waste, Solid and toxic waste. EIA in the energy and transportation sectors. Basic principles and techniques in the planning and management of public transportation systems. Data requirements in transportation planning; evaluation of transportation alternatives and the decision-making process. Travel demand and supply analysis (trip generation, distribution, assignment and modal split). Cost and capacity relationship of all modes; relationship between land use and transportation. Rural transport systems.

**URP 4544/5544: Discourses in Urban & Regional Planning Theory**

**Module Content:** Review of intellectual and political underpinnings of contemporary planning theories. Paradigm epochal shifts in planning research and practice. Modernist versus postmodernist/ post- Fordism; new frontiers/ debates in planning. Is there any need for theory in planning- the theory/practice chasm/ nexus. Academics/ Practitioners? Ideology and planning. How have regional theories influences regional development practices and regional development. Theoretical underpinnings of selected regional planning/development strategies (development nodes, ISRDPs, growth centre policy, SDIs, IDZ, river basin management, decentralization, trans-frontier parks etc.). Evaluation of institutional and jurisdictional setting for regional planning (SACU, SADC, NEPAD, ECOWAS, EC, NAFTA, etc.). The future of regional planning.

**URP 4642/5642: Case Studies in Sustainable Settlement Planning**

**Module Content:** Concepts of sustainable development and sustainable settlement planning; priorities for development, conditions for sustainable development (economic, ecology etc.). Creating sustainable livelihood and implications for political ecology and economy for resource allocation. Sustainable cities case studies. SMART CITIES AND NEW URBANISM. Urban renewal and regeneration, cluster development and place marketing. Principles for creating sustainable

places, operational principles for sustainable development; restoration ecology. Best case studies. Tourism, the tourism industry. The essential components of econ-tourism, natural base, infrastructure, economic relationships. Reconciling human and wildlife/parks conflicts; community-based initiatives. Laws of conservation of endangered and threatened species and ecosystems. Traditional/cultural properties. Heritage landscapes types; traditional cultural values in preservation planning, IKS; procedures for national register nomination; consideration, documentation, protection and monitoring of heritage sites.

#### **URP 4642/5642: Key Issues in Contemporary Planning**

**Module Content:** Planning as mediation, arbitration and resolution of conflicts in resource allocation and usage. Levels of participation, (including Arnsteins ladder of planning participation). Techniques of and case studies in participation, mediation and conflict resolution. Gender: concept definitions; History of gender issues; local and international. Concept of gender and development. Gender analytical tools and framework. Empowerment framework: information, access, participation, control, culturally determined gender roles and environmental conservation in selected parts of the world. Examination and comparative analysis of specific planning themes and issues (development management, informal housing and employment, urban sprawl, rural land use, planning institutions, change of land in SADC countries. EIA as a management tool, basic concepts, preliminary activities, impact identification (scoping); baseline study; impact evaluation (quantification); mitigation measures; assessment; documentation; decision making; post auditing; falsehoods surrounding EIA, problems and solution of EIA; institutional arrangements.

#### **URP4546/5546: Project Design & Management**

**Module Content:** Project identification and principles of project design implementation monitoring and feedback. Preparing an offer of service and reinterpretation of client's mandates, tendering procedures for projects, Pre-qualification, costing of projects. Creating demand, client relations, and professional ethics. Designing a project, dos and don'ts. Contract administration and financial procedures, penalties, retention and insurance.

#### **URP4644/5644: Housing Studio**

**Module Content:** Theory of Housing; evolution of housing prototypes. Housing and land use in rural and urban areas. Formal and informal housing; shelter and poverty. Housing delivery systems. Housing quality and affordability. Land tenure systems. Housing policies and Strategies; the urban housing market. Interaction between informal and formal of housing supply. The myth of home-ownership and the reality of housing tenancy. Urban housing development and design processes.

#### **URP 4565/5565: Local Economic Development**

**Module Content:** Overview of LED, evolution of LED, globalization and local economic development, principles and concepts in LED, empowerment, indigenization, technology and skill transfer, Gender- GID (gender in development) and GAD (gender and development)., disability and planning, participation, Governance and Institutions, Micro Enterprises and financing mechanisms, indigenous technical knowledge, technology and the environment. Farmer-based innovations in agriculture; African case studies. Blending appropriate technology with farmer indigenous knowledge. Concepts of technology; socio-economic and environmental impacts of technology. Appropriate technology; intermediate technologies, political issues of technology and the environment. Applications and impacts of modern technology in environmental management. Integrating LED in Spatial development initiatives, spatial development plans, IRDSP, Spatial planning, strategic Planning etc.

#### **URP 4667: Planning Small Towns**

**Module Content:** Overview of planning in small towns, the planning process and the mini-town, determining small town goals and objectives, information, data and resources for the mini-plan, transportation and circulation in small towns, natural environment, community preservation and restoration, the role of small towns in development, links with rural and regional development, types of small, resource frontier towns, limited resource bases, design and appearance of small

towns, putting the small town plan into action, development facilitation and local economic development in small towns, strategies for small town development, strategic for the future of small towns.

**URP 4668: Modes of Participation, Mediation & Conflict Resolution**

**Module Content:** Overview of participation, mediation and conflict resolution, participation, mediation and conflict resolution guiding principles and specification, planning as mediation, arbitration and resolution of conflicts in resource allocation and usage. Consultation and participation. Who gains and who loses. Levels of participations. Ladder and Hierarchy of planning participation, mediation and resolution, participatory mapping and modeling, transact analysis, trends and time lines, seasonal calendars, matrix ranking and scoring, livelihoods analysis, wealth and wellbeing ranking, Venn diagramming and semi structured interviewing. Skills and techniques for facilitating group dynamics, functional PRA teams, establishment of rapport Participatory Project Planning: Community ACTION Plans. Case studies of participation in action-participation in housing and infrastructure development, Participation in urban design and planning, participation in rural resources planning and management, participation in mobility and accessibility planning etc. Challenges and issues in participation, mediation and conflict resolution.