

FACULTY OF
NATURAL AND AGRICULTURAL
SCIENCES

YEARBOOK 2014

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1. CONTACT DETAILS: OFFICE OF THE DEAN AND ACADEMIC ADMINISTRATION

| POSITION | DEAN | ASSISTANT DEAN QWA-QWA | FACULTY MANAGER | LEARNING AND TEACHING MANAGER | NATURAL SCIENCES UNDERGRADUATE AND HONOURS | BUILDING SCIENCES UNDERGRADUATE AND HONOURS | MASTER'S AND DOCTORAL DEGREES |
|--------------------|------------------------------|--------------------------------------------|---------------------------|----------------------------------|-----------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------|
| NAME | Prof Neil Heideman | Prof Riaan Luyt | Johan Kruger | Elzmarie Oosthuizen | Simoné Williams | Epefia Maboa | Rebecca Dipyere Mandy Basson |
| BUILDING | Room 9, Biology Building | Science Building, Room 108, Qwa-Qwa Campus | Room 11, Biology Building | Room 10, Biology Building | Glass doors B1/B6, George du Toit Administration Building | Room N143, George du Toit Administration Building | Room 315 / 322A, George du Toit Administration Building |
| TEL. NUMBER | 051 401 2322 | 058 718 5313 | 051 401 3199 | 051 4012934 | 051 401 9271 | 051401 2943 | 051 401 2943 / 2722 |
| E-MAIL | dean@ufs.ac.za | luytas@qwa.ufs.ac.za | krugerjd@ufs.ac.za | oosthuizenem@ufs.ac.za | williamssv@ufs.ac.za mkoenaf@ufs.ac.za | maboaemb@ufs.ac.za | dipyererd@ufs.ac.za bassonmg@ufs.ac.za |
| WEB ADDRESS | http://www.ufs.ac.za/natagri | | | | | | |

2. CONTACT DETAILS: PROGRAMME DIRECTORS

| Programme | Architecture | Agricultural Sciences | Agricultural Economics Agricultural Management | Biochemistry | Botany, Plant Breeding, Plant Health Ecology, Plant Pathology | Genetics, Behavioural Genetics, Human Molecular Biology, Forensic Sciences | Microbiology, Microbial Biotechnology | Entomology & Zoology | Building Sciences | Centres for Environmental Management, Sustainable Agriculture, Disaster Management |
|-------------------------|-------------------------------------------------------|--------------------------------------|---------------------------------------------------|----------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Name | Jako Olivier | Prof Japie van Wyk | Dr Antonie Geyer | Dr Frans O'Neill | Dr Botma Visser | Zurika Odendaal | Prof Stephanus Kilian | Prof Jo van As | Mart-Mari Els | Mpho Leripa (Qwa-Qwa Campus Faculty Officer) |
| Building | Room 26, ARG111, Architecture Building | Room LG 3. G02, Agriculture Building | Room LG 1.129 Agriculture Building | Room 5, Biotechnology Building | Room 134, Biology Building | Room 322 ,Steyn Annex | Room 50, Biotechnology Building | Room D 118, Biology Building | Room A6, Quantity Surveying and Construction Management | Science Building, Room 5 |
| Telephone Number | 051 401 2332 | 051 401 2677 | 051 401 9053 | 051 401 7553 | 051 401 3278 | 051 401 2776 | 051 401 2780 | 051 401 2427 | 051 401 2257 | 058 718 5132 |
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| Programme | Computer Science, Informatics, Information Technology | Consumer Science | Extended and UPP Natural Sciences | Geography | Geology, Geohydrology | Mathematical Sciences | Mathematical Statistics, Actuarial Science | Physical Science , Chemical Sciences | Urban and Regional Planning | Extended and UPP Agricultural Sciences |
| Name | Prof Pieter Bilgnaut | Prof Hester Steyn | Rina Meintjes | Eldalze Kruger | Dr Hermann Praekelt | Prof Schalk Schoombie | Michael von Maltitz | Dr Johan Venter | Dr Lize Barclay | Elzmarie Oosthuizen |
| Building | Room WWG 313, Mathematical Sciences Building | Room LG 9.106, Agriculture Building | Room CEM 2. 202, Chemistry Building | Room GEO 2.3, Geography Building | Room GG 305, Geology Building | Room WWG 110 A, Mathematical Sciences Building | Room W102, Mathematical Statistics Building | Room CEM 2. 101, Chemistry Building | Room 7 ARG4, Architecture Building | Room 10, Biology Building |
| Telephone Number | 051 401 2605 /3705 | 051 401 2304 | 051 401 2783 | 051 401 2185 | 051 401 2373 | 051 401 2329 | 051 401 2609 / 2933 | 051 401 3336 | 051 401 2795 | 051 401 2934 |
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3. USING THE YEARBOOK

The Yearbook contains information that will enable students to plan their undergraduate as well as postgraduate studies in the Faculty of Natural and Agricultural Sciences, University of the Free State (UFS). The information can be divided into three sections, namely general administrative information, academic learning programmes and module content.

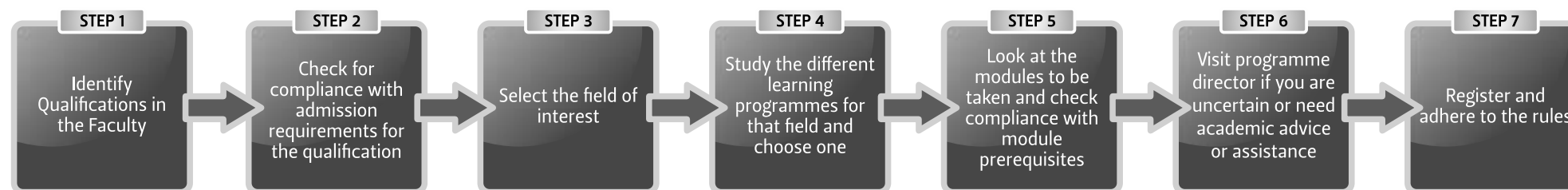
In the first section students find:

- Contact details of the academic administration officials in the Dean's office and at the student administration in the George du Toit Administration Building.
- Contact details of the different programme directors where students can get academic advice and assistance when choosing an appropriate learning programme. Consultations outside registration periods (January and July) are only available on appointment.
- Qualification types, the structure and the constitution of the qualifications.
- Core competencies for graduates.

The second section consists of:

- Faculty rules.
- Qualifications offered by the Faculty.
- Learning programmes for different qualifications.
- Transitional regulations.

Students need to follow these steps when determining the modules for which they have to register:



The third section contains module content information:

- Department in which modules are offered.
- Module code, NQF level, number of credits and CESM categories.
- Prerequisites, module name and contact sessions.
- Content of the module and the method of assessment.
-

The Yearbook describes students' rights and obligations. The academic programmes must be regarded as part of the agreement between the Faculty and the students. Students registering for a programme in the Faculty must adhere to the General Institutional Rules of the UFS as well as the Rules of the Faculty of Natural and Agricultural Sciences. Students will only be allowed to register if they comply with all the admission requirements.

It is important to note that even though the outcomes of academic programmes will remain unchanged from the first time of registration, minor changes to learning programmes, modules and module contents may occur so that the Faculty of Natural and Agricultural Sciences can ensure the relevance of the degrees. Students must therefore consult the new Yearbook every academic year before registration to ensure alignment with updated curricula, as the Faculty updates the Yearbook to keep abreast of the latest scientific developments. It is the student's **responsibility** to be fully conversant with these rules.

4. ACADEMIC STAFF

| | AGRICULTURAL ECONOMICS (051 401 2824) | ANIMAL, WILDLIFE AND GRASSLAND SCIENCES (051 401 2211) | SOIL, CROP AND CLIMATE SCIENCES (051 401 2212) | CONSUMER SCIENCE |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|
| Professor | Prof. B.J. Willemse | *Prof. J.P.C. Greyling , Prof. G.N. Smit, Prof. H.A. Snyman, Prof. J.B. van Wyk, Prof. F.W.C. Nesor | Prof. L.D. van Rensburg | |
| Professors Extraordinary | | Prof. M.M. Scholtz, Prof. T.L. Nedambale, Prof. A.J. van der Zijpp, Prof. A. Maiwashe | *Prof. C.C. du Preez , Prof. J.C. Pretorius, | |
| Associate Professor | Prof. B. Grové | Prof H.O. de Waal | Prof. P.A.L. le Roux, Prof. C.W. van Huyssteen | *Prof. H.J.H. Steyn |
| Affiliated Professors | | | Prof. C.J. Stigter, Prof. S. Walker | |
| Affiliated Associate Professor | | | Prof. M. Tsubo, Prof. R. van Antwerpen | |
| Senior Lecturer | Dr A.C. Geyer | Dr. A.M. Jooste | Dr J. Allemann, Dr G.M. Ceronio, Dr G.M. Engelbrecht | |
| Lecturers | Dr H. Jordaan, *Mr D.B. Strydom , Ms N. Matthews, Mr A.O. Ogundeji, Mr F.A. Maré, Mr J.I.F. Henning, Mr P. Mokhatla, Mr H.N. van Niekerk | Dr M.D. Fair, Mr P.J. Malan, Mr F.H. de Witt, Mr O.B. Einkamerer, Dr G.D.J. Scholtz, Mr F. Deacon | Mr J.H. Barnard, Ms L. de Wet, Ms E. Kotzé, Mr A.S. Steyn | Ms I. van der Merwe, Dr J.F. Vermaas |
| Junior Lecturers | | Mr M.B. Raito | | Ms J.S. van Zyl, Ms P.Z. Swart, Ms N. Cronje, Ms N. Tinta |
| Lecturers Units | Dr L. Terblanche, Mr W.A. Lombard, Ms N. Mdungela, Ms N. Venter, Ms J. Hayward | | Dr. J.H. van der Waals | |
| Research Associate | | | | |
| Junior Researcher | | Dr B.B. Janecke | | |
| Agricultural Engineering | Mr J.J. van Staden | | | |

| | ARCHITECTURE (051 401 2332) | QUANTITY SURVEYING AND CONSTRUCTION MANAGEMENT (051 401 2248) | URBAN AND REGIONAL PLANNING (051 401 2486) |
|------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Professor | Prof. W.H. Peters | | *Prof. V.J. Nel |
| Affiliated Professors | Prof. O. Joubert | | |
| Senior Lecturers | Ms M. Bitzer, Ms P.N. Tumubweinee, Ms A. Wagener | | Dr M.M. Campbell |
| Lecturers | Mr G. Bosman, Mr J.L. du Preez, Mr J.W. Ras | Prof. K. Kajimo-Shakanthu, Mr H.J. van Vuuren, Dr B.G. Zulch, Mr P.M. Oosthuizen, Mr M.S. Ramabodu, Mr M Letsie, Ms E. Jacobs, Ms O.R.C. du Preez, Ms M.M. Els | Mr P.J. Potgieter, Ms E. Barclay, Mr Y. Mashalaba |
| Junior Lecturers | *Mr H.B. Pretorius , Mr W.R. Bitzer, Mr J.I. Olivier, Mr J.H. Nel, Mr H. Raubenheimer, Mr Z.G. Wessels | | |

| | CHEMISTRY (051 401 9212) | COMPUTER SCIENCE AND INFORMATICS (051 401 2754) | GENETICS (051 401 2595) | GEOGRAPHY (051 401 2255) | GEOLOGY (051 401 2515) | MATHEMATICS AND APPLIED MATHEMATICS (051 401 2691) | MATHEMATICAL STATISTICS AND ACTUARIAL SCIENCE (051 401 2311) |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Distinguished Professor | *Prof. A. Roodt | | | | | | |
| Senior Professor | | | | | | *Prof. J.H. Meyer | Prof. M.S. Finkelstein |
| Professor | | | *Prof. J.J. Spies, Prof. J.P. Grobler | Prof. G.E. Visser | | Prof. A.H.J.J. Cloot, Prof. S.W. Schoombie | *Prof. R. Schall |
| Professor Researcher | | | | | Prof. W.A. van der Westhuizen | | |
| Professors Extraordinary | | | | | | | |
| Professors | Prof. J.C. Swarts, Prof. B.C.B. Bezuidenhout, Prof. J. Conradie | *Prof. P.J. Blignaut | | | | | |
| Associate Professors | Prof. W. Purcell, Prof. J.H. van der Westhuizen, Prof. H.G. Visser | | | | Prof. W.P. Colliston, Prof. M. Tredoux, Prof. C.D.K. Gauert | Prof. T.M. Acho | |
| Affiliated Professors | Prof. D. Ferreira, Prof. H. Frank, Prof. K. Swart, Prof. T. van der Merwe, Prof. S. Otto, Prof. J.M. Botha | Prof. H.J. Messerschmidt | Prof. T.E. Turner | | Prof. D.E. Miller | | |
| Affiliated Associate Professors | Prof. C. Edlin, Prof. G. Fouché, Prof. V. Maharaj, Prof G.Steyl | | Prof. A. Kotzé | | | | |
| Senior Lecturers | Dr S.L. Bonnet, Dr K von Eschwege, Dr. J.A. Venter, Dr E.H.G. Langner, Dr E. Erasmus | Dr A. van Biljon, Dr L. de Wet, Dr J.E. Kotze, Dr E. Nel, Dr T. Beelders | | *Dr C.H. Barker | Dr J.O. Claassen, *Dr F. Roelofse | Ms J.S. van Niekerk, Dr S. Dorfling | Dr J.M. van Zyl, Dr L van der Merwe, Mr F.F. Koning, Dr D. Chikobvu, Dr A. Verster |
| Senior Lecturer- researcher | | | | | Dr H.E. Praekelt | | |
| Lecturers | Dr L. Twigge, Dr A. Brink, Dr M. Schutte-Smith, Dr E. Müller, Dr R. Shago, Ms A. Wilhelm-Mouton, Ms A-L. Manicum | Ms E.H. Dednam, Mr A.J. Burger, Mr W. Nel, Mr R. Brown | Dr K. Ehlers, Mr M.F. Maleka, Mr J.A. Viljoen, Ms P. Spies, Ms S-R Schneider, Ms L. Heathfield | Ms E. Kruger, Ms T.C. Mehlokhulu, Ms R.T. Massey | | Ms A.F. Kleynhans, Mr C. Venter | Mr A.M. Naudé, Mr M.J. von Maltitz, Mr S. van der Merwe, Ms E. Girmay, Ms W. Oosthuizen, Ms Z. Ludick, Dr M. Sjölander |
| Affiliated Lecturers | | | Dr D.L. Dalton, Lt.-Col. A. Lucassen | | | | |
| Junior Lecturers | | Ms M.J.F. Botha, Mr R.C. Fouché, Mr J. Marais, Mr J.P. du Plessis, Mr D. Wium | Ms Z. Odendaal, Ms L. Wessels, Ms H. van der Westhuizen | Ms M. Rabumbulu, Ms A. Pretorius, Mr A.J. van der Walt | Ms H. Pretorius, Mr A.I. Odendaal, Ms J. Magson | | |
| Subject Coordinators | Dr C. Marais, Ms R. Meintjes | | | | | | |

| | CHEMISTRY (058 718 5130) | COMPUTER SCIENCE AND INFORMATICS (058-718 5216) | GEOGRAPHY (058-718 5476) | MATHEMATICS AND APPLIED MATHEMATICS (058-718 5204) |
|----------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------|
| QWAQWA-CAMPUS | | | | |
| Professor | Prof. A.S. Luyt | | | |
| Associate Professor | | | Prof. W.F. van Zyl | *Prof. J. Schröder |
| Senior Lecturers | | | *Dr G. Mukwada | |
| Lecturers | Ms N.F. Molefe, Mr T.A. Tsotetsi, Ms M.A. Malimabe | Mr R.M. Alfonsi, Ms R.D. Wario | Mr A. Adjei, Ms M. Naidoo | Mr S.P. Mbambo |
| Junior Lecturers | *Mr R.G. Moji, | *Mr V.F.S. Mudavanhu, Mr B. Sebastian, Mr F.M. Radebe, Mr T. Lesesa, Mr M.B. Mase, Mr G.J. Dollman | Mr P.S. Mahasa | Ms H.C. Faber |

| | MICROBIAL, BIOCHEMICAL AND FOOD BIOTECHNOLOGY (051 401 2396) | | PHYSICS (051 401 2321) | PLANT SCIENCES (051 401 2514) | | | ZOOLOGY AND ENTOMOLOGY (051 401 2427) |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| | Division of Microbiology and Biochemistry | Division of Food Sciences | | Plant Pathology | Botany | Plant Breeding | |
| Senior Professor | | | Prof. H.C. Swart | | | | |
| Distinguished Professor | Prof. J.L.F. Kock | | | | | | |
| Professor | *Prof. J.C. du Preez, Prof. J. Albertyn, Prof. R.R. Bragg, Prof. S.G. Kilian, Prof. M.S. Smit, Prof. E. van Heerden, Prof. B.C. Viljoen | Prof. G. Osthoff | Prof. P.J. Meintjes, *Prof. J.J. Terblans, Prof. O.M. Ntwaeaborwa, Prof. W.D. Roos | Prof. Z.A. Pretorius, Prof. W.J. Swart, Prof. N.W. McLaren | | Prof. M.T. Labuschagne | *Prof. J.G. van As, Prof. S. v.d. M. Louw, Prof. L. Basson |
| Professors Extraordinary | | | | Prof. P. Crous | | | Prof. G.L. Prinsloo, Prof. L.J. Fourie |
| Associate Professors | Prof. C.H. Pohl-Albertyn | Prof. A. Hugo, Prof. C.J. Hugo | Prof. M.J.H. Hoffman | | Prof. P.J. du Preez | *Prof. L. Herselman | Prof. L.L. van As |
| Affiliated Professors | Prof. M.F. DeFlaun | | | | | | |
| Affiliated Associate Professors | Prof. E.J. Lodolo | | Prof. K.T. Hillie | Prof. R. Prins | Prof. M. van der Bank | Prof. R. Prins, Prof. J.B.J. van Rensburg | |
| Senior Lecturers | Dr H.G. O'Neill, Dr F.H. O'Neill, Dr D. Opperman | Dr J. Myburgh, Dr M. de Wit | Dr R.E. Kroon | Dr M. Gryzenhout, Dr G.J. Marais | Dr G.P. Potgieter, Dr B. Visser | | Dr C.R. Haddad |
| Lecturers | Dr O.M. Sebolai, Dr C.W. Swart-Pistor | Dr C. Bothma | Dr. B. van Soelen | | Dr M. Cawood, Dr L. Mohase, Dr M. Jackson, Dr L. Joubert | Dr A. van Biljon, Dr A. Minnaar-Ontong, Dr R. van der Merwe | Ms E.M.S.P. van Dalen, Mr H.J.B. Butler, Dr C. Jansen van Rensburg, Dr S Brink |
| Junior Lecturers | Ms C.E. Boucher, Mr W.P.D. Schabort | | | | Ms M. Westcott | | Mr V.R. Swart, Ms L. Heyns, Mr D Fourie |
| Research Associate | | | | | Dr L. Rossouw | | |
| Senior Researcher | | | Dr. E Coetsee-Hugo | | | | |
| Researcher | Ms L. Steyn | | | | | | |

| | MICROBIAL, BIOCHEMICAL AND FOOD BIOTECHNOLOGY | | PHYSICS (058-718 5303) | PLANT SCIENCES (058-718 5134) | | | ZOOLOGY AND ENTOMOLOGY (058-7185324) |
|----------------------|-----------------------------------------------|---------------------------|-----------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------|----------------|-----------------------------------------------------|
| | Division of Microbiology and Biochemistry | Division of Food Sciences | | Plant Pathology | Botany | Plant Breeding | |
| QWAQWA-CAMPUS | | | | | | | |
| Associate Professor | | | Prof. B.F. Dejene | | | | |
| Senior Lecturers | | | | | *Dr. A.O.T. Ashafa, Dr E.J.J. Sieben, Dr L.V. Buwa | | *Dr A. le Roux, Dr M.M.O. Thekiso |
| Lecturers | | | *Dr J.J. Dolo, Mr R.O. Ocaya, Mr S.V. Motloutg, Mr K.G. Tshabalala | | Dr R. Ngara | | Dr P.M. Leeto, Dr J. van As, Mr E. Bredenhand |
| Junior Lecturers | | | Mr L.F. Koao | | Mr T.R. Pitso | | Ms H.J.M. Matete, Ms M. van As |

| | DIMTEC (051 401 2721) | CENTRE FOR MICROSCOPY (051 401 2264) | CENTRE FOR ENVIRONMENTAL MANAGEMENT (051 401 2863) | CENTRE FOR SUSTAINABLE AGRICULTURE, RURAL DEVELOPMENT AND EXTENSION (051 401 2163) | INSTITUTE FOR GROUNDWATER STUDIES (051 401 2175) |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Director | | | *Prof. M.T. Seaman | *Prof. I.B. Groenewald | *Dr P.D. Vermeulen |
| Professor | | | | | Prof. G.J. van Tonder |
| Associate Professor | | Prof. P.W.J. van Wyk | | | |
| Affiliated Professors | | | Prof. A. Turton | | |
| Affiliated Associate Professors | | | | | Prof. K. Witthaus, Prof. J.L. Nieber |
| Affiliated Researchers | | | | | Prof. J.F. Botha, Dr J. van der Merwe, Mr S.S. de Lange |
| Senior Lecturer | | | | Dr J.A. Van Niekerk | |
| Lecturers | *Dr A.J. Jordaan | | Ms M.F. Avenant | | |
| Junior Lecturers | Dr B. Grové, Dr L. Terblanche, Prof. G. Viljoen, Mr E. du Plessis, Prof. H. Hudson, Prof. W. Purcell, Mr C. Dreyer, Dr D. Sakulski, Dr H. Booyesen, Ms A. Weyers, Dr. D. Chikobvu | | | | |
| | Ms O. Kunguma, Ms A. Ncube, Ms J. Belle, Mr A.O. Ogundeji | | | | |
| Lecturers/Researchers | | | | | Ms L-M. Deysel, Dr F.D. Fourie |
| Research Associate | | | Dr N.L. Avenant, Dr N.B. Collins, Mr P. Grundlingh, Dr S. Mitchell, Dr J. Brink, Dr P.C. Zietsman, Dr H. Bezuidenhout, Dr D.F. Toerien | | |

* Academic Department Head

5. QUALIFICATION TYPES

The Higher Education Qualifications Framework (HEQF) contains nine qualification types mapped on to the six levels of the National Qualifications Framework (NQF) offered by higher education institutions. Some levels have more than one

qualification type. The following qualification types are presented at the Faculty of Natural and Agricultural Sciences, UFS:

| UNDERGRADUATE QUALIFICATIONS | | | | POSTGRADUATE QUALIFICATIONS | | | |
|------------------------------|------------|-----------------------|--------------------------------------------------------------------------------------------------|-----------------------------|------------|-----------------------|--------------------------------------------------------|
| Type of qualification | Exit level | Minimum total credits | Credits and level | Type of qualification | Exit Level | Minimum total credits | Credits and level |
| Advanced Diploma | 7 | 120 | Minimum 120 credits at Level 7 | Postgraduate Diploma | 8 | 120 | Minimum 120 credits at Level 8 |
| Bachelor Degree | 7 | 360 | Minimum 120 credits at Level 7 Maximum 96 credits at Level 5 | Bachelor Honours Degree | 8 | 120 | Minimum 120 credits Minimum 120 credits at Level 8 |
| Professional Degree | 8 | 480 | Minimum 120 credits at Level 7 Minimum 96 credits at Level 8 Maximum 96 credits at Level 5 | Master's Degree | 9 | 180 | Minimum 180 credits Minimum 120 credits at Level 9 |
| | | | | Doctoral Degree | 10 | 360 | Minimum 360 credits Minimum 360 credits at Level 10 |

6. CONSTITUTION OF QUALIFICATIONS

The majority of the bachelor's degrees offered in the Faculty of Natural and Agricultural Sciences consist of three years' study. The first year of study provides students with the opportunity to develop a broad scientific foundation and they are required to complete eight modules (four modules per semester). These modules serve as the foundation for specialisation in the subsequent years. In the second year of study, majors are selected (at NQF Level 6), supplemented with modules from a supportive discipline. Learning programmes provide students with the opportunity to select modules from related supportive disciplines to ensure

purposeful qualifications. In the third year of study, students must specialise in two major fields of interest, for example, Physics and Chemistry, or Microbiology and Biochemistry, or Genetics and Botany (at NQF Level 7), with at least a total of 60 credits completed for each major. Furthermore, students may also be required to complete modules to ensure that they have the necessary literacy required to function in a demanding academic environment. The diagram below indicates how degrees are composed and how one qualification provides entry into a qualification at the next NQF level.

The bachelor's degree (B) makes provision for three fields of interest, namely:

- Architecture
- Agricultural Sciences
- Consumer Sciences

The Bachelor of Science (BSc) and the Bachelor of Science Honours degrees make provision for six fields of interest, namely:

- Biological Sciences
- Building Sciences
- Consumer Sciences
- Chemical and Physical Science
- Geosciences
- Information Technology
- Mathematical Sciences

The Bachelor of Sciences in Agriculture (BScAgric) degree makes provision for three fields of interest, namely:

- Animal, Grassland and Wildlife Sciences
- Plant Breeding and Plant Pathology
- Soil, Crop and Climate Sciences

In each field of interest different modules may be combined as majors. The different combinations of majors, minors and supportive modules are referred to as learning programmes. All the learning programmes comply with the minimum credits as indicated under the heading *Types of Qualifications* above. Each learning programme has a unique code which refers to a qualification registered with SAQA. The first two or three digits refer to different degrees as follows:

| | | | | | | | |
|------------------------|-------|--------------------------------------------|-----------|-------------------------------------------------|-------|-----------------------------------|-------|
| Advanced Diploma | 400xx | Bachelor Agric | 501xx | Master's degree by dissertation | 473xx | Doctor | 493xx |
| Advanced Diploma Agric | 500xx | Bachelor of Science Agriculture | 51xxx, | Master's degree by coursework | 474xx | Doctor of Philosophy | 491xx |
| Bachelor | 401xx | | or 52xxx, | Master of Science by dissertation | 471xx | Doctor of Science | 490xx |
| Bachelor of Science | 41xx | | or 53xxx, | Master of Science by coursework | 472xx | University Preparation Programmes | |
| or | 42xxx | | or 54xxx | Master of Agricultural Sciences by dissertation | 571xx | Agriculture | 5000x |
| or | 43xxx | Bachelor Honours | 453xx | Master of Agricultural Sciences by coursework | 572xx | Sciences | 4000x |
| or | 44xxx | Bachelor of Science Honours | 450xx | | | Extended programmes | |
| | | Bachelor of Science in Agriculture Honours | 550xx | | | Agriculture | 509xx |
| | | Postgraduate Diploma | 460xx | | | Sciences | 409xx |

The first digits that indicate the degree, can include one of the two digits representing a major. The subsequent digits represent either the selected two majors or the major and minor in the case of the Bachelor of Science Agriculture degree, or a single specialty area in the case of Honours, Master's and Doctoral degrees. Every discipline is identified by a two-digit code as given in the table below.

Table 1: Identification codes of different disciplines

| | | | | | | | |
|--------------------------|----|----------------------------------|----|-------------------------|----|-----------------------------|----|
| Actuarial Science | 10 | Botany | 20 | Forensic Sciences | 30 | Physics | 40 |
| Agricultural Economics | 11 | Chemistry | 21 | Genetics | 31 | Plant Breeding | 41 |
| Agrometeorology | 12 | Computer Science and Informatics | 22 | Geochemistry | 32 | Plant Pathology | 42 |
| Agronomy | 13 | Consumer Science | 23 | Geography | 33 | Quantity Surveying | 43 |
| Architecture | 14 | Construction Management | 24 | Geohydrology | 34 | Soil Science | 44 |
| Animal Science | 15 | Disaster Management | 25 | Geology | 35 | Spatial planning | 45 |
| Applied Mathematics | 16 | Engineering Science | 26 | Grassland Science | 36 | Statistics | 46 |
| Astrophysics / Astronomy | 17 | Entomology | 27 | Mathematical Statistics | 37 | Sustainable Agriculture | 47 |
| Behavioural Genetics | 18 | Environmental Geology | 28 | Mathematics | 38 | Urban and Regional Planning | 48 |
| Biochemistry | 19 | Food Science | 29 | Microbiology | 39 | Zoology | 49 |

Table 2: Identification codes of other specialisation fields

| | | | | | | | |
|----------------------------------|---------|------------------------------|----|----------------------------------------|----|----------------------|----|
| Approved Alternative Combination | 00 | Economics | 55 | Irrigation Management | 62 | Nano Sciences | 69 |
| Programme without two majors | 01 – 09 | Environmental Management | 56 | Human Settlements | 63 | Plant Health Ecology | 70 |
| Accounting | 50 | Environmental Rehabilitation | 57 | Land and Property Development | 64 | Polymer Sciences | 71 |
| Agricultural Engineering | 51 | Facilities Management | 58 | Life Sciences | 65 | Property Sciences | 72 |
| Agricultural Management | 52 | Finance | 59 | Limnology | 66 | Psychology | 73 |
| Business | 53 | Geoinformatics | 60 | Microbiotechnology | 67 | Risk Analysis | 74 |
| Environmental Sciences | 54 | Human Molecular Biology | 61 | Mineral Resource Throughput Management | 68 | Wildlife Management | 75 |

The curricula for the different learning programmes consist of three types of modules, namely compulsory, elective and required modules. Compulsory modules must be taken by all the students in the learning programme; elective modules provide students with the opportunity to select modules of interest; and required modules must be followed when a student does not comply with certain requirements. The curricula for the different learning programmes are set out below, starting on p.34.

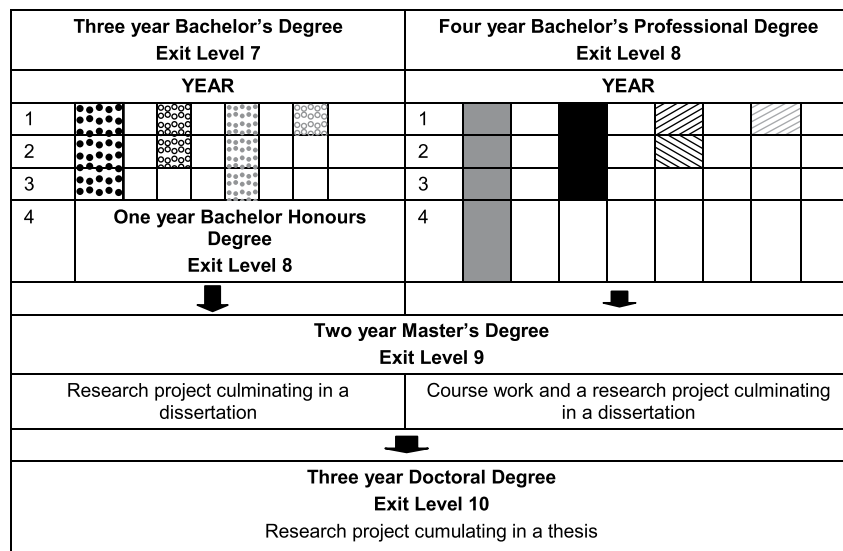
Examples of learning programme codes

| Learning programme | First two or three digits represent type of degree (or part of the major) | Subsequent digits represent different disciplines or specialisation fields | Learning programme code |
|----------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------|
| BAgric In Agricultural Economics | 401xx | xxx11 | 40111 |
| BConsumer Science | 401xx | xxx23 | 40123 |
| BSc with Chemistry and Physics | 42xxx (where 2 is part of 20, the code for Chemistry) | x2140 | 42140 |
| BSc Hons Chemistry | 450xx | xxx21 | 45021 |
| MSc Chemistry by dissertation | 471xx | xxx21 | 47121 |
| PhD Chemistry | 491xx | xxx21 | 49121 |

7. STRUCTURE OF QUALIFICATIONS

COMPOSITION OF THREE AND FOUR YEAR DEGREES

The different blocks represent different modules; if the blocks have the same colour they represent the same discipline.



MODULE CODES

Undergraduate modules may be presented as semester or year modules. The credits awarded to every module give an indication of the teaching and learning time. One module credit equals 10 notional hours which include hours spent in the lecture room and on independent work and study.

A module is indicated with the code ABCxyz and this code represents the following:

ABC Indicates the discipline

x A numeral stating the study year, for example first year = 1

y An odd number indicates the first semester and an even number indicates the second semester. The numerals 0 or 9 indicate a year module

z The number multiplied by four indicates the number of credits

For example, AGR354 indicates that it is an Agronomy module (AGR), presented during the third academic year at NQF Level 7 (3), that the module is presented during the first semester (odd number 5), and represents 4x4 = 16 teaching credits (4).

The numerical code for Honours, Master's and Doctoral modules will start with a 6, 7 and 9 respectively, and often the second and third numbers do not have the same meaning as the codes of undergraduate modules.

8. CORE COMPETENCIES FOR GRADUATES

A Bachelor's or Bachelor of Science Graduate is:

| Academically excellent | Adjusted to cultural diversity | An active global citizen |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>This entails that the student:</i> | | |
| <ul style="list-style-type: none"> Attains a strong sense of academic integrity and scholarship. Becomes self-motivated and self-regulated, with an ability to continuously direct his/her own learning. Adapts to a changing environment and becomes committed to lifelong learning. Accepts critical thinking and decision-making as part of the learning process. Attains an appropriate level of achievement in language proficiency, reading and writing, problem solving, communication and broad research activities. Becomes competent in information and communication technologies. Develops cognitive and analytical skills that are flexible and transferable through various learning experiences. | <ul style="list-style-type: none"> Acquires an understanding of the social and cultural diversity in our country. Learns to value and respect different cultures. | <ul style="list-style-type: none"> Acquires an appreciation of the global perspective on his/her chosen discipline(s). Learns to accept social responsibilities. Is able to work effectively both as a team leader and a team member. Takes cognisance of existing social, economic, political and environmental issues. Encourages the improvement and sustainability of the environment. Respects human rights, attaches importance to equity and values, ethics and ethical standards. |
| Knowledge | Skills | Values and attitudes |
| <ul style="list-style-type: none"> Integrated, comprehensive knowledge of the main areas within the two major disciplines of choice. This includes an understanding of, and an ability to apply and evaluate, the key terms, concepts, facts, principles, rules and their theories. Detailed knowledge of at least one area of specialisation and how that knowledge relates to other fields, disciplines or practices. An understanding of contested knowledge and an ability to evaluate types of knowledge and explanations typical of the discipline. | <ul style="list-style-type: none"> An understanding of a range of enquiry methods in a field, discipline or practice, and their suitability to specific investigations. An ability to apply a range of methods to resolve problems or introduce change within a practice. An ability to identify, analyse, critically reflect on and address complex problems, applying evidence-based solutions and theory-driven arguments. An ability to make decisions and act ethically and professionally, and the ability to justify these decisions and actions drawing on appropriate ethical values and approaches within a supported environment. An ability to manage processes in unfamiliar and variable contexts, recognising that problem solving is context- and system-bound, and does not occur in isolation. | <ul style="list-style-type: none"> An ability to accurately identify, evaluate and address own learning needs in a self-directed manner, and facilitate collaborative learning processes. An ability to take full responsibility for own work, decision making and use of resources and limited accountability for the decisions and actions of others in varied or ill-defined contexts. An ability to develop appropriate processes of information gathering for a given context or use. An ability to independently validate sources of information, and evaluate and manage it. An ability to develop and communicate own ideas and opinions in well-structured arguments. |

9. FACULTY RULES

NAS1 – General rules

The **General Institutional Rules** of the UFS are set out in General Institutional Rules (First Qualification, as well as Advanced and Postgraduate Qualifications) for each year in the Yearbook of the University, and contains the following relevant information:

| GENERAL RULES FOR FIRST QUALIFICATIONS | | | |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| A1 – General rules | A2 – Application for admission | A3 – Admission or readmission to the university and an academic qualification | A4 – Submission of documentation to register as a student |
| A5 – Duration of study and curriculum compilation | A6 – Registration and re-registration as student | A7 – Amendment of a qualification and/or module(s) and/or university campus/centre and/or mode of instruction | A8 – Credit accumulation and transfer |
| A9 – Assessment rules | A10 – Qualifications with distinction | A11 – Qualification certificates, Deans and Senate Medals | A12 – Statements of results, academic records, study records, certified statements, conduct certificates and certified examination timetables |
| A13 – Requests on the grounds of exceptional circumstances | A14 – Discipline | A15 – Financial support | A16 – Module and lecture hall timetable and examination timetable |
| A17 – Residing in campus housing | A18 – Fees payable | A19 – Information Communication and Technology | |
| GENERAL RULES FOR POSTGRADUATE DIPLOMA | | | |
| A20 – General rules | A21 – Application for admission | A22 – Admission or readmission to the university and an academic qualification | A23 – Submission of documentation to register as a student |
| A24 – Duration of study and curriculum compilation | A25 – Registration and re-registration as student | A26 – Amendment of a qualification and/or module(s) and/or university campus/centre and/or mode of instruction | A27 – Credit accumulation and transfer |
| A28 – Assessment rules | A29 – Qualification with distinction | A30 – Qualification certificates | A31 – Intellectual property |
| A32 – Publication of a research essay | A33 – Statements of results, academic records, study records, certified statements, conduct certificates and certified examination timetables | A34 – Requests on the grounds of exceptional circumstances | A35 – Discipline |
| A36 – Financial support | A37 – Module and timetable and examination timetable | A38 – Residing in campus housing | A39 – Fees payable |
| A40 – Information communication and technology | | | |
| GENERAL RULES FOR BACCALAUREUS HONOURS DEGREES | | | |
| A45 – General rules | A46 – Application for admission | A47 – Admission or readmission to the university and a baccalaureus honours degree | A48 – Submission of documentation to register as a student |
| A49 – Duration of study and curriculum compilation | A50 – Registration and re-registration as student | A51 – Amendment of a qualification and/or module(s) and/or university campus/centre and/or mode of instruction | A52 – Credit accumulation and transfer |
| A53 – Assessment rules | A54 – Qualifications with distinction | A55 – Qualification certificates, Dean's and Senate Medals | A56 – Intellectual property |
| A57 – Publication of a research essay | A58 – Statements of results, academic records, study records, certified statements, conduct certificates and certified examination timetables | A59 – Requests for exceptional cases | A60 – Discipline |
| A61 – Financial support | A62 – Module and timetable and examination timetable | A63 – Residing in campus housing | A64 – Fees payable |
| A61 – Recognition of modules passed at this or another institution of higher education | A62 – Presentation modes and assessment | A63 – Times and venues where examinations are conducted | A64 – Assessors/moderators |
| A65 – Information communication and technology | | | |

| GENERAL RULES FOR MASTER'S DEGREES | | | |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| A70 – General rules | A71 – Application for admission | A72 – Admission or readmission to the university and a baccalaureus honours degree | A73 – Submission of documentation to register as a student |
| A74 – Mode of presentation | A75 – Requirements in respect of a dissertation or publishable, mutually related article (s) (journal article option) or mini-dissertation, or an extended essay, or dissertation | A76 – Duration of study and curriculum compilation | A77 – Registration and re-registration as student |
| A78 – Amendment of a research title | A79 – Study and co-supervisor (s) | A80 – Assessors and moderators | A81 – Amendment of a qualification and/or module(s) and/or university campus/centre and/or mode of instruction |
| A82 – Credit accumulation and transfer | A83 – Assessment rules | A84 – Qualification with distinction | A85 – Qualification certificates, Dean's and Senate Medals |
| A86 – Intellectual property | A87 – Publication of a dissertation, extended essay, dissertation | A88 – Statements of results, academic records, study records, certified statements, conduct certificates and certified examination timetables | A89 – Requests for exceptional cases |
| A90 – Discipline | A91 – Financial support | A92 – Module and timetable | A93 – Residing in campus housing |
| A94 – Fees payable | A95 – Information Communication and Technology | | |
| GENERAL RULES FOR DOCTOR'S DEGREES | | | |
| A100 – General rules | A101 – Application for admission | A102 – Admission or readmission to the University and a doctoral degree | A103 – Submission of documentation to register as a student |
| A104 – Mode of presentation | A105 – Requirements in respect of a thesis or publishable, mutually related articles, (journal article option) or mini-thesis | A106 – Duration of study and curriculum composition | A107 – Registration and re-registration as a student |
| A108 – Amendment of a research title | A109 – Promoter and co-promoter(s) | A110 – Assessors and moderators | A111 – Amendment of a qualification and/or discipline and/or module(s) and/or university campus/centre |
| A112 – Credit accumulation and transfer | A113 – Assessment rules | A114 – Qualification with distinction | A115 – Qualification certificates |
| A116 – Intellectual property | A117 – Publication of a thesis | A118 – Statements of results, academic records, study records, certified statements, conduct certificates and certified examination timetables | A119 – Requests for exceptional cases |
| A119 – Requests for exceptional cases | A121 – Financial support | A122 – Module and timetable | A123 – Residing in campus housing |
| A124 – Fees payable | A125 – Information Communication and Technology | | |
| GENERAL RULES FOR DOCTOR'S DEGREES (NQF Exit Level 10) | | | |
| A130 – General rules | A131 – Application for admission | A132 – Admission or readmission to the higher doctorate | A133 – Registration and re-registration as a student |
| A134 – Mentor | A135 – Assessors | A136 – Requirements that must be met at the submission of scientific publications | A137 – Assessment reports |
| A138 – Pass requirements | A139 – Plagiarism | A140 – Qualification certificates | A141 – Fees payable |
| GENERAL RULES: HONORARY DEGREES | | | |
| A145 – Honorary suggestions | A146 – Qualification certificates | A150 – Convocation | |

The General Institutional Rules of the UFS apply to this faculty *mutatis mutandis* (A1 to A150). These **Rules of the UFS** are, with the necessary adjustments, applicable to all the qualifications that are awarded by the Faculty of Natural and Agricultural Sciences. Rules of the **Faculty of Natural and Agricultural Sciences (NAS)**, which specifically apply to the degree and other programmes presented in the Faculty, are equally important and

relevant. Students must consult the new Yearbook every academic year before registration to ensure alignment with updated curricula, as the Faculty updates the Yearbook to keep abreast of the latest scientific developments. It is the student's **responsibility** to be conversant with these rules and the following rules are important.

NAS2 and NAS3 – Entrance and progress requirements

Undergraduate programmes

The faculty offers various undergraduate qualifications in different categories including Diplomas, Access and Extended programmes and Bachelor degrees. The following fields of study are covered in each of the categories at the main campus and on the QwaQwa campus where indicated or where indicated on the QwaQwa campus only:

- **Diplomas:** Advanced Diploma in Sustainable Agriculture and Rural Development.
- **Access and Extended Programmes:** University Preparation Programme: Agricultural Sciences for BAgric; University Preparation Programme: Natural and Agricultural Sciences(Mathematics and Chemistry) for BSc, Access: Natural and Agricultural Sciences (Mathematics and Chemistry) for BSc (Qwa-Qwa, Bachelor of Agriculture Extended Programme, Bachelor of Agricultural Sciences Extended Programme, Bachelor of Science Extended Programme (Mathematics and Chemistry) (Qwa-Qwa), Bachelor of Science Extended Programme (Mathematics and Finances).
- **Bachelor Degrees:**
 - **Bachelor of:**
 - o Architecture; Agriculture (Agricultural Management, Animal Production Management, Crop Production Management, Irrigation Management, Mixed Farming Management, Wildlife Management); Agricultural Economics, Consumer Sciences(General and Food);
 - **Bachelor of Science in:**
 - o Actuarial Sciences, Agricultural Economics,
 - o Biological Sciences: Biochemistry and Botany, Biochemistry and Entomology, Biochemistry and Genetics, Biochemistry and Microbiology, Biochemistry and Zoology, Botany and Entomology, Botany and Genetics, Botany and Microbiology, Botany and Zoology, Entomology and Genetics, Entomology and Microbiology, Entomology and Zoology, Genetics and Microbiology, Genetics and Zoology, Microbiology and Zoology, Behavioural Genetics, Human Molecular Biology, Forensic Sciences, Botany and Plant Breeding, Plant Health Ecology, Botany and Plant Pathology, Environmental Rehabilitation, Botany (QwaQwa), Entomology (Qwa-Qwa) Life Sciences (Qwa-Qwa), Zoology (QwaQwa).
 - o Building Sciences: Construction Management(residential) Quantity Surveying(residential) Construction Management (Distance learning), Construction Management (Facilities Management) (Distance learning), Quantity Surveying (Distance learning)
 - o Chemical and Physical Sciences: Chemistry and Biochemistry, Chemistry and Botany (QwaQwa), Chemistry and Food Science, Chemistry and Microbiology, Chemistry and Physics (QwaQwa), Physics and Agrometeorology, Physics and Astrophysics, Physics and Engineering Subjects, Chemistry and Entomology (QwaQwa only), Chemistry and Zoology (QwaQwa only).
 - o Consumer Science
 - o Geosciences: Geoinformatics, Geography and Environmental Sciences, Geography and Statistics, Geography and Agrometeorology, Environmental Geography (QwaQwa only),Geology specialisation, Geochemistry, Environmental Geology, Geology and Chemistry, Geology and Geography, Geology and Physics.
 - o Computer and Information Technology Sciences: Information Technology and Chemistry (QwaQwa), Information Technology and Mathematical Statistics, Information Technology and Mathematics, Information Technology and Physics (QwaQwa), Information Technology and Business, Information Technology and Management (QwaQwa only).

- o Mathematics, Mathematical Statistics and Statistical Sciences: Climate Science, Econometrics, Investment Sciences, Psychometrics, Mathematics and Applied Mathematics, Mathematics and Chemistry, Mathematics and Mathematical Statistics, Mathematics and Physics, Mathematics and Finances, Statistics and Accounting, Statistics and Economics, Statistics and Psychology.
- **Bachelor of Science in Agriculture in:**
 - o Agrometeorology, Agronomy, Animal Sciences, Food Sciences, Grassland Sciences, Plant Breeding, Plant Pathology, Soil Sciences.

NAS2.1 – Faculty Undergraduate entrance requirements

In addition to the requirements contained in General Regulation A2(a), a candidate has to comply with the additional faculty requirements:

- a) Students should apply for admission to the programmes listed above on the prescribed form before the closing date.
- b) The following Bachelors and Bachelor of Science degrees require selection: Architecture, Construction Management, Forensic Sciences, Geology, Engineering Sciences and Quantity Surveying.
- c) Applications to these programmes, on the prescribed form, must reach the Registrar, Academic Student Services, on or before 31 July for Quantity Surveying and Construction Management, or 30 September for the rest, the year before the intended registration. Students will be notified of preliminary selection before the end of October, but the final selection will only be confirmed after the National Senior Certificate (NSC) examination results are available.
- d) Admission depends on Admission Point (AP) or the M Scores (MS) as well as the performance in Mathematics (M), Physical Science

(PS) and Life Sciences (LS). The Admission Point (AP) or the M Scores (MS) are calculated as indicated in Table 3:

- e) The entrance requirements in Table 4 below are a broad indication for entrance to the Faculty of Natural and Agricultural Sciences and applicable to prospective students. It is important to note that some programmes have higher requirements or the requirements are adjusted as indicated in Table 5.

Table 3: Calculating AP and M Scores

Calculation of the AP with regard to candidates who passed Grade 12 in 2008 onwards:

| NCS Performance level | UFS Admission Point (AP) | NCS Performance level | UFS Admission Point (AP) |
|-----------------------|--------------------------|-----------------------|--------------------------|
| 7 (90% – 100%) | 8 | 4 (50% - 59%) | 4 |
| 7 (80% – 89%) | 7 | 3 (40% – 49%) | 3 |
| 6 (70% – 79%) | 6 | 2 (30% – 39%) | 2 |
| 5 (60% – 69%) | 5 | | |

Calculation of the M score with regard to candidates who passed Grade 12 prior to 2008:

M Scores are calculated using the symbols of the six (6) best matriculation subjects (regardless of whether they are higher or standard grade) passed in one examination.

| Symbol | A | B | C | D | E | F |
|--------|---|---|---|---|---|---|
| HG | 8 | 7 | 6 | 5 | 4 | 3 |
| SG | 6 | 5 | 4 | 3 | 2 | 1 |

Table 4: Broad Entrance Requirements

| The following is applicable to students who matriculated before or during 2007: | The following is applicable to students who completed the National Senior Certificate during or after 2008: |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (i) Senior certificate with matriculation endorsement (matriculation exemption) or an equivalent qualification. (ii) A minimum MS of 30. (iii) HG = E or SG = C in an official tuition language. (iv) Mathematics HG = D or SG = B. Alternatively at least a pass mark of 60% in WTV164 or WTV194 or WTW184. If WKS114 or WTW114 is included in the learning programme at least a level 6 (70%) and at least a level 7 (80%) is respectively required for Mathematics. (v) Both Biology and Physical Science will be required. (This applies strictly as from 2015; in 2014 meritorious cases offering only one of Life Sciences or Physical Science at the appropriate level will still be considered.) (vi) Biology HG = D or SG = B and Physical Science HG = E or SG = C. (vii) Participation in the NBT tests for Language. (viii) Participation in the NBT tests for Mathematics. | (i) NCS with an endorsement that allows entrance to degree studies or an equivalent qualification. (ii) A minimum AP of 30. (iii) A performance level 4 (50%) in an official tuition language. (iv) Mathematics on level 5 (60%). Alternatively at least a pass mark in WTV164 or WTV194 or WTW184 is required. If WKS114 or WTW114 is included in the learning programme a level 6 (70%) and a level 7 (80%) is respectively required for Mathematics. Alternatively a pass mark of at least 70% in WTV164/WTV194 or at least 60% in WTW184 or a pass in WTW134 is required (v) Both Life Sciences and Physical Science must be offered. (This applies strictly as from 2015; in 2014 meritorious cases offering only one of Life Sciences or Physical Science at the appropriate level will still be considered.) (vi) Life Sciences level 5 (60%) and Physical Science level 4 (50%). Alternatively, at least 60% is required in the modules CHE112, CHE132, CHE122 and CHE142. (vii) Participation in the NBT tests for Language. (viii) Participation in the NBT tests for Mathematics. |

f) If students wish to transfer from other higher education institutions or another programme before they have completed their undergraduate studies must provide evidence of their academic progress, in the form of an academic record. These records will be used to determine which modules could be recognised in the UFS prescribed curriculum and at which level the student will be placed.

NAS2.2 – Specific undergraduate programme requirements

Table 5: Specific entrance requirements

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(a) Advanced Diploma in Sustainable Agriculture and Rural Development</p> <ul style="list-style-type: none"> A related diploma or qualification at NQF Level 6. Applicants with different qualifications can be admitted if their qualifications are judged equivalent by a designated UFS panel through the Recognition of Prior Learning process. Applicants should have sound and proven experience relevant to the agricultural environment. Practical experience in agriculture and/or rural development, and appropriate prior learning are prerequisites for admission. This qualification is not envisaged for the individual passing directly on from the National Senior Certificate to subsequent NQF levels. | <p>(b) University Preparation Programme (Natural Sciences and Mathematics)</p> <ul style="list-style-type: none"> Requires a National Senior Certificate that allows entrance to diploma or higher certificate. Minimum AP of 20. Official tuition language with a minimum achievement level 3 (40%). Mathematics with a minimum achievement level 3 (40%). Life Sciences with a minimum achievement level 3 (40%) OR Physical Science with a minimum achievement level 3 (40%). |
| <p>(c) University Preparation Programme (Agricultural Sciences)</p> <ul style="list-style-type: none"> National Senior Certificate that allows entrance to diploma or higher certificate studies. Minimum AP of 20. Official tuition language with a minimum achievement level 3 (40%). Mathematical Literacy with a minimum achievement level 6 (70%) OR Mathematics with a minimum achievement level 3 (30%). | <p>(d) BAgric extended four-year</p> <ul style="list-style-type: none"> Requirement (i) in Table 4 above. A minimum AP of 25. Official tuition language with a minimum achievement level 4 (50%). Mathematics on performance level 2(30%) or Mathematical Literacy at least at level 6 (70%) if the AP score is above 26. |

Table 5: Specific entrance requirements

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(e) BSc extended four-year (Chemistry and Mathematics)</p> <ul style="list-style-type: none"> Requirement (i) in table 4 above. A minimum AP of 25. Official tuition language with a minimum achievement level 4 (50%). Mathematics on performance level 3 (40%). Life Sciences at performance level 4 (50%) or Physical Science on performance level 3 (40%). | <p>(f) BSc extended four-year (Mathematics and Finances)</p> <ul style="list-style-type: none"> Requirement (i) in table 4 above. A minimum AP of 25. Official tuition language with a minimum achievement level 4 (50%). Mathematics at performance level 3 (40%). |
| <p>(g) BSc Agric extended five year</p> <ul style="list-style-type: none"> Requirement (i) in table 4 above. A minimum AP of 25 and a performance level 4 (50%) in an official tuition language. Mathematics at performance level 3 (40%). Life Sciences or Agricultural Science at performance level 4 (50%) or Physical Science at performance level 3 (40%). | <p>(h) BAgric</p> <ul style="list-style-type: none"> Requirements (i)-(iii) & (vii) in table 4 above. Mathematics at performance level 3(40%) or Mathematical Literacy at least at level 7(80%) if the AP is 33 or above. |
| <p>(i) BSc Actuarial Science (4336)</p> <ul style="list-style-type: none"> Requirements (i), (iii)-(iv), (vii) & (viii) in table 4 above. A minimum AP of 34. Mathematics at performance level 7 (80%). | <p>(j) BSc in Agricultural Sciences</p> <ul style="list-style-type: none"> Requirements (i)-(iv), (vii) & (viii) in table 4 above. Either Life Sciences, Agricultural Sciences or Physical Science . (As from 2016 Physical Science with either Life Sciences or Agricultural Sciences will be required). Performance level 5 (60%) for Life Sciences or Agricultural Sciences and Performance level 4 (50%) for Physical Science. |
| <p>(k) BSc in Agricultural Economics</p> <ul style="list-style-type: none"> Requirements (i)-(iv), (vii) & (viii) in table 4 above. | <p>(l) B Consumer Sciences</p> <ul style="list-style-type: none"> Requirements (i)-(iii) & (vii) in table 4 above. |
| <p>(m) BArchitecture (BArchStud)</p> <ul style="list-style-type: none"> A selection process takes place before admission. A maximum number of 55 students are admitted. A student registered for a programme at the UFS and wishing to change to the BArchStud-programme, must contact the department on or before 31 May of the year before intended registration. Requirements (i)-(iii), (vii) & (viii) in table 4 above. Mathematics at performance level 4 (50%). All information pertaining to the selection process will be communicated in writing by the department to the applicants, after the closing date for applications on 31 May of the year before the intended registration. Applicants have to pass a preliminary selection process. Applicants who passed the preliminary selection will be invited to a selection interview at which a portfolio of creative work has to be presented. Qualifying applicants must write aptitude and NBT test and submit the results to the department before the selection interview. Students will be notified of the outcome not later than the end of November of the year before intended registration. | <p>(n) BSc in Chemical and Physical Science</p> <ul style="list-style-type: none"> Requirements (i)-(iv), (vii) & (viii) in table 4 above. Physical Science at performance level 5 (60%) or Physical Science HG = E or SG = C. If Biological subjects is the second major Life Sciences at performance level 5(60%) is required. Students intending to offer Chemistry as a major must take note that In the second year a maximum of 80 and in the third year a maximum of 60 students will be admitted to the second year owing to laboratory constraints. These students will be admitted based on academic excellence. Students intending to register for engineering subjects must take note that limited space is available. <p>(o) BSc in Forensic Sciences</p> <ul style="list-style-type: none"> A selection process takes place before admission. A maximum number of 80 students will be admitted. NBT tests results will also be used for selection purposes. Applications close on 30 September 2013. Requirements (i), (iii)-(iv), (vii) & (viii) in table 4 above. A minimum AP \geq 34 (with cumulative AP \geq 17 for Mathematics, Life Science and Physical Science). No person with a criminal record will be allowed into this programme. <p>(p) BSc Geography</p> <ul style="list-style-type: none"> Requirements (i)-(iv) and (vii)& (viii) in table 4 above. Physical Science at performance level 4(50%) to register for the Geoinformatics programme. Life Sciences at performance level 5(60%) is required for Environmental Sciences and Agrometeorology programmes. Life Science performance level 5(60%) or Physical Science performance level 4(50%) for all Statistics programmes. |

Table 5: Specific entrance requirements

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| <p>(q) BSc in Geology</p> <ul style="list-style-type: none"> • A selection process takes place before admission. In the first year a maximum number of 80 students will be admitted to GLG114 owing to laboratory constraints. In the second and third year a maximum number of 60 students will be admitted due to laboratory constraints. These students will be admitted based on academic excellence. Students failing GLG114 or GLG124 and any other prescribed first year module will not be able to continue their studies in any of the Geology programmes. • Applications to the BSc Geology programme, on the prescribed form, must reach the Registrar, Academic Student Services, UFS, Bloemfontein, on or before 30 September of the year before the intended registration. Students will be notified of the outcome as soon as examination results are available and no later than January. • The selection process will be based on academic performance. • Requirements (i)-(iv), (vii) & (viii) in table 4 above. • Physical Science at performance level 5 (60%) [this apply as from 2015 in 2014 students with performance level 4 will be consider on merit] or Physical Science HG = E or SG = C. Alternatively, at least 65% is required in the modules CHE112, CHE132, CHE122 and CHE142, and in WTV164/194. • An AP of 34 or higher is highly recommended. | <p>(r) BSc Information Technology</p> <ul style="list-style-type: none"> • Requirements (i)-(iii) and (vii)& (viii) in table 4 above. • Mathematics at performance level 4 (50%) in order to register for WTW174. • Mathematics at performance level 5 (60%) to register for WTW134. • Mathematics at performance level 6 (70%) to register for WKS114. • Mathematics at performance level 7 (80%) in order to register WTW114. Alternatively (senior students) a pass mark WTW164/WTV164 or in WTW184. • If Chemistry or Physics is the second major, Physical Science at performance level 4 (50%) is required. |
| <p>(s) BSc in Mathematical Sciences</p> <ul style="list-style-type: none"> • Requirements (i)-(iv), (vii) & (viii) in table 4 above. • Mathematics at performance level 7 (80%). Alternatively (senior students) a mark of at least 70% in WTW164/WTV164 or at least 60% in WTW184 (Main Campus) or 50% in WTW134 is required. • If Agrometeorology, or Chemistry or Physics is the second major Physical Science a performance level of 4 (50%) is required. • If enrolling for Applied Statistics degrees only level 5(60%) for Mathematics is a required | <p>(t) BSc in Quantity Surveying and BSc in Construction Management</p> <ul style="list-style-type: none"> • A selection process takes place before admission. A maximum number of 80 students is admitted owing to laboratory constraints. • Application must be submitted before or on 31 July each year of the year before intended registration. • Requirements (i), (iii)-(iv), (vii) & (viii) in table 4 above. • A minimum AP of 34. <p>One of the following at performance level 4 (50%): Physical Science, Economics, Business Studies or Accounting, or 70% in WTV164/WTV194 and an average of at least 65% for all modules in the first year of the UPP or BSc Extended programme and at least 70% in both WTV154 and WTV164.</p> |

NAS2.3 – Other requirements: Note to students applying for any programme in this faculty

- a) Students who score below 65% in the language NBT test must register for the language module ALN108 or AFA108.
- b) First-time entering students with a performance level 5 in Mathematics or with a NBT mathematics score lower than 50% will have to attend compulsory extra Mathematics tutorial classes for three hours per week.
- c) First-time entering students with a performance level of 4 for Physical Science will have to attend compulsory tutorials in Chemistry and Physics if those subjects are included in their curriculum.
- d) Registration for extra modules has financial implications, and the extra modules do not contribute to the total number of credits required to obtain a degree.
- e) Students who have registered for the extra language module and more than one additional tutorial will not be able to register for the full curriculum and will only be allowed to register for three required modules per semester as prescribed in the learning programme.

Postgraduate programmes

The faculty offers various postgraduate qualifications including Postgraduate Diplomas, Honours, Master's, and Doctoral degrees.

The following Postgraduate Diploma is presented: Postgraduate Diploma in Disaster Management.

The Honours degrees are divided into two categories namely, Bachelor Honours degrees and Bachelor of Science Honours degrees. The following fields of study are covered in each of the categories:

- Bachelor Honours is offered in Architecture, Agricultural Management, Consumer Sciences, Spatial Planning.
- Bachelor of Science Honours degree is awarded in the following fields of study: Actuarial Sciences, Agricultural Economics, Agrometeorology, Astrophysics, Behavioural Genetics, Biochemistry, Botany (QwaQwa), Chemistry (QwaQwa), Computer Information Systems, Consumer Science, Construction Management, Entomology, Environmental Geography (QwaQwa), Environmental Geology, Environmental Rehabilitation, Food Science, Forensic Genetics, Genetics, Geochemistry, Geography, Geography and Ecology, Geography and Environmental Science, Geohydrology, Geology, Limnology, Mathematics and Applied Mathematics, Mathematical Statistics, Microbiology, Physics (QwaQwa), Plant Breeding, Plant Health Ecology, Plant Pathology, Polymer Science (only QwaQwa) Soil Science, Statistics, Quantity Surveying, and Zoology (QwaQwa).

The Master's degrees are divided into three categories namely; Master's degrees, Master's of Sciences degrees, and Master's of Sciences in Agriculture degrees.

The following fields of study are covered in each of the categories:

- Master's Degrees is offered in the following fields of study: Architecture, Architecture (Professional), Agricultural Management, Consumer Science, Disaster Management, Environmental Management, Human Settlements (MLHD), Irrigation Management, Mineral Resource Throughput Management (MRTM), Sustainable Agriculture, Land and Property Development, Urban and Regional Planning (Professional) and Urban and Regional Planning (Research), Wildlife Management
- Master's of Science is awarded in the following fields of study: Agricultural Economics, Actuarial Sciences, Agrometeorology, Applied Mathematics, Astronomy, Behavioural Genetics, Geoinformatics, Biochemistry, Botany, Chemistry, Computer Information Systems, Construction Management, Consumer Science, Entomology, Environmental Geology, Environmental Rehabilitation, Food Science, Forensic Genetics, Forensic Sciences, Forensic Sciences Interdisciplinary, Genetics, Geochemistry, Geography, Geography and Environmental Science, Geohydrology, Geology, Grassland Science, Limnology, Mathematics, Mathematical Statistics, Mathematical Statistics and Risk Analysis, Microbial Biotechnology, Microbiology, Nano Science Physics, Polymer Science, Plant Breeding, Plant Health Ecology, Plant Pathology, Soil Science, Statistics, Quantity Surveying, Zoology.
- Master's of Science in Agriculture are offered in the following fields of study: Agrometeorology, Agronomy, Animal Sciences, Food Science, Grassland Science, Plant Breeding, Plant Pathology, Soil Science.

PhD degrees are offered in the following fields of study:

- Actuarial Sciences, Architecture, Agricultural Economics, Agricultural Management, Agronomy, Agrometeorology, Animal Sciences, Astronomy, Applied Mathematics, Behavioural Genetics, Geoinformatics, Biochemistry, Botany, Chemistry, Computer Information Systems, Construction Management, Consumer Science Disaster Management, Environmental Management, Entomology, Environmental Geology, Environmental Rehabilitation, Food Science, Forensic Genetics, Forensic Sciences, Forensic Sciences Interdisciplinary, Forensic Sciences, Genetics, Geochemistry, Geography, Geography and Environmental Science, Geohydrology, Geology, Grassland Science, Human Settlements (MLHD), Irrigation Management, Land and Property Development Limnology, Mathematics, Mathematical Statistics, Microbiology, Microbial Biotechnology, Mineral Resource Throughput Management, Nanoscience, Physics, Plant Breeding, Plant Health Ecology, Plant Molecular Biology, Plant Pathology, Polymer Science, Property Science, Quantity Surveying, Risk Analysis, Spatial planning, Soil Science, Statistics, Sustainable Agriculture, Urban and Regional Planning, Wildlife, Wildlife Management and Zoology.

NAS3.1 – Admission requirements for the Postgraduate Diploma

In addition to the requirements contained in General Regulation A32 (a), a candidate has to comply with the additional faculty requirements:

- (a) A applicant have at least a minimum three-year degree (at NQF Level 7) from any applicable field of study.
- (b) A minimum average of 60% must be obtained in the final year of study.
- (c) The student must prove to the Academic Departmental Head that he/she has adequate knowledge to justify admission to the programme.

- (d) Applicants who do not have the formal minimum requirements must apply through Recognition of Prior Learning.
- (e) Admission is subject to a selection process. Qualification and experience in the disaster management field will be an added advantage.

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| 1. Postgraduate Diploma in Disaster Management | <ul style="list-style-type: none"> • Admission depends on previously acquired knowledge and experience in the disaster management field. |
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NAS3.2 – Admission requirements for Bachelor Honours Degrees

In addition to the requirements contained in General Regulation A21 (a), a candidate has to comply with the additional faculty requirements:

- (a) A Bachelor degree or equivalent NQF Level 7 qualification including one of the following: BArchStud, BAgric, B Consumer Sciences, BSc, BScIT, BScQS or BScConst and the following additional requirements per discipline.
- (b) A deserving applicant in possession of a BSc degree with the required major subjects may be permitted by the Academic Departmental Head and with the approval of the Dean to receive postgraduate training in Agriculture. Such a student registers for BScAgric Hons, during which prescribed honours modules as well as certain additional undergraduate Agriculture modules may be taken in consultation with the departmental chair.
- (c) All Honours degrees are selection courses and admission to these degrees is subject to approval of the departmental chair.
- (d) Applicants should apply for admission to the Honours degree on the prescribed form. These forms should be completed and handed to the Academic Departmental Head. at the beginning of the second semester. Selection will take place when results are available. The honours programmes start on a date as determined by the relevant department. All modules in the learning programme must be successfully completed.

NAS3.3 – Specific programme requirements for Honours degrees

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| <p>2. Architecture</p> | <ul style="list-style-type: none"> • Application must reach the UFS before 31 May. • A selection process takes place before admission. A maximum of 45 students will be admitted. • All information pertaining to the selection process will be communicated in writing by the department to the applicants, after the closing date for applications on 31 May. • To be eligible for BArchStud Hons selection, a candidate must have obtained a BArchStud degree or equivalent qualification from any other Architectural Learning Site with a collective average mark in his/her final year of 55% for the following modules or their equivalent, BOW306, OGT304 and TAR304, as well as a subminimum of 60% for ONW300 or its equivalent. • Candidates who do not comply with the above prerequisite must either repeat (only once) selected module(s) or work in an architect's office for a year in order to be eligible for BArchStud Hons selection the following year. • Candidates must (at the discretion of the Academic Departmental Head) attend a personal interview, present a portfolio and provide verified academic records. The final discretion on whether the candidate is regarded as being ready for the programme will rest with the selection panel. • Language proficiency in the medium of instruction that students want to do the programme (English or Afrikaans) will be tested as part of selection. |
| <p>3. Actuarial Science</p> | <ul style="list-style-type: none"> • A candidate must have a BSc or BCom degree in Actuarial Science, as well as being qualified for at least four exemptions in the subjects of the Faculty / Institute of Actuaries, of which at least one exemption has to be for CT1, CT4 or CT6. |
| <p>4. Agricultural Economics</p> | <ul style="list-style-type: none"> • A minimum of 60% in Agricultural Economics at third year level. |
| <p>5. Agriculture</p> | <p>Agricultural Management, Irrigation Management, Wildlife Management</p> <ul style="list-style-type: none"> • A minimum of 60% in agricultural management and/or agricultural economics or equivalent modules at NQF 7 level. <p>Irrigation Management</p> <ul style="list-style-type: none"> • A minimum of 60% in Agricultural Engineering or equivalent at NQF 7 level. • Apart from the above mentioned requirements, the Academic Departmental Head may expect a student to complete certain additional courses. |
| <p>6. Agrometeorology</p> | <ul style="list-style-type: none"> • Agrometeorology at third-year level. |
| <p>7. Behavioural Genetics (Human Genetics)</p> | <ul style="list-style-type: none"> • Admission into BSc Hons in Behavioural Genetics for students who majored in Genetics and Psychology or Zoology is subject to selection. A minimum of 60% in Genetics at third-year level is required. Selection will take place during August each year. |
| <p>8. Biochemistry</p> | <ul style="list-style-type: none"> • At least 64 credits in Biochemistry at third year level. An average of 65% in undergraduate Biochemistry modules. Admission is subject to a selection process. |
| <p>9. Botany</p> | <ul style="list-style-type: none"> • A minimum of 60% in Botany at third-year level and in consultation with the Academic Departmental Head. |
| <p>10. Chemistry</p> | <ul style="list-style-type: none"> • To be considered for BSc Hons in Chemistry, a student must have a BSc degree. Other prerequisites include WTW114 or WTW134, plus WTW124 or WTW144. An average mark of 60% in CEM314, CEM334, CEM324 and CEM344 |
| <p>11. Computer Information Systems</p> | <ul style="list-style-type: none"> • A minimum average of 60% is required for the four third-year Computer Science modules (RIS314, RIS334, RIS324 and RIS344) or their equivalents. In exceptional cases admission may be allowed in consultation with the programme director or Academic Departmental Head.. |
| <p>12. Consumer Sciences</p> | <ul style="list-style-type: none"> • Consumer Science or relevant NQF at Level 7 at third-year level with at least 60%. |
| <p>13. Construction Management</p> | <ul style="list-style-type: none"> • Students who have passed the BSc Construction Management degree, or have obtained an approved relevant qualification of equal value with an average of at least 65%, may register for the BSc Construction Management Honours degree, subject to selection and a special curriculum arising from the qualification obtained. |
| <p>14. Entomology</p> | <ul style="list-style-type: none"> • Entomology at third-year level. |
| <p>15. Environmental Rehabilitation</p> | <ul style="list-style-type: none"> • A minimum of 60% in relevant modules at third-year level and in consultation with the Academic Departmental Head. |

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| 16. Food Science | <ul style="list-style-type: none"> Food Science at third-year level. An average of 65% in undergraduate Food Science modules. Admission is subject to a selection process. |
| 17. Forensic Sciences | <ul style="list-style-type: none"> Admission into BSc Hon in Forensic Sciences is subject to selection. A minimum of 60% in relevant modules at third-year level or equivalent modules are required. Selection will take place at the end of August each year. |
| 18. Genetics | <ul style="list-style-type: none"> Admission into BSc Hon in Genetics is subject to selection. A minimum of 60% in Genetics at third-year level or equivalent modules are required. Selection will take place during August of the same year. |
| 19. Geography | <ul style="list-style-type: none"> A candidate must achieve an average pass mark of 60% for all Geography modules (64 credits) at third-year level to be admitted to the honours degree. In exceptional cases the department may grant admission by virtue of an oral or written evaluation in which the candidate displays relevant knowledge of the theory and principles of the subject. Depending on a candidate's academic background, additional modules may be prescribed by the department. Proof of computer literacy is a prerequisite. A candidate's skills in English will be assessed and if the required standard is not met, additional modules (Proficient performance in the TALPS Test is required) will be prescribed. For admission to the examination, a semester mark or year mark of at least 50% is required for each module. |
| 20. Geology, Geochemistry and Environmental Geology | <ul style="list-style-type: none"> For admission to the honours degree in Geology, Geochemistry or Environmental Geology a candidate must achieve a combined average pass mark of 60% in four Geology modules (64 credits) at third-year level (two modules in the first semester and two in the second semester, including GLG314 and GLG324 or equivalent modules). Students must complete all required NQF Level 7 Geology modules in a maximum of two years. Students who have completed their Geology modules in the first attempt will be given preference. Thirty students will be admitted to the Geology honours programme. However the Geochemistry and the Environmental Geology programme can only accommodate a maximum of five students each. Proficient performance in the TALPS Test is required. |
| 21. Geoinformatics | <ul style="list-style-type: none"> Geography at third-year level or equivalent Geography at NQF 7 at another university with at least 64 credits in total in this subject area. Minimum average of 60% in the third year. B.Sc in Geography with an average of 60% of 3 year modules. |
| 22. Geohydrology | <ul style="list-style-type: none"> A degree in Engineering or a BSc or a BScAgric degree. An average of 60% in the final year of a BSc degree calculated from the major subject, as well as Geology, Chemistry, and Mathematics or Statistics on first-year level is required for admission to the degree. The candidate compiles his/her curriculum in consultation with the Director of the Institute of Groundwater Studies. |
| 23. Grassland Science | <ul style="list-style-type: none"> Grassland Science at third-year level. |
| 24. Home Economics | <ul style="list-style-type: none"> BSc Home Economics, B Consumer Science or an equivalent qualification. |
| 25. Limnology | <ul style="list-style-type: none"> A BSc or BScAgric degree with at least one of the following as major: Biochemistry, Botany, Chemistry,, Entomology, Mathematics, Microbiology, Physics, Soil Science, Zoology. |
| 26. Mathematics and Applied Mathematics | <ul style="list-style-type: none"> At least four Mathematics and Applied Mathematics or equivalent modules, at third-year level, completed with an average mark of 60%. Students may be required to take additional undergraduate courses based on their academic background. The Academic Departmental Head grants admission and consults on the compilation of the curriculum. Students will do an oral presentation for their final assessment. Proficient performance in the TAPLS Test is required. |
| 27. Mathematical Statistics | <ul style="list-style-type: none"> A minimum average pass mark of 60% in WKS314, WKS324, WKS334 and WKS344. |
| 28. Microbiology | <ul style="list-style-type: none"> At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314. Admission is subject to a selection process. |
| 29. Physics | <ul style="list-style-type: none"> An average mark of 60% in FSK314, FSK332, FSK352, FSK324, FSK342 and FSK362. The Academic Departmental Head may grant permission for admission to the honours degree in exceptional cases. The programme commences in middle January and students must apply for admission to the Academic Departmental Head before that date. |
| 30. Plant Breeding | <ul style="list-style-type: none"> A minimum of 60% average for all the Plant Breeding modules on third-year level is required. |
| 31. Plant Health Ecology | <ul style="list-style-type: none"> Plant Health or equivalent modules at third-year level. |
| 32. Plant Pathology | <ul style="list-style-type: none"> An average of 60% for the third year in a BSc or BSc Agric degree with at least one of the following as major: Microbiology, Plant Sciences, Plant Pathology or equivalent NQF level 7 modules. Students may be required to take additional undergraduate courses based on their academic background. |
| 33. Polymer Science | <ul style="list-style-type: none"> A minimum of 60% average for all the Chemistry modules on third-year level is required. |
| 34. Soil Science | <ul style="list-style-type: none"> Soil Science at third-year level. |

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| 35. Statistics | <ul style="list-style-type: none"> WTW114 and WTW124, as well as a minimum average mark of 60% in STK216, STK226, STK316 and STK326. |
| 36. Spatial Planning | <ul style="list-style-type: none"> A person may be considered for selection and admitted to the programme in Spatial Planning if he/she is in possession of an appropriate qualification at NQF Level 7 (SAQA certificate must accompany the qualification when requested), as approved by the Academic Departmental Head and has an average of at least 60% in previous qualifications for final year modules. Applicants may have to write selection tests if they are considered to be suitable for selection. These tests, and possible interviews, may be conducted on the Bloemfontein Campus, at a pre-arranged time and date. If a student does not entirely meet the admission requirements, the Academic Departmental Head and the Recognition of Prior Learning office in consultation with the Dean may, in meritorious cases, recommend that some concessions be made in respect of the requirements. The final decision shall rest with the Dean, or shall be determined by the Recognition of Prior Learning office. Supplementary courses, as determined by the Head of the Department, may be required; or a student may be expected to do an extra year of study in order to complete the programme. Proficient language skills in the medium of instruction (English or Afrikaans) will be tested as part of selection. An acceptable module in the use of language as determined by the Academic Departmental Head, will have to be taken and passed at the students' own cost should he/she not comply with the required standard. |
| 37. Quantity Surveying | <ul style="list-style-type: none"> Students who have passed the BSc Quantity Surveying degree, or have obtained an approved relevant qualification of equal value with an average of at least 65%, may register for the BSc Quantity Surveying Honours. Subject to selection and a special curriculum arising from the qualification obtained. |
| 38. Wildlife | <ul style="list-style-type: none"> Grassland Science at third-year level or equivalent modules and in consultation with the Academic Departmental Head.. |
| 39. Zoology | <ul style="list-style-type: none"> Zoology at third-year level. |

NAS3.4 – Admission requirements for Master’s Degrees

In addition to the requirements contained in General Regulation A46(a), a candidate has to comply with the additional faculty requirements:

- (a) All Master’s degrees are selection programmes and admission to these degrees is subject to approval of the Academic Departmental Head.
- (b) Applicants must apply for admission to the Master’s degree on the prescribed form. These forms are completed and submitted to the Academic Departmental Head. at the beginning of the second semester. Selection will take place when the results are ready. The Master’s courses start on a date as determined by

the relevant department. Each module in the learning programmes must be successfully completed.

- (c) Applicants must have an applicable Honours degree or equivalent NQF Level 8 qualification and the additional requirements per discipline (see Reg. NAS3.5).
- (d) If a student does not entirely meet the admission requirements, the Dean may, in consultation with the Head of the Department, in meritorious cases, recommend that some concessions be made in respect of the requirements.

NAS3.5 – Specific programme requirements for Master’s Degree

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| (a) Master of Architecture (Professional) | <ul style="list-style-type: none"> Application must reach the UFS before 31 May. A selection process takes place before admission. A maximum number of 45 candidates will be admitted. All information pertaining to the selection process will be communicated in writing by the department to the applicants, after the closing date for applications on 31 May. To be eligible for BArchStud Hons selection a candidate must have obtained a BArchStud degree or equivalent qualification from any other Architectural learning site with a joint average mark in his/her final year of 55% for the following modules or their equivalent: BOW608, OGT606 and TAR604, as well as a subminimum of 60% for ONW600 or its equivalent. Candidates who do not comply with the above prerequisite must either repeat (only once) selected module(s) or work in an architect's office for a year in order to be eligible for BArchStud Hons selection the following year. Candidates must (at the discretion of the Academic Department Head) attend a personal interview, present a portfolio and provide verified academic records. Qualifying candidates must submit a research proposal as determined and communicated by the Academic Department Head. The final discretion whether the candidate is regarded as ready for the programme will rest with the selection panel. |
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| (b) Master of Architecture | <ul style="list-style-type: none"> • Apart from the general regulations the following is applicable: • Candidates must have obtained EITHER the advanced postgraduate professional qualification, BArch or an equivalent thereof OR the BArchStud Hons or its equivalent. • Candidates who are in possession of the BArch must prove that a Design Dissertation formed part of the requirements for the conferment of such degree. • Candidates who are in possession of the BArchStud Hons must have obtained a minimum of 60% in THREE of the following modules or their equivalent: ONW600, BOW608, OGT606 and TAR604. • Qualifying candidates must submit a dissertation proposal as determined and communicated by the Academic Department Head. The final discretion whether the candidate is regarded as being ready for the programme will be the selection panel's. |
| (c) Master of Agriculture | <p>Apart from the general regulations, the following apply:</p> <ul style="list-style-type: none"> • Students must convince the specific Academic Department Head that he/she has sufficient knowledge of the subject to be admitted to the programme. |
| (d) Master of Consumer Sciences | <ul style="list-style-type: none"> • No additional requirements. |
| (e) Master of Disaster Management | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • A candidate must in order to be admitted to this Master's programme have: <ul style="list-style-type: none"> o a disaster management Honours degree or equivalent from any other institution (Minimum 120 Credits, NQF Exit Level 8) with an average pass mark of 60%, OR o a disaster management postgraduate diploma from the UFS or any other institution (Minimum 120 Credits, NQF Exit Level 8) with an average pass mark of 60%. • A candidate must prove to the Academic Departmental Head that he/she has: <ul style="list-style-type: none"> o adequate knowledge to justify admission to this study. o practical and/or preparatory experience which will be an added advantage. • A candidate must submit a research proposal together with the application. <p>NB: An Executive Committee of the UFS will assess the extent, nature and suitability of experience or preparatory studies mentioned above.</p> |
| (f) Master of Environmental Management, course code 700 | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • A three-year degree on (NQF Level 6) or an equivalent qualification with appropriate experience will be considered by the University, for admission. Depending on the academic background of the candidate, additional modules may be prescribed. • Where a candidate with merit does not comply fully with the admission requirements, the Dean, in conjunction with the Faculty Management Committee, may recommend that the requirements be partially waived. • As only a limited number of candidates can be accepted, an application form available from the Centre for Environmental Management (cem@ufs.ac.za) must be submitted by the end of September of the preceding year, after which selection will take place. |
| (g) Master of Human Settlements (MLHD) | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • A candidate who wishes to enrol for the degree must have a 60% average in one of the following: <ul style="list-style-type: none"> - an applicable four-year degree plus applicable practical experience and/or applicable preparatory studies, OR - an applicable Honours degree, or an Honours degree plus applicable studies, and/or practical experience. • A candidate must submit a research proposal together with the application. |
| (h) Master of Land and Property Development Management (MProp) | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • Candidates must, for a period of two years that may coincide with the period mentioned below, have worked under the supervision of the Academic Departmental Head, while they were registered as students for the degree of MSc(Construction Management) during the same period. <p>A candidate must, in the period of at least two years after obtaining an approved Bachelor of Science Honours degree with at least an average of 65% within an approved discipline, have been actively involved in the theory and practice of the property sciences or relevant activities. Only 10 students will be allowed to register annually.</p> |

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| (i) Master of Mineral Resource Throughput Management | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • An Honours degree or an equivalent qualification (NQF Level 8) with 2 – 4 years relevant mining experience. Depending on the academic background of the candidate, additional modules may be prescribed. • Where a candidate with merit does not fully comply with the admission requirements, the RPL process may be followed or the Dean, in conjunction with the course co-ordinator, may recommend that the requirements be waived, with the final decision taken by the Executive Committee of Senate. • As only a limited number of candidates can be accepted for the theoretical component, an application form available from the Department of Geology must be submitted on or before 30 September of the preceding year, after which selection will take place. Proficient performance in the TALPS Test is required. |
| (j) Master of Sustainable Agriculture | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • A candidate who wishes to enrol for the degree must have one of the following: <ul style="list-style-type: none"> - an applicable three-year degree plus applicable practical experience and/or applicable preparatory study, OR - an applicable four-year degree plus applicable practical experience and/or applicable preparatory studies, OR - an applicable Honours degree, or an Honours degree and applicable studies, and/or practical experience. <p>NB: The scope, nature and applicability of practical experience and preparatory study in Reg. NAS3.4 (a) and (b) above will be determined by the Director of the Centre for Sustainable Agriculture This qualification will only be presented to groups of students on request of their employees and in a block session format.</p> |
| (k) Master of Urban And Regional Planning (Research) | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • A candidate who wishes to enrol for the degree, must have a 60% average in one of the following: <ul style="list-style-type: none"> - an applicable four-year degree plus applicable practical experience and/or applicable preparatory studies OR - an applicable Honours degree, or an Honours degree and applicable studies, and/or practical experience. • A candidate must submit a research proposal together with the application. |
| (l) Master of Urban and Regional Planning (Professional) MURP. | <p>Apart from the general regulations the following is applicable:</p> <ul style="list-style-type: none"> • A person may be admitted to the programme in Urban and Regional Planning if he/she is in possession of one of the following qualifications with an average pass mark of at least 60% and has the necessary academic background: • Bachelor Honours in Urban and Regional Planning. • A degree similar to a Bachelor Honours in Urban and Regional Planning (missing modules for the Bachelor Honours in Spatial Planning must be completed). • Bachelor in Land and Property Development Management (missing modules for the Bachelor Honours in Spatial Planning must be completed). • Applicants may have to write selection tests if they are considered to be suitable for selection. These tests, and possible interviews, may be conducted on the Bloemfontein Campus, at a pre-arranged time and date. If the Dean, or be determined by the Recognition of prior Learning office • Supplementary courses, as determined by the Head of the Department, may be required; or a student may be expected to undergo an extra year of study in order to complete the programme if a he/she does not entirely meet the admission requirements. • A candidate must submit a research proposal together with the application. |
| (m) Master of Sciences | <p>Apart from the general regulations the following is applicable to the different disciplines:</p> <ul style="list-style-type: none"> • Geohydrology <ul style="list-style-type: none"> - An applicable Honours degree with a minimum average pass mark of 65% is required. Additional coursework may be prescribed where candidates do not have the required background in Geohydrology. In special cases admission may be allowed in consultation with the Director of IGS. • Limnology <ul style="list-style-type: none"> - Candidates in possession of a BSc Hons degree in Limnology are admitted to this course for which a dissertation (LIM700 – 120 credits) is required, based on an approved research project. Persons in possession of a BSc Hons or BScAgric Hons degree in a related field of study must, in addition to the dissertation, successfully complete theoretical work and assignments (4) in Limnology in order to gain Honours status in Limnology before the dissertation is handed in for examination. The Limnology Committee will appoint supervisors and decide in which department a candidate will register. For further information: 051 401 2863. • Mathematics or Applied Mathematics <ul style="list-style-type: none"> - For admission to a Master's degree in Mathematics or Applied Mathematics, the candidate needs Mathematics or Applied Mathematics, or the equivalent at Honours level. Candidates may be required to take additional modules if their relevant background is insufficient. Proficient performance in the TALPS Test is required. • Mathematical Statistics <ul style="list-style-type: none"> - An appropriate Honours degree and mathematical background is required. Admission is subject to the approval of the Academic Departmental Head. • Computer Information Systems <ul style="list-style-type: none"> - An applicable Honours degree with a minimum average pass mark of 60% is required. • Geology <ul style="list-style-type: none"> - Proficient performance in the TALPS Test is required. |

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| (n) Master of Science In Agriculture | Apart from the general regulations the following is applicable: <ul style="list-style-type: none"> • The candidates must convince the head of the department/centre concerned that he/she has adequate knowledge of the subject to justify admission to the study. • In the case of Animal and Grassland Sciences, admission to the study is subject to the approval of a postgraduate selection committee and Academic Departmental Head. Approval will be based on a satisfactory study record and appropriate qualification, or experience obtained. Additional modules may be required before admission to the MScAgric study is granted. |
| (o) Master of Science In Consumer Sciences | <ul style="list-style-type: none"> • No additional requirements. |
| (p) Master of Science In Construction Management | Apart from the general regulations the following is applicable: <ul style="list-style-type: none"> • Candidates must, for a period of two years (that may coincide with the period mentioned below), have worked under the supervision of the Academic Departmental Head, while they were registered as students for the degree of MSc(Construction Management) during the same period. • A candidate must, in the period of at least two years after obtaining an approved Bachelor of Science Honours degree with at least an average of 65%, have been actively involved in the theory and practice of Construction Management. |
| (q) Master of Science In Quantity Surveying | Apart from the general regulations the following is applicable: <ul style="list-style-type: none"> • Candidates must have worked under the supervision of the Academic Departmental Head for a period of two years (that may coincide with the period mentioned below) while they were registered as students for the degree of MSc (QS). • Candidates must, in the period of at least two years after obtaining an approved Bachelor of Science Honours degree with at least an average of 65%, have practised the theory and have been actively involved in Quantity Surveying. |

NAS3.6 – Transfer between higher degree studies

- In consultation with the supervisor(s) and on the recommendation of the supervisor(s), the Academic Departmental Head, and the Research Committee of the faculty, a candidate who has been admitted for the Master’s degree in terms of Reg. A80 may, after a study and registration period of at least one year, apply to be allowed to continue his/her studies at the PhD degree level. Following admission to the PhD, at least two years must elapse before the PhD degree can be conferred. The period of study for the degree will therefore be at least three years.
- The MSc degree may be conferred upon a candidate if:
 - o the candidate withdraws his candidature for the PhD degree, or
 - o his candidature for the PhD degree is cancelled, or
 - o the candidate does not meet the requirements for the Doctoral degree

NAS3.7 – Admission requirements for a doctoral degree

In addition to the admission requirements contained in General Regulation A71(a), a candidate has to comply with the following additional faculty requirements apply:

- (a) All PhD degrees are selection programmes and admission to these degrees is subject to approval by the Academic Departmental Head.
- (b) The PhD candidate must show that he/she has sufficient knowledge of the subject prior to admission. Students should apply for admittance to the doctoral degree on the prescribed form. These forms should be completed and submitted to the Academic Departmental Head.
- (c) The PhD candidate must have a Master’s degree or equivalent NQF Level 9 qualification. Master’s degrees include: MArch, MArchProf, MSc, MAgric, MScAgric, MEM, MSA, MScConstr, MScQS, MUPR, MMRTM or MDisasterM. The following additional requirements for specific disciplines apply:

NAS3.8 – Specific programme requirements for doctoral degrees

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| (a) Disaster Management | <ul style="list-style-type: none"> In order to be admitted to the PhD, a candidate must be in possession of an relevant Master's degree and specific/ relevant modules in the postgraduate diploma in disaster management. Depending on the background and knowledge that the applicant has, some core disaster management modules may be required in order to equip the student with adequate disaster management knowledge. A candidate's thesis is written under the guidance of a promoter, and the thesis must demonstrate that the candidate is able to conduct independent scientific research. The Management Committee of DiMTEC will assign promoters and decide in which department a candidate should register. |
| (b) Limnology | <ul style="list-style-type: none"> In order to be admitted to the PhD, a candidate must be in possession of an MSc in Limnology. Candidates in possession of an MSc degree in a related field of study will, in addition to the dissertation, have to complete theoretical work and assignments (4) in Limnology before the thesis can be submitted for examination. Two assignments shall take the form of presentations, and an oral examination takes place. The Limnology Committee will appoint supervisors and decide in which department a candidate should register. |
| (c) Environmental Management | <ul style="list-style-type: none"> In order to comply with the admission requirements, a candidate must possess a MEM degree before registering for the PhD degree. Individuals holding another Master's degree may be considered for admission. In such instances the Management Committee of the Centre for Environmental Management may supplement the thesis with assignments, taken from the MOB700 course, which must be completed prior to the thesis being submitted for examination. The Management Committee of the Centre for Environmental Management will assign promoters and decide in which department a candidate should register. |
| (d) Microbial Biotechnology | <ul style="list-style-type: none"> A candidate must be in possession of a Master's degree in Microbiology, Biochemistry, Food Science, Microbial Biotechnology or related disciplines. Candidates in possession of a Master's degree in related subjects (e.g. Botany, Zoology, Chemistry, Chemical Engineering) can be requested by the Microbial Biotechnology Committee to complete additional theoretical work, work assignments, and/ or modules before the thesis is submitted for examination. |
| e) Geology | <ul style="list-style-type: none"> Proficient performance in the TALPS Test is required |

NAS4 – Progress requirements

Regulation A8(c) indicates that a student must complete his/her studies in the minimum prescribed study period plus two years. This is known as the residential period. Most of the undergraduate programmes in this faculty thus have a residential period of five years, except BScAgric and BSc Extended programmes which have a six year residential period.

- Students must successfully complete a minimum of 64 mainstream credits per year to be allowed to register the following year. Students who do not obtain a minimum of 64 credits per year will automatically be **BLOCKED FOR REGISTRATION** in the faculty. They will be expected to re-apply in order to be re-admitted to this faculty.
Students must therefore pass a minimum of 32 credits per semester to be allowed to register the following semester. Students who fail to obtain 32 credits after the first semester will automatically be blocked for registration. They can appeal to the Faculty Admissions Committee for re-admission. The appeal form must be completed and submitted to the Office of the Dean two days after the results of the supplementary examination are available.
- Students will only be allowed to repeat a module once if they meet the minimum requirements for repetition.
If a student only requires 32 credits to obtain a qualification and has not exceeded the residential period, special permission may be granted to repeat a module for the **SECOND** time. No first-year module can be repeated more than once.
- In order to repeat a module, a student must have completed that module and obtained a semester mark of at least 30 %. Students can follow the appeal process and the Appeal Committee could consider the matter on the basis of merit.
- Students in the Faculty of Natural and Agricultural Sciences will only be allowed to repeat 9 (12) modules in their three- or four-year study programme.
- Class attendance is required for students who have to register for the same module a second time. In the event of timetable clashes between repeated and new modules, preference must be given to the module being repeated. In such cases, students may not register for the new module.
- Students who do not pass all their required first-year modules (at least 120 main stream credits) in three years, and have at least obtained 48 second-year credits, will not be allowed to re-register to the Faculty of Natural and Agricultural Sciences.

- g) Students must pass a minimum of 80 credits to be able to register for modules in a subsequent study year of a learning programme.
- h) Students cannot register for third-year modules if any first-year modules are outstanding.
- i) Students must complete their degrees within the residential period. If it becomes evident that the student will not be able to comply with this regulation, the student can be deregistered even if the residential period has not been reached.
- j) Students who do not comply with , but have a maximum of 4 modules outstanding, will only be allowed to conditionally register for one more semester. The student must then pass all the modules that they are registered for in that semester. Approval by the Faculty Admissions Committee is needed. Applications for conditional registration close on 31 August of their fifth study year for outstanding first semester modules and 31 January after completion of their fifth year for outstanding second semester modules.
- k) Students repeating modules can only register for a maximum of 64 credits per semester. Special permission may be granted for adding one 16-credit module.
- l) Students may only register for one additional 16-credit module per semester, over and above the number of prescribed modules required in the learning programme. Approval will depend on the academic record of the student.
- m) Opportunity exists in the Faculty of Natural and Agricultural Sciences to appeal against the decision made by the Programme Director and/or delegated Representative. A student may submit an appeal to a decision, which must contain supporting documentation that substantiates the situation, to the Appeals Committee of the Faculty. The Appeals Committee consists of the Teaching and Learning Manager and at least two other senior academics within the faculty. The Appeals Committee deliberates the cases before the semester starts. Appeal applications must be submitted to the Office of the Dean five working days before the semester starts. Results of the appeal will be available before the semester starts.

NAS5 – Module requirements

- (a) Students must comply with the requirements of the specific programme and specific modules. All prerequisites for modules presented in the learning programmes in the faculty are provided under module contents p.81.
- (b) Some modules require selection and students will only be allowed to register for that specific module after approval of the Programme Director.

- (c) Students who passed Grade 12 Information Technology at performance level 4 or Computer Application Technology (CAT) at performance level 5 are exempted from BRS111/BRC111.
- (d) For some modules the minimum prerequisite applies. The requirement is a semester/year mark or an examination mark of 40% in the relevant module. It is indicated as, for example, Min. (WTW114), if WTW114 is the relevant module.
- (e) If a co-requisite is required and the modules are taken for the first time, the module prescribed as co-requisite must be taken simultaneously with the relevant module. For example, to take GLG242, the prerequisites are 55% average for GLG114 and GLG124 and the co-requisite with GLG244.

NAS6 – Students from other faculties

- (a) Students from other faculties who register for subjects in the Faculty of Natural and Agricultural Sciences must comply with the minimum regulation requirements, as set out in NAS2.1 and NAS2.2 and with the prerequisite for specific modules as indicated in the module content on p.81.

NAS7 – Learning programme

Students have to:

- Select a learning programme.
- Follow the specific prescribed curriculum.
- Select one of the Biological Sciences, Mathematical Sciences, Chemical and Physical Science , Geosciences, Information Technology and Consumer Sciences fields of interest for BSc degrees; or Soil Crop and Climate, Animal Wildlife and Grassland, Agricultural Economics, or Food Sciences for one of BScAgric degrees; or Crop Production, or Animal Production fields of interest for the BAgric degrees.
- Verify that all the selected modules are included in the **class and examination timetable**.
- Verify that the **prerequisites** prescribed for every module are met.
- Be aware that elective modules can be exchange with each other, but all compulsory modules must be successfully completed.

NAS7.1 – The selection of a learning programme

- a) Students are only allowed to change to different fields of interests or degrees within the faculty at the end of their first year of study. If a student changes

from one field of interest to another, higher studies must be completed in a maximum of five or six years, depending on the field of interest.

- b) Students can change within fields of interests only up to the second year of study; this does not grant them permission to extend the duration of study beyond five years.
- c) Students who change from one major within a complementary learning programme could have an extension on their study duration.

NAS7.2– Minimum credit allocation

A degree cannot be conferred if the minimum credit requirements are not met and the prescribed curriculum are not fully completed:

(a) **All Degrees**

If a student want endorsement with **two majors**, at least 60 credits per major discipline at NQF Level 7 is required.

(b) **BArchStud, BAgric, B Consumer Sciences, BSc, BScQS or BScConst**

A total of at least 360 credits, with a maximum of 96 credits at NQF Level 5 and at least 120 credits at Level 7 must be obtained over three years. At least 60 credits must be from one discipline and at NQF Level 7.

(c) **BSc Extended Programme (four years):**

A total of at least 498 credits, of at least 128 credits must be developmental modules, a maximum of 112 credits at NQF Level 5 and at least 120 credits at NQF Level 7 must be obtained over four study years.

(d) **BScAgric, BSc Consumer Sciences (four years):**

A total of at least 480 credits, with a maximum of 96 credits at NQF Level 5 and at least 120 credits at NQF Level 8 for the degree must be obtained over four years. At least 60 credits must be from the minor discipline at NQF Level 7.

NAS7.3 – Changing from BAgric to BScAgric

- (a) A student who has registered for the BAgric degree can change to a suitable learning programme in the BScAgric degree in consultation with Academic Student Services and the Programme Director of Agriculture. The student must have passed the compulsory first academic year of the BAgric degree with an average mark of at least 75%. In addition, compulsory first-year modules such as WTW134, CEM114 and BMT124 and other required modules to comply with the minimum prerequisites for professional registration (SACNASP).

NAS8 – Assessment examination and promotion

NAS8.1 – Examination and promotion system

In addition to the requirements contained in General Regulation A14-27, a candidate has to comply with the additional faculty requirements:

- (a) The guidelines as set out in the study guide for assessment method and calculation of semester and final marks apply.
- (b) The promotion system only applies to specific modules as indicated in the module contents starting on p.81. Students who obtain a semester for 70 % or higher in a specific module can be promoted if the promotion system applies to the module. The module mark becomes the final mark for the module.
- (c) For the duration of the examinations, see the module contents starting on p.81.
- (d) The degree is awarded with distinction to a student who obtained a weighted average of 75% in the prescribed final modules and if the programme was completed in the prescribed minimum study years.

NAS8.2 – Evaluation for Departments of Architecture, Quantity Surveying and Construction Management, and Urban and Regional Planning

- (a) For most the modules presented by the Department of Architecture, Quantity Surveying and Construction Management evaluation of the student's academic progress will take place on a continuous basis by means of assignments, tests and/or design tasks as specified in the module guide. The acknowledgment of a year/semester mark obtained will be subject to satisfactory attendance at lectures, studio periods and seminars. A final mark which will be taken as the student's examination mark will be compiled from the marks obtained in the assessments mentioned above.
- (b) Modules presented by departments other than Architecture or Quantity Surveying/Construction Management will be subject to the evaluation procedure of those departments.
- (c) Students in the Department of Architecture must meet the prescribed sub-minimum of 30% for all assignments and design task as specified in the module guides to pass a module.

10. QUALIFICATIONS IN THE FACULTY

| 10.1 BACHELOR DEGREES AND DIPLOMAS | | MINIMUM PERIOD OF STUDY | NQF LEVEL | NUMBER OF LEARNING PROGRAMMES | ABBREVIATION | PAGE |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------|-----------|-------------------------------|-----------------------------|------|
| DIPLOMA | | | | | | |
| 1 | Advanced Diploma in Sustainable Agriculture and Rural Development | 1 ½ year | 7 | 1 | ADSARD | |
| ACCESS PROGRAMMES AND EXTENDED PROGRAMMES – South Campus first year of study | | | | | | |
| 2 | University Preparation Programme: Agricultural Sciences for BAgric | 1 year | 5 | 1 | UPP Agric | |
| 3 | University Preparation Programme: Natural and Agricultural Sciences for BSc | 1 year | 5 | 1 | UPP Mathematics & Chemistry | |
| 4 | Bachelor of Agriculture Extended | 4 years | 7 | 1 | BAgric | |
| 5 | Bachelor of Agricultural Science Extended Programme | 5 years | 7 | 1 | BScAgric | |
| 6 | Bachelor of Science Extended Programme (Mathematics and Chemistry) | 4 years | 7 | 1 | BSc | |
| 7 | Bachelor of Science Extended Programme (Mathematics and Finances) | 4 years | 7 | 1 | BSc | |
| BACHELOR'S DEGREES | | | | | | |
| 8 | Bachelor of Architecture | 3 years | 7 | 1 | BArchStud | |
| 9 | Bachelor of Agriculture | 3 years | 7 | 7 | BAgric | |
| 10 | Bachelor of Consumer Sciences | 3 years | 7 | 2 | BConsumer | |
| 11 | Bachelor of Science | 3 years | 7 | 6 (61) | BSc | |
| 12 | Bachelor of Science in Information Technology | 3 years | 7 | 6 | BSc IT | |
| 13 | Bachelor of Science in Construction Management (Residential + Distance learning) | 3 years | 7 | 2 | BScConstr | |
| 14 | Bachelor of Science in Quantity Surveying (Residential+ Distance learning) | 3 years | 7 | 2 | BScQS | |
| 15 | Bachelor of Science in Construction Management (Facilities Management) (Distance learning) | 3 years | 7 | 1 | BScConstr | |
| 16 | Bachelor of Science in Agriculture | 4 years | 8 | 4 (8) | BScAgric | |
| 17 | Bachelor of Science in Consumer Sciences | 4 years | 8 | 1 | BScConsumer Science | |

| 10.2 POSTGRADUATE DIPLOMAS, BACHELOR, HONOURS, MASTER'S AND DOCTORAL DEGREES | | MINIMUM PERIOD OF STUDY | NQF LEVEL | NUMBER OF LEARNING PROGRAMMES | ABBREVIATION | PAGE |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------|-----------|-------------------------------|------------------------------|------|
| POSTGRADUATE DIPLOMA | | | | | | |
| 1 | Postgraduate Diploma in Disaster Management | 1 year + 1 year | 8 | 1 | PGDip in Disaster Management | |
| BACHELOR HONOURS DEGREES | | | | | | |
| 2 | Bachelor of Architecture Honours | 1 year | 8 | 1 | BArchStudHon | |
| 3 | Bachelor of Agriculture Honours | 1 year | 8 | 3 | BAgricHons | |
| 4 | Bachelor of Consumer Science Honours | 1 year | 8 | 1 | BConsumerHon | |
| 5 | Bachelor of Science Honours | 1 year | 8 | 35 | BScHon | |
| 6 | Bachelor of Science Honours in Construction Management (Residential) | 1 or 2 years | 8 | 1 | BScHonConstr | |
| 7 | Bachelor of Science Honours in Quantity Surveying (Residential) | 1 or 2 years | 8 | 1 | BScHonQS | |
| 8 | Bachelor of Science Honours in Construction Management (Distance learning) | 1 or 2 years | 8 | 1 | BScHonConstr | |
| 9 | Bachelor of Science Honours in Quantity Surveying (Distance learning) | 1 or 2 years | 8 | 1 | BScHonQS | |
| 10 | Bachelor of Spatial Planning Honours | 1 year | 8 | 1 | BHonSP | |
| MASTER'S DEGREES | | | | | | |
| 1 | Master of Architecture | 2 years | 9 | 1 | March | |
| 2 | Master of Architecture (Professional) | 1 year | 9 | 1 | MArchProf | |
| 3 | Master of Agriculture | 2 years | 9 | 1 | MAgric | |
| 4 | Master of Disaster Management | 2 years | 9 | 1 | MDisasterM | |
| 5 | Master of Environmental Management | 2 years | 9 | 1 | MEM | |
| 6 | Master of Human Settlements | 2 years | 9 | 1 | MLHD | |
| 7 | Master of Land and Property Development Management | 2 years | 9 | 1 | MPROP | |
| 8 | Master of Mineral Resource Throughput Management | 2 years | 9 | 1 | MRTM | |
| 9 | Master of Sustainable Agriculture | 2 years | 9 | 1 | MSA | |
| 10 | Master of Science | 2 years | 9 | 36 | MSc | |
| 11 | Master of Science in Agriculture | 2 years | 9 | 8 | MScAgric | |
| 12 | Master of Science in Consumer Sciences | 2 years | 9 | 1 | MScConsumer Science | |
| 13 | Master of Science in Construction Management | 2 years | 9 | 1 | MScConstr | |
| 14 | Master of Science in Quantity Surveying | 2 years | 9 | 1 | MScQS | |
| 15 | Master of Urban and Regional Planning (Professional) | 2 years | 9 | 1 | MURPProf | |
| 16 | Master of Urban and Regional Planning (Research) | 2 years | 9 | 1 | MURPResearch | |
| DOCTORAL DEGREES | | | | | | |
| 1 | Doctor of Architecture | 3 years | 10 | 1 | DArch | |
| 2 | Philosophiae Doctor | 3 years | 10 | 57 | PhD | |
| 3 | Doctor of Science | 3 years | 10 | 50 | DSc | |

11. LEARNING PROGRAMMES & MODULES REQUIRED

11.1 DIPLOMAS

11.1.1 ADVANCED DIPLOMA IN SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT 50047(5203)

LEARNING PROGRAMMES FOR AGRICULTURE AND RURAL DEVELOPMENT

The main aim of the programme is to afford students, primarily agricultural extensionists, the opportunity to acquire the necessary skills and know-how to teach, demonstrate and facilitate sustainable agriculture and rural developmental (SARD) issues and practices to the benefit of the agricultural community. The exit level outcomes reflect an integration of the specific and critical outcomes. On achieving this qualification a graduate will, within the field of SARD and agricultural extension, be able to:

- (a) Manage rural structures and group dynamics.
- (b) Design strategies that will create understanding of production, marketing and value adding of agricultural produce by the community.
- (c) Apply sustainable plant production practices.
- (d) Apply sustainable animal production practices.
- (e) Conduct sound and effective communication skills and transfer of knowledge systems.

COMPULSORY YEAR 1 + 2

| | | | |
|--------|-------------------------------------------|--------|--------------------------------------------------------|
| ADS126 | Fundamentals of Rural Development | ADS136 | Foundational Theories in Animal Production |
| ADS146 | Fundamentals of Agriculture Economics | ADS226 | Basic communication skills for Sustainable Agriculture |
| ADS116 | Foundational theories in Plant Production | | |

11.2 LEARNING PROGRAMMES FOR ACCESS AND EXTENDED PROGRAMMES (SOUTH CAMPUS)

Candidates who do not comply with the Faculty of Natural and Agricultural Sciences entry requirements for main stream BSc studies can gain admission to the university through the University Preparation Programme (UPP) or the BSc Extended programmes. The programme provides students with an opportunity to improve their skills and competencies with aim of gaining access to mainstream studies after successful completion of the first year. These Programme also

addresses, through a course in Skills and Competencies in Lifelong Learning, the student's wider needs with regards to quality of personal life, study and reading skills, self-assertiveness, problem solving, and other generic competencies. These students also attend an academic language course in English to improve their reading and writing skills for higher education purposes.

UNIVERSITY PREPARATION PROGRAMMES 40001, 50001(4002,5002)

| LEARNING PROGRAMMES FOR UNIVERSITY PREPARATION PROGRAMMES | | | | | | | | |
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| 11.2.1 NATURAL SCIENCES 40001(4002) (CHEMISTRY / MATHEMATICS) | | | | 11.2.2 AGRICULTURAL SCIENCES 50001(5002) (AGRICULTURAL SUBJECTS) | | | | |
| YEAR | | Semester 1 | Semester 2 | | Semester 1 | Semester 2 | | |
| 1 | Academic Modules | Mathematics Chemistry Biology | WTV154 OR MATD1534 CHE 112 + CHE132 BLGY1503 | WTV164 MATD1544 CHE122 + CHE142 | 1 | Agricultural Economics Biological principals in Agriculture Chemistry Introduction to Animal Wildlife and Grassland Sciences | LEC114 LWB114 LWC112 | LWC121 VWW124 |
| | Development Modules | Academic language course Computer Literacy Life-long Learning – Natural Sciences | ALN108 BRC111 VBN108 | | | Academic language skills course English or Afrikaans Computer Literacy Life-long Learning Mathematical Literacy in Agriculture | ALN108 or AFA108 BRC111 MTA108 VBL108 | |
| <p>After successful completion of ALL THE MODULES in the first year of the BSc Four-year Curriculum (Extended Programme) with an average of 60 % for Academic modules, the student changes to the first year main fields of interest modules of the learning programme of his/her choice on the main campus set out in the Faculty's Yearbook. Students must take note of the following requirements:</p> <ul style="list-style-type: none"> Students must pass all academic modules in the June examination to continue their studies in the second semester To register for CHE122 students must have passed CHE112 and CHE132 To register for CHE142 students must have passed CHE112 and WTV154 or level 4 for NCS Mathematics. To register for WTV164 students must have passed WTV154. To register for MATD5134 students must have have a level 4 for NCS Mathematics. To register for MATD5144 students must have passed MATD5134 <p>Students who could not complete the first two years of study in three years will not be allowed for re-registration to the Faculty of Natural and Agricultural Sciences.</p> | | | | <p>After successful completion of ALL THE MODULES in the first year of the BAGIC Four-year Curriculum (Extended Programme) or the UPP AGRIC Sciences with an average of 55 % for the Academic modules, the student changes to the first year main fields of interest modules of the learning programme of his/her choice on the main campus set out in the Faculty's Yearbook. Students must take note of the following requirements:</p> <ul style="list-style-type: none"> Students must pass all academic modules in the June examination to continue their studies in the second semester To register for LWC112 students must have passed LWC121. <p>Students who could not complete the first two years of study in three years will not be allowed for re-registration to the Faculty of Natural and Agricultural Sciences.</p> | | | | |
| 2 | <p>In their second year of study students have to register for CHE151, CHE161, ALC208 and BRS121 as well as all the first year main fields of interest modules in the learning programme of choice as set out in the Faculty Yearbook.</p> <p>Students must take note of the following requirements:</p> <ul style="list-style-type: none"> To register for CHE151 students must have passed CHE122 + CHE142 as well as WTV164. To register for CHE161, students must have passed CHE151. The modules CHE112, CHE122, CHE132, CHE142, CHE151 and CHE161 must be passed to get recognition for CEM114 and CEM124/CEM144. BLGY1503 and BRC111 must be passed to get recognition BLGY1513 and BRC111 to get recognition for BRS111. (See BSc main fields of interest learning programmes). | | | 2 | <p>Follow the main fields of interest <u>first year</u> BAgric Learning Programme of choice as set forth in the Faculty Yearbook.</p> <ul style="list-style-type: none"> The modules LEC114, LWB 114, must be passed to get recognition for LEK114 and LWL114. To register for LWL151, students must have passed LW121 The modules LWC 112 + LWC121 + LWL151 to get recognition for LWL134 and BRC111 must be passed to get recognition for BRS111. (See BSc main fields of interest learning programmes). | | | |
| 3 | <p>Follow <u>second year</u> learning programme of choice in the Faculty Yearbook.</p> <p>Students must take note of the following requirement:</p> <ul style="list-style-type: none"> Students must have pass CHE151, CHE161, ALC208 and BRS121 to be allowed to change to the programme code of current study. | | | 3 | <p>Follow <u>second year</u> BAgric Learning Programme of choice as set forth in the Faculty Yearbook.</p> | | | |
| 4 | <p>Follow the <u>third year</u> learning programme of choice as set out in the Faculty Yearbook.</p> | | | 4 | <p>Follow the <u>third year</u> BAgric Learning Programme of choice as set forth in the Faculty Yearbook.</p> | | | |

EXTENDED PROGRAMMES 50990, 50991 (4393)

| LEARNING PROGRAMMES FOR EXTENDED PROGRAMMES | | | | | | |
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| 11.2.3 BSc AGRICULTURE FIVE-YEAR 50990 SOUTH CAMPUS | | | | 11.2.4 B AGRICULTURE FOUR YEAR 50991 SOUTH CAMPUS | | |
| Year | | Semester 1 | Semester 2 | | Semester 1 | Semester 2 |
| 1 | Mathematics Chemistry Biology ELECTIVES: Agricultural Economics Introduction to Animal Wildlife and Grassland Sciences | WTV154 OR MATD1534 CHE 112 + CHE132 BLGY1503 LEC114 OR | WTV164 or MATD1544 CHE122 + CHE142 OR VWW124 | Agricultural Economics Biological principals in Agriculture Chemistry Mathematics Introduction to Animal Wildlife and Grassland Scieinces | LEC114 LWB114 LWC112 WTV154 (if Mathematics 3) | LWC121 VWW124 |
| | Academic language course Life-long Learning – Natural Sciences Computer Literacy | ALN108 VBN108 BRC111 | | Mathematical Literacy in Agriculture Life-long Learning Academic language skills course English or Afrikaans Basic Computer Literacy | MTA108 if not WTV154 VBL108 ALN108 orAFA108 BRC111 | |
| <p>After successful completion of ALL THE MODULES in the first year of the BSc Four-year Curriculum (Extended Programme) with an average of 60 % for Academic modules, the student changes to the first year main fields of interest modules of the learning programme of his/her choice on the main campus set out in the Faculty's Yearbook.</p> <ul style="list-style-type: none"> Students must pass all academic modules in the June examination to continue their studies in the second semester To register for CHE122 students must have passed CHE112 and CHE132 To register for CHE142 students must have passed CHE112 and WTV154 or level 4 for NCS Mathematics. To register for WTV164 students must have passed WTV154. To register for MATD5134 students must have have a level 4 for NCS Mathematics. To register for MATD5144 students must have passed MATD5134 <p>Students who could not complete the first two years of study in three years will not be allowed for re-registration to the Faculty of Natural and Agricultural Sciences.</p> | | | | <p>After successful completion of ALL THE MODULES in the <u>first year</u> of the BAGIC Four-year Curriculum (Extended Programme) or the UPP AGRIC Sciences with an average of 55 % for the Academic modules, the student changes to the first year main fields of interest modules of the learning programme of his/her choice on the main campus set out in the Faculty's Yearbook. The student register for the 50901-50907 learning programme code.</p> <ul style="list-style-type: none"> Students must pass all academic modules in the June examination to continue their studies in the second semester To register for LWC121 students must have passed LWC112. <p>Students who could not complete the first two years of study in three years will not be allowed for re-registration to the Faculty of Natural and Agricultural Sciences.</p> | | |
| 2 | In their second year of study students have to register for CHE151, CHE161, ALC208 and BRS121 as well as all the <u>first year</u> main fields of interest modules in the learning programme of choice as set out in the Faculty Yearbook. Students must take note of the following requirements: | | | 2 | <p>Follow the main fields of interest <u>first year</u> BAgric Learning Programme of choice as set forth in the Faculty Yearbook.</p> <ul style="list-style-type: none"> The modules LEC114, LWB114, must be passed to get recognition for LEK114 and LWL114. To register for LWL151, students must have passed LWC121 The modules LWC112 + LWC121 + LWL151 to get recognition for LWL134 and BRC111 must be passed to get recognition for BRS111. (See BSc main fields of interest learning programmes). | |
| 3 | <p>Follow main fields of interest <u>second year</u> BSc learning programme of choice as set out in the Faculty Yearbook.</p> <p>Students must take note of the following requirement:</p> <ul style="list-style-type: none"> Students must have passed CHE151, CHE161, ALC208 and BRS121 to be allowed to change to the programme code of current study. | | | | <p>Follow the main fields of interest <u>second year</u> BAgric learning programme of choice as set forth in the Faculty Yearbook.</p> | |
| 4 | <p>Follow main fields of interest <u>third year</u> BSc learning programme of choice as set out in the Faculty Yearbook.</p> | | | | <p>Follow the main fields of interest <u>third year</u> BAgric learning programme of choice as set forth in the Faculty Yearbook.</p> | |

| 11.2.5 BSc FOUR-YEAR 40990(MATHEMATICS AND CHEMISTRY) (Main Campus the 40904-40929, 40935-40962, 40968, 40970) | | | | 11.2.6 BSc FOUR-YEAR 40991 (MATHEMATICS AND FINANCES) (SOUTH CAMPUS) (Main Campus the 40901-40903, 40940-40944, 40964-40967,40971, 40972-40974) | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Year | | Semester 1 | Semester 2 | | Semester 1 | Semester 2 | |
| 1 | Mathematics Chemistry Biology | WTV154 OR MATD1534 CHE 112 + CHE132 BLGY1503 | WTV164 OR MATD1544 CHE122 + CHE142 | 1 | Mathematics Accounting or Business functions Introduction to human resource management Introduction to individual differences Economics | WTV154 OR MATD1534 EACC61406 OR EFBM51505 OR EHRM51305 OR EECF61406 | WTV164 OR MATD1544 EACC62406 OR EFBM62506 EFIP52505 EECF62406 |
| | Academic language course Life-long Learning – Natural Sciences Computer Literacy | ALN108 VBN108 BRC111 | | | Academic language course Life-long Learning – Natural Sciences Computer Literacy | ALF108 VBN108 BRC111 | |
| <p>After successful completion of ALL THE MODULES in the first year of the BSc Four-year Curriculum (Extended Programme) with an average of 60 % for Academic modules, the student changes to the first year main fields of interest modules of the learning programme of his/her choice on the main campus set out in the Faculty's Yearbook. The student register for the 40904-40929, 40935-40962, 40968, 40970 learning programme code. Students must take note of the following requirements:</p> <ul style="list-style-type: none"> • Students must pass all two academic modules in the June examination to continue their studies in the second semester • To register for CHE122 students must have passed CHE112 and CHE132 • To register for CHE142 students must have passed CHE112 and WTV154 or level 4 for NCS Mathematics. • To register for WTV164 students must have passed WTV154. • To register for MATD5134 students must have have a level 4 for NCS Mathematics. • To register for MATD5144 students must have passed MATD5134 <p>Students who could not complete the first two years of study in three years will not be allowed for re-registration to the Faculty of Natural and Agricultural Sciences.</p> | | | | <p>After successful completion of ALLTHE MODULES in the first year of the BSc Four-year Curriculum (Extended Programme) with an average of 60 % for Academic modules, the student changes to the first year main fields of interest modules of the learning programme of his/her choice on the main campus set out in the Faculty's Yearbook. The student register for the 40901-40903, 40940-40944, 40964-40967,40971, 40972-40974 learning programme code Students must take note of the following requirements:</p> <ul style="list-style-type: none"> • To register for WTV164 students must have passed WTV154. • To register for MATD5134 students must have have a level 4 for NCS Mathematics. • To register for MATD5144 students must have passed MATD5134 <p>Students who could not complete the first two years of study in three years will not be allowed for re-registration to the Faculty of Natural and Agricultural Sciences.</p> | | | |
| 2 | <p>In their second year of study students have to register for CHE151, CHE161, ALC208 and BRS121 as well as all the first year main fields of interest modules in the learning programme of choice as set out in the Faculty Yearbook.</p> <p>Students must take note of the following requirements:</p> <ul style="list-style-type: none"> • To register for CHE151 students must have passed CHE122 + CHE142 as well as WTV164. • To register for CHE161, students must have passed CHE151. • The modules CHE112, CHE122, CHE132, CHE142, CHE151 and CHE161 must be passed to get recognition for CEM114 and CEM124/CEM144. BLGY1503 and BRC111 must be passed to get recognition BLGY1513 and BRS111. (See BSc main fields of interest learning programmes). | | | 2 | <p>In their second year of study students have to register for CHE151, CHE161, ALC208 and BRS121 as well as all the <u>first year</u> main fields of interest modules in the learning programme of choice as set out in the Faculty Yearbook.</p> | | |
| 3 | <p>Follow second year learning programme of choice in the Faculty Yearbook. Students must take note of the following requirement:</p> <ul style="list-style-type: none"> • Students must have pass CHE151, CHE161, ALC208 and BRS121 to be allowed to change to the programme code of current study. | | | 3 | <p>Follow main fields of interest <u>second year</u> learning programme of choice in the Faculty Yearbook. Students must take note of the following requirement:</p> | | |
| 4 | <p>Follow the third year learning programme of choice as set out in the Faculty Yearbook.</p> | | | 4 | <p>Follow main fields of interest <u>third year</u> learning programme of choice in the Faculty Yearbook.</p> | | |

11.3 LEARNING PROGRAMMES FOR BACHELOR DEGREES FOR DEGREES (NQF LEVEL 7 & 8)

11.3.1 BACHELOR OF ARCHITECTURE STUDIORUM 40114(4310)

The Baccalaureus Architecturae Studiorum involves full-time education that extends over six semesters and involves lectures, projects, and continuous evaluation.

The purpose of this programme is to educate candidates who may register in the appropriate category for which they qualify with the South African Council for the Architectural Profession in terms of the provisions of the Architectural Profession Act 44 of 2000. The degree BArchStud provides access to the BArchStudHons degree.

Students are strongly advised to work in an architect's office or other approved similar institution during holidays in order to gain practical experience.

The evaluations and examinations for the degree BArchStud are recognised by the minister concerned in terms of the provisions of the Architectural Profession Act (Act 44 of 2000). Training experience after completion of the BArchStud degree will be controlled by the conditions of the South African Council for the Architectural Profession. The registrar of this Council will provide information in this regard.

| YEAR | FIRST | FIRST |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| SEMESTER | FIRST | SECOND |
| COMPULSORY YEAR | ONW100 Design BOW106 Building Science OGT104 History of the Environment GRT104 Presentation Techniques | |
| COMPULSORY SEMESTER | GRT112 Trigonometrical Drawing | GRT122 Photography |
| | UFS101 *ALN108 or AFA108 | |
| YEAR | SECOND | SECOND |
| SEMESTER | FIRST | SECOND |
| | ONW200 Design BOW206 Building Sciences OGT204 History of the Environment GRT204 Computer Drafting KWE204 Construction Science TAR204 Theory of Architecture | |
| YEAR | THIRD | THIRD |
| SEMESTER | FIRST | SECOND |
| | ONW300 Design BOW306 Building Science OGT304 History of the Environment TAR304 Theory of Architecture BKR306 Building Contracts Law KWE304 Construction Science | |

11.3.2 BACHELOR OF AGRICULTURE

11.3.2.1 MANAGEMENT SPECIALISATION FIELDS OF INTEREST 50101-50106 (5311-5318)

LEARNING PROGRAMMES FOR MANAGEMENT SPECIALISATION

The objective of the degree and different learning programmes is to train students to apply agricultural knowledge practically on farm level as well as in agriculturally-related organisations. The BAgric qualification will allow persons to apply their knowledge in the fields of resource utilisation, agricultural production, processing, management and communication.

Learning programmes in this FIELD OF INTEREST offer SIX options. These learning programmes will lead to one of the following qualifications: BAgric Irrigation Management, Animal Production Management, Mixed-farming Management, Crop Production Management,

Agricultural Management or Wildlife Management. The programmes consist of the combination of two majors, e.g. combined with management subjects. The table below indicates the combinations for the different qualifications. Each student includes all the compulsory modules (row C1) from the prescribed disciplines for all three study years. Students must select sufficient other modules (other science subjects as supportive electives) from the compulsory row of any other discipline or from their own electives (E) to obtain a total of at least 120 credits for each of the first and the second year of study.

| DISCIPLINE | IRRIGATION MANAGEMENT | ANIMAL PRODUCTION MANAGEMENT | MIXED FARMING MANAGEMENT | WILD LIFE MANAGEMENT | CROP PRODUCTION MANAGEMENT | AGRICULTURAL MANAGEMENT | IRRIGATION MANAGEMENT | ANIMAL PRODUCTION MANAGEMENT | MIXED FARMING MANAGEMENT | WILD LIFE MANAGEMENT | CROP PRODUCTION MANAGEMENT | AGRICULTURAL MANAGEMENT |
|---------------|-----------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| OLD CODE | 5311 | 5312 | 5313 | 5317 | 5314 | 5316 | 5311 | 5312 | 5313 | 5317 | 5314 | 5316 |
| NEW CODE | 50104 | 50102 | 50105 | 50106 | 50103 | 50101 | 50104 | 50102 | 50105 | 50106 | 50103 | 50101 |
| EXT CODE | 50904 | 50902 | 50905 | 50906 | 50903 | 50901 | 50904 | 50902 | 50905 | 50906 | 50903 | 50901 |
| YEAR | FIRST | | | | | | FIRST | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C1 | LWL114 LWL134 LWL154 LEK114 | LWL114 LWL134 LWL154 LEK114 | LWL114 LWL134 LWL154 LEK114 | LWL114 LWL134 LWL154 LEK114 | LWL114 LWL134 LWL154 LEK114 | LWL114 LWL134 LWL154 LEK114 | LWL124 LWL164 GKG124 VWW124 | LWL124 LWL164 GKG124 VWW124 | LWL124 LWL164 GKG124 VWW124 | LWL124 LWL164 GKG124 VWW124 | LWL124 LWL164 GKG124 VWW124 | LWL124 LWL164 GKG124 VWW124 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% *ALN108 or AFA108 | | | | | | BRS121 | | | | | |
| YEAR | SECOND | | | | | | SECOND | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| C2 | AGR214 GKD214 LEK214 LWR214 | GKD214 LEK214 VKD214 WDK214 | AGR214 LEK214 VKD214 ONE OF GKD214 LWR214 WDK214 | GKD214 LEK214 VKD214 WDK214 | AGR214 GKD214 LEK214 LWR214 | LEK134 LEK214 VKD214 AGR214 | AGR224 GKD224 LEK124 LNG224 | LEK124 LEK224 LNG224 VKD224 | LEK124 AGR224 VKD224 ONE OF LWR224 GKD224 LNG224 | DRK226 LEK124 LNG224 VKD224 | AGR224 GKD224 LEK124 ONE OF LWR224 LNG224 | LEK124 LEK224 AGR224 VKD224 |
| YEAR | THIRD | | | | | | THIRD | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| C3 | AGR314 GKD314 LNG314 ONE OF LBB314 LBB334 | VKD314 VKD334 WDK314 ONE OF LBB314 LBB334 | AGR314 VKD314 LWR314 VKD334 ONE OF GKD314 WDK314 ONE OF LBB314 LBB334 | WDK314 VKD314 LBB314 LBB334 | AGR314 GKD314 LWR314 ONE OF LBB314 LBB334 | LBB314 AGR314 ONE OF VKD314 VKD334 | AGR324 GKD324 LNG324 LBB362 ONE OF LBB324 LBB344 | VKD324 VKD344 LBB362 WDK324 ONE OF LBB324 LBB344 | AGR324 LBB362 LBB324 LBB344 ONE OF VKD324 VKD344 ONE OF GKD324 WDK324 | WDK324 VWW364 DRK364 LBB362 ONE OF LBB324 LBB344 | AGR324 GKD324 LWR324 LBB362 ONE OF LBB324 LBB344 | LBB324 LBB344 LBB362 ONE OF AGR324 VKD324 VKD344 |

11.3.2.2 AGRICULTURAL ECONOMICS 50111(5318)

LEARNING PROGRAMMES FOR AGRICULTURAL ECONOMICS

The objective of the degree is to train students to apply agricultural knowledge practically on the farm level as well as in agriculturally-related organisations. The BAgric qualification will allow persons to apply their knowledge in the fields of resource utilisation, agricultural production, processing, management and communication.

Learning programmes in this FIELD OF INTEREST offer ONE option. Each student includes all the compulsory modules (row C1) from the prescribed disciplines for all three study years. Students must select sufficient other modules (other science subjects as supportive electives) from the compulsory row of any other discipline or from their own electives (E) to obtain a total of at least 120 credits for each year of study.

| YEAR | FIRST | FIRST | SECOND | SECOND | THIRD | THIRD |
|--------------------------|-----------------------------------------|-----------------------------------------|---------------------------------------------------|-------------------------------|--------------------------------------|--------------------------------------|
| SEMESTER | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND |
| COMPULSORY C1 | LEK134 HRG114 EACC61406 LEK114 | LWL124 EBUS62406 HRG124 LEK124 | LEK214 EBUS63406 | LEK224 LNG224 | LEK314 LEK334 LBB314 | LEK324 LEK344 LBB324 LBB362 |
| ELECTIVES | | | ETXA60806 AGR214 GKD214 VKD214 WDK214 | ETXA60806 AGR224 VKD224 | AGR314 VKD314 GKD314 WDK314 | AGR324 VKD324 GKD324 WDK324 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% | BRS121 | | | | |
| | *ALN108 or AFA108 | | | | | |

11.3.3 BACHELOR OF CONSUMER SCIENCES 40123 (4351, 4352)

LEARNING PROGRAMMES FOR CONSUMER SCIENCE

Consumer science is a study of the need of man regarding housing, clothing and food and the management of resources to satisfy these needs. After completion of this programme, the B Consumer Science student will be capable of following a career as a Consumer Scientist, e.g. consumer consultant, designer, buyer, marketer, or quality control inspector of consumer products. The student should also be capable of advising consumers on the management of time, energy and other resources. The major subjects are Foods, Consumer Science and Textiles. **Learning**

programmes in the CONSUMER SCIENCE FIELD OF INTEREST offer THREE options of which two is a three-year exit at level outcome. Each student includes all the compulsory modules (row C1) from the prescribed disciplines for all three study years and selects sufficient other modules (other science subjects as supportive electives) from the compulsory row to obtain a total of at least 120 credits for each year of study.

| | GENERAL 40123 (4351) | | | | | | FOOD 40123 (4352) | | | | | |
|-------------------|----------------------|-----------|----------|----------|---------------|---------------|-------------------|-----------|----------|----------|----------|-----------|
| YEAR | FIRST | FIRST | SECOND | SECOND | THIRD | THIRD | FIRST | FIRST | SECOND | SECOND | THIRD | THIRD |
| SEMESTER | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND |
| COMPULSORY | CNFD1532 | CNCS1622 | CNFD2614 | CNFD2624 | CNST3712 | CNFD3744 | CNFD1532 | CNCS1622 | VDG234 | VDG244 | VGM334 | VGM344 |
| C1 | CNST1534 | CNST1644 | CNST2614 | CNCS2624 | CNCS3732 | CNST3722 | VDG134 | VDG144 | CNFD2614 | CNFD2624 | CNCS3732 | CNFD3744 |
| | CNCS1634 | CNCS1624 | MCB214 | CNCS2622 | CNFD3713 | CNCS3724 | CNCS1634 | EBUS62406 | MCB214 | CNCS2622 | CNFD3713 | CNCS3724 |
| | EBUS61406 | EBUS62406 | VWS214 | MCB224 | CNFD3732 | | EBUS61406 | EBUS66404 | VWS214 | MCB224 | CNFD3732 | EBUS74407 |
| | | | | | VDG314 | | | | | | VDG314 | |
| ELECTIVES | | | | | ONE OF | ONE OF | | | | | | |
| E | | | | | CNST334 | CNCS344 | | | | | | |
| | | | | | CNST354 | EBUS66406 | | | | | | |
| | | | | | EBUS63406 | ONE OF | | | | | | |
| | | | | | | CNST344 | | | | | | |
| | | | | | | EBUS74407 | | | | | | |
| REQUIRED | BRS111 | BRS121 | | | | | BRS111 | BRS121 | | | | |
| | UFS101 | | | | | | UFS101 | | | | | |
| | *ALN108 or | | | | | | *ALN108 or | | | | | |
| *if NBT < 65% | AFA108 | | | | | | AFA108 | | | | | |
| YEAR | FOURTH | | | | | | FOURTH | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY | | | | | | | CNCS4809 | | | | | |
| C1 | | | | | | | | | | | | |
| ELECTIVES | CNST4814 | | | | | | CNST4824 | | | | | |
| E | CNST4834 | | | | | | CNST4844 | | | | | |
| | CNST4853 | | | | | | CNST4864 | | | | | |
| | CNCS4834 | | | | | | CNCS4824 | | | | | |
| | CNFD4808 | | | | | | CNCS4844 | | | | | |
| | VDG408 | | | | | | | | | | | |
| | CNCS4814 | | | | | | | | | | | |

11.4 LEARNING PROGRAMMES FOR BACHELOR OF SCIENCE DEGREES FOR DEGREES (NQF LEVEL 7 & 8)

11.4.1 BACHELOR OF SCIENCE

11.4.1.1 BACHELOR OF SCIENCE 4x00

LEARNING PROGRAMMES FOR BACHELOR OF SCIENCE GENERAL

Each student includes 120 credits per year for three years. In planning their degree they need to consider the prerequisite for the second-year and third-year modules. They can only take modules that do not clash on the official timetable. This degree makes provision for one major with at least 60 NQF Level 7 credits in that major and a combination of different related modules for at least 60 credits also at NQF Level 7.

| YEAR | FIRST | | | SECOND | | | THIRD | |
|----------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| SEMESTER | FIRST | SECOND | | FIRST | SECOND | | FIRST | SECOND |
| COMPULSORY C1 | 120 CREDITS OF BLGY1513 CEM114 FSK 114 OR FSK134 WTW114 OR WTW134 GLG114 | 120 CREDITS OF BLGY1623 OR BLGY1643 OR BLGY1663 OR BLG1683 CEM124 OR CEM144 FSK 124 OR FSK144 WTW114 OR WTW134 GLG124 | C2 | 120 CREDITS OF BOC216 CEM214+CEM232 DRK216 FSK214+ FSK232 GEN216 MKB216 PLK216 WTW214 WTW234 WTW254 | 120 CREDITS OF BOC216 CEM224+CEM242 DRK226 FSK224+FSK242 GEN246 MKB226 PLK226 WTW224 WTW244 WTW264 | C3 | 120 CREDITS OF BOC314+BOC334 CEM314+CEM334 DRK314+DRK334 FSK314+FSK332+FSK352 GEN334+GEN354 MKB314+MKB334 PLK314+PLK334+PLK354 | 120 CREDITS OF BOC324+BOC 344 CEM324+CEM344 DRK324+DRK344 FSK324+FSK342+FSK362 GEN324+GEN344 MKB324+MKB344orMKB364 PLK324+PLK344 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 ALN108 OR AFA 104 | BRS121 | | | | | | |

11.4.1.2 BACHELOR OF SCIENCE IN ACTUARIAL SCIENCES 41000 (4336)

LEARNING PROGRAMMES IN ACTUARIAL SCIENCES

Students need to include all the compulsory modules for each year.

| YEAR | FIRST | | | SECOND | | | THIRD | |
|----------------------------------|-----------------------------------------|-------------------------------------------------------------|----|-----------------------------------------|-----------------------------------------|----|--------------------------------------------------|------------------|
| SEMESTER | FIRST | SECOND | | FIRST | SECOND | | FIRST | SECOND |
| COMPULSORY C1 | WTW114 WKS114 FBS114 EECF61406 | WTW124 WKS124 EECF62406 FBS122 ATW164 RIS182 | C2 | ATW216 WTW214 WKS216 EECS71407 | ATW226 WTW244 WKS226 EECS72407 | C3 | *ATW306 *ATW396 ATW316 WKS314 WKS334 | WKS324 WKS344 |
| ELECTIVE | | | | WTW254 | | | | |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | BRS121 | | | | | | |

11.4.1.3 BACHELOR OF SCIENCE IN AGRICULTURAL ECONOMICS 41100

LEARNING PROGRAMMES FOR AGRICULTURAL ECONOMICS

The objective is to train scientists who, through research and practically orientated development, can promote a scientific subject in particular or agricultural science in general. After acquiring the BScAgric qualification, the person will have the following skills, e.g. problem identification and aim formulation, collecting and verification of data, systematisation and interpretation of data, effective communication of information and making recommendations.

the compulsory modules (row C1) from the prescribed disciplines for all three study years. Students must select sufficient other modules (other science subjects as supportive electives) from the compulsory row of any other discipline or from their own electives (E) to obtain at least 120 credits for each year of study.

Learning programmes in this **FIELD OF INTEREST** offer **ONE** option. Each student includes all

| YEAR | FIRST | | | SECOND | | | THIRD | |
|----------------------|----------------------------------------|-----------------------------------------------|----|-------------------------------------------------------|-----------------------------------------|----|-----------------------------------------------------------------|-------------------------------------------------------|
| SEMESTER | FIRST | SECOND | | FIRST | SECOND | | FIRST | SECOND |
| COMPULSORY C1 | WTW134 STK114 BLGY1513 LEK114 | LEK124 WTW144 STK124 | C2 | LEK214 EECF61306 STK216 | LEK224 STK226 RIS182 EECF62306 | C3 | LEK314 LEK334 STK316 | LEK324 LEK344 LEK361 STK326 |
| ELECTIVE | | ONE OF GKG124 VWW124 BLGY1643 | | ONE OF AGR214 GKD214 VKD214 WDK224 | ONE OF AGR224 VKD224 | | ONE OF AGR314 VKD314 VKD334 GKD314 WDK314 | ONE OF AGR324 VKD324 GKD324 WDK324 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% | BRS121 | | | | | | |
| | *ALN108 or AFA108 | | | | | | | |

11.4.1.4 BACHELOR OF SCIENCE CONSUMER SCIENCES 42301 (4354)

LEARNING PROGRAMMES FOR CONSUMER SCIENCE

After completion of the BSc Consumer Science programme the student will be capable to follow a career in the food industry. The major subjects are Foods and Food Science. **Learning programmes in the CONSUMER SCIENCE FIELD OF INTEREST offer one option**, that takes four years and exits at at NQF Level 8. Each student includes all the compulsory modules (row C1) from the

prescribed disciplines for all three study years and select sufficient other modules (other science subjects as supportive electives) from the compulsory row to obtain a total of at least 120 credits for each year of study.

| YEAR | FIRST | FIRST | SECOND | SECOND | THIRD | THIRD | FOURTH | FOURTH |
|----------------------|------------------------------------------|------------------------------------------------------|--------------------------------------------------|--------------------------------------------|------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|
| SEMESTER | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 CNFD1532 | BLGY1643 BLGY1683 CEM144 BMT124 CNCS1622 | BCC214 MKB216 CNFD2614 VWS212 VWS232 | EBUS66406 CNFD2624 VWS244 V WS222 | CNFD3713 CNFD3732 VDG314 VWS314 | CNFD3744 VWS324 CNCS3724 VWS344 | CNCS4809 R Select 76 credits from CNCS4814 CNFD4808 VDG408 VWS414 VWS454 VWS474 VWS434 | VWS464 CNCS4824 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% | BRS121 | | | | | | |
| | *ALN108 or AFA108 | | | | | | | |

11.4.1.4 BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES

BIOLOGICAL SCIENCES FIELDS OF INTEREST 1: 41920, 41927, 41931, 41939, 41949, 42027, 42031, 42039, 42049, 42731, 42739, 42749, 43139, 43149, 43949.
(4306, 4302, 4304, 4307, 4305, 4503)

| LEARNING PROGRAMMES BIOLOGICAL SCIENCES FIELDS OF INTEREST 1 | | | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|----------|------------|----------|
| <p>Learning programmes in the BIOLOGICAL FIELD OF INTEREST 1 offer 15 options with a combination of any two of the six disciplines. Learning programmes consist of the combination of any two majors, e.g. Biochemistry and Microbiology, Biochemistry and Genetics, Biochemistry and Botany, Biochemistry and Entomology, Biochemistry and Zoology, Microbiology and Genetics, Microbiology and Botany, Microbiology and Entomology or Microbiology and Zoology. Students SELECT TWO DISCIPLINES and include all the</p> | | | | | | | <p>compulsory modules in row (C1, C2, and C3) of each of the selected disciplines for all three study years. Students need to SELECT enough elective modules per semester from the compulsory row (C1, C2, and C3) of any other discipline or from the elective row (E) for their selected disciplines to obtain at least 120 credits for each study year.</p> | | | | | |
| DISCIPLINE | BIOCHEMISTRY | MICROBIOLOGY | GENETICS | BOTANY | ENTOMOLOGY | ZOOLOGY | BIOCHEMISTRY | MICROBIOLOGY | GENETICS | BOTANY | ENTOMOLOGY | ZOOLOGY |
| OLD CODE | 4306 | 4305 | 4307 | 4302 | 4304 | 4303 | 4306 | 4305 | 4307 | 4302 | 4304 | 4303 |
| DISCIPLINE CODE | 19 | 39 | 31 | 20 | 27 | 49 | 19 | 39 | 31 | 20 | 27 | 49 |
| YEAR | FIRST | | | | | | FIRST | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY | BLGY1513 | BLGY1513 | BLGY1513 | BLGY1513 | BLGY1513 | BLGY1513 | BLGY1623 | BLGY1623 | BLGY1623 | BLGY1623 | BLGY1623 | BLGY1623 |
| C1 | CEM114 | CEM114 | CEM114 | CEM114 | CEM114 | CEM114 | BLGY1643 | BLGY1643 | BLGY1643 | BLGY1643 | BLGY1643 | BLGY1643 |
| | FSK134 | FSK134 | FSK134 | FSK134 | FSK134 | FSK134 | BLGY1663 | BLGY1663 | BLGY1663 | BLGY1663 | BLGY1663 | BLGY1663 |
| | WTW114 OR | WTW114 OR | WTW114 OR | WTW114 OR | WTW114 OR | WTW114 OR | BLGY1683 | BLGY1683 | BLGY1683 | BLGY1683 | BLGY1683 | BLGY1683 |
| | WTW134 | WTW134 | WTW134 | WTW134 | WTW134 | WTW134 | BMT124 | BMT124 | BMT124 | BMT124 | BMT124 | BMT124 |
| | | | | | | | CEM144 OR | CEM144 OR | CEM144 OR | CEM144 | CEM144 | CEM144 |
| | | | | | | | CEM124 | CEM124 | CEM124 | | | |
| REQUIRED | BRS111 | BRS111 | BRS111 | BRS111 | BRS111 | BRS111 | BRS121 | BRS121 | BRS121 | BRS121 | BRS121 | BRS121 |
| | UFS101 | UFS101 | UFS101 | UFS101 | UFS101 | UFS101 | | | | | | |
| *if NBT < 65% | *ALN108 OR AFA | *ALN108 OR AFA | *ALN108 OR AFA | *ALN108 OR AFA | *ALN108 OR AFA | *ALN108 OR AFA | | | | | | |
| | 104 | 104 | 104 | 104 | 104 | 104 | | | | | | |
| YEAR | SECOND | | | | | | SECOND | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| C2 | BOC216 | MKB216 1 | GEN216 | PLK216 | ENT216 | DRK216 | BOC226 | MKB226 | GEN246 | PLK226 | ENT226 | DRK226 |
| | | | | PLK202 | | | | | | | | |
| C2 | | BOC216 | | | | | | BOC226 | | | | |
| ELECTIVES | CEM214 | CEM214 | FFG216 | | AGR214; | ANA216 | CEM224 | IQM242 | FFG226 | | AGR224 | ANA226 |
| | CEM232 | CEM232 | | | AGR324; | HTG214 | CEM242 | CEM224 | | | HRT324 | HTG224 |
| | FFG216 | STK216 | | | HTG214 | | FFG226 | CEM242 | | | PPG324 | |
| | STK216 | VWS212; | | | | | VWS222 + | VWS222 + | | | PLT224 | |
| | VWS212; VWS232 | VWS232 | | | | | WVS224 | WVS224 | | | | |
| | WTW214 | | | | | | STK226 | STK226 | | | | |
| | | | | | | | WTW224 | WTW224 | | | | |
| YEAR | THIRD | | | | | | THIRD | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| C3 | BOC314 | MKB314 | GEN334 | PLK302 | ENT314 + | DRK314 | BOC324 | MKB324 | GEN324 | PLK324 | ENT324+ | DRK324 |
| | BOC334 | | GEN354 | PLK314 | ENT334 OR | DRK334 | BOC344 | ONE OF | GEN344 | PLK344 | ENT344 | DRK344 |
| | | | | ONE OF | ENT354 | | | MKB344 | | | | |
| | | | | PLK334 | | | | MKB364 | | | | |
| | | | | PLK354 | | | | VWS344 | | | | |
| C3 | | BOC314 | | | | | | | | | | |
| ELECTIVES | FFG316 FFG332 | STK316 | MBG314 | | AGR314; | ANA316+ | VWS324 + | VWS324 | MKB344 | | AGR324; | ANA326 |
| | STK316 | VWS314 VWS334 | MBG334 | | PPG414; | ANA304; | VWS344 | STK326 | MKB364 | | PPG424; | |
| | VWS314 VWS334 | | FFG316 | | PP6434; | HTG304; | STK326 | MKB344 | VWS344 | | PPG444; | |
| | | | FFG332 | | PLT314 | | | MKB364 | FFG326 | | PLT424 | |
| | | | | | | | | VWS344 | FFG342 | | | |

BIOLOGICAL SCIENCES FIELDS OF INTEREST 2: 43118, 43161, 43130 (4376, 4377)

LEARNING PROGRAMMES IN BIOLOGICAL SCIENCES FIELDS OF INTEREST 2

Learning programmes in the **BIOLOGICAL SCIENCES FIELDS OF INTEREST 2 offer 3 options** with a Behavioural Genetics (Genetics and Psychology), Human Molecular Biology or Forensics Sciences. Students **SELECT TWO DISCIPLINES** and include all the compulsory modules in row (C1, C2, and C3) of each of the selected disciplines for all three study years. Students need to

SELECT enough elective modules per semester from the compulsory row (C1, C2, and C3) of any other discipline or from the elective row (E) for their selected disciplines to obtain at least 120 credits for each study year.

| DISCIPLINE | BEHAVIOURAL GENETICS | HUMAN MOLECULAR BIOLOGY | FORENSIC SCIENCES | BEHAVIOURAL GENETICS | HUMAN MOLECULAR BIOLOGY | FORENSICS SCIENCES |
|-----------------|-----------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------|
| OLD CODE | 4377 | 4376 | 43 | 4377 | 4376 | |
| DISCIPLINE CODE | 43118 | 43161 | 43130 | 43118 | 43161 | 43130 |
| YEAR | FIRST | | | FIRST | | |
| SEMESTER | FIRST | | | SECOND | FIRST | |
| COMPULSORY C1 | BLGY1513 CEM114 PSY 112+ PSY152 WTW114 or WTW134 | BLGY1513 CEM114 FSK134 WTW114 or WTW134 | BLGY1513 CEM114 FSK134 or FSK114 WTW114 or WTW134 | PSY124 BLGY1623 BLGY1663 BLGY1683 BMT124 CEM124 or CEM144 BRS121 | BLGY1623 BLGY1643 BLGY1663 BLGY1683 CEM144 BMT124 BRS121 | BLGY1623 BLGY1663 CEM124 FSK144 or FSK124 WTW144 BRS121 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% *ALN108 OR AFA 104 | BRS111 UFS101 *ALN108 OR AFA 104 | BRS111 UFS101 *ALN108 OR AFA 104 | | | |
| YEAR | SECOND | | | SECOND | | |
| SEMESTER | FIRST | | | SECOND | | |
| COMPULSORY C2 | GEN216 PSY212 PSY232 | GEN216 | FORS2616 GEN216 CEM214 CEM232 | GEN246 PSY224 | GEN246 | FORS2626 GEN246 CEM224 CEM242 |
| ELECTIVES (E) | DRK216 FFG216 | BOC216 DRK216 FFG216 MKB216 | | DRK226 FFG226 | BOC226 DRK226 FFG226 MKB226 | |
| YEAR | THIRD | | | THIRD | | |
| SEMESTER | FIRST | | | SECOND | | |
| COMPULSORY C3 | GEN334 GEN354 PSY312 PSY332 | GEN334 GEN354 MBG314 MBG334 | GDF314 GDF334 | GEN324 GEN344 PSY324 | GEN324 GEN344 MBG324, MBG344 | GDF324 GDF344 |
| ELECTIVES (E) | DRK314,DRK334 FFG316 FFG332 MBG314, MBG334 | | GEN314 + GEN354 CEM314 +CEM334 | DRK324,DRK344 FFG326, FFG342; MBG324,MBG344 | | GEN324 + GEN344 CEM324 + CEM344 |

BIOLOGICAL SCIENCES FIELDS OF INTEREST 3: 42070,42041, 42042, 42057

| LEARNING PROGRAMMES BIOLOGICAL SCIENCES FIELDS OF INTEREST 3 | | | | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------|
| Learning programmes in the BIOLOGICAL SCIENCES FIELDS OF INTEREST 3 offer 4 options, Plant health Ecology, Botany and Plant Pathology, Botany and Plant Breeding, Environmental Rehabilitation with Botany as a major in combination with other modules. Each student selects all | | | | | the compulsory modules (rows C1, C2, C3) for each study year and chooses modules as supportive electives (E) per semester to obtain at least 120 credits for each study year. | | | |
| DISCIPLINE | PLANT HEALTH ECOLOGY | BOTANY AND PLANT PATHOLOGY | BOTANY AND PLANT BREEDING | ENVIRONMENTAL REHABILITATION | PLANT HEALTH ECOLOGY | BOTANY AND PLANT PATHOLOGY | BOTANY AND PLANT BREEDING | ENVIRONMENTAL REHABILITATION |
| OLD CODE | | | | | | | | |
| NEW CODE | 42070 | 42042 | 42041 | 42057 | 42070 | 42042 | 42041 | 42057 |
| YEAR | FIRST | | | | FIRST | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW114 or WTW134 | BLGY1513 CEM114 FSK134 WTW114 or WTW134 | BLGY1513 CEM114 FSK134 WTW114 or WTW134 | BLGY1513 CEM114 GLG114 WTW134 | BLGY1663 BLGY1643 CEM144 BMT124 GKG124 VWW124 | BLGY1623 BLGY1643 BLGY1663 BLGY1683 CEM144 BMT124 | BLGY1623 BLGY1643 BLGY1663 BLGY1683 CEM144 BMT124 | BLGY1643 BLGY1663 BMT124 GKG124 GLG124 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% *ALN108 OR AFA 104 | | | | BRS121 | | | |
| YEAR | SECOND | | | | SECOND | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| | ENT216 MKB216 ONE OF GKD214 LWR214 PLK216 WDK214 | PLK216 GKD214 MKB216 | PLK216 GEN216 ONE OF BOC216 ENT216 MKB216 | PLK216 GKD214 GLG212 GLG214 | ENT226 PPG224 ONE OF AGR224 LWR224 PLK226 | PLK226 PLK202 PLT224 PPG224 | PLK226 PLK202 PLT224 ONE OF BOC226 ENT226 GEN246 MKB226 | PLK202 PLK226 GKD224 GLG242 GLG244 |
| YEAR | THIRD | | | | THIRD | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| | ENT314 PPG314 PPG334 ONE OF ENT354 PLK334 | PLK302 PLK314 PLK354 PPG314 PPG334 | PLK302 PLK314 PLK334 PLK354 PLT314 | PLK302 PLK314 PLK334 GKD314 GLG374 | ENT324 PPG324 PPG344 ONE OF LWR324 PLK344 | PLK324 PLK344 PPG324 PPG344 | PLK324 PLK344 PLT324 PLT344 | PLK324 PLK344 GKD324 GLG384 |

11.4.1.5 BACHELOR OF SCIENCE IN BUILDING SCIENCES

BUILDING SCIENCES FIELDS OF INTEREST 1: 42401, 42402, 42403, 44301, 44302

A degree for the academic preparation of a candidate for the profession of Quantity Surveying and Construction Management. Learning programmes in the BUILDING SCIENCES FIELDS OF INTEREST 1 offer Five options.,. Each student selects all the compulsory modules (rows C1, C2,

C3) for each study year and chooses modules as supportive electives (E) per semester to obtain at least 120 credits for each study year.

| | 1 | | 2 | | 3 | | 4 | |
|---------------|-----------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------|
| DISCIPLINE | BSc CONSTRUCTION MANAGEMENT (RES) | | BSc QUANTITY SURVEYING (RES) | | BSc CONSTRUCTION MANAGEMENT (DL) | | BSc QUANTITY SURVEYING (DL) | |
| New code | 42401 | | 44301 | | 42402 | | 44302 | |
| | 4387 | | 4386 | | 4392 | | 4324 | |
| | 376 CREDITS | | 376 CREDITS | | 376 CREDITS | | 376 CREDITS | |
| YEAR | FIRST | | | | FIRST | | | |
| SEMESTER | FIRST | | | | FIRST | | | |
| COMPULSORY C1 | POB104 BOE104 END104 FSK112 EBUS51305 STK114 EACC61406 OR | WTW142 EACC62406 | BKF104 BOE104 END104 FSK112 EBUS51305 STK114 EACC61406 OR | WTW142 EACC62406 | COE104 FSK112 EBUS51305 PQM104 PDE104 STK114 EACC61406 OR | WTW142 EACC62406 | COE104 DQF104 FSK112 EBUS51305 PDE104 STK114 EACC61406 OR | WTW142 EACC62406 |
| ELECTIVES | EBE112 IGW104 ENG104 | EBE122 STK124 | EBE112 IGW104 ENG104 | EBE122 STK124 | EBE112 EGS104 ENG104 | EBE122 STK124 | EBE112 EGS104 ENG104 | EBE122 STK124 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% *ALN108 or AFA108 | BRS121 | BRS111 UFS101 *ALN108 or AFA108 | BRS121 | | | | |
| YEAR | SECOND | | | | SECOND | | | |
| SEMESTER | FIRST | | | | FIRST | | | |
| COMPULSORY C2 | BOW204 BOE204 END204 EECF61306 HRG204 KWE204 POB204 | | BKF204 BOE204 BOW204 END204 EECF61306 KWE204 HRG204 | | BSC204 CSC204 COE204 EECF61306 HRG204 PDE204 PQM204 | | BSC204 CSC204 COE204 DQF204 EECF61306 HRG204 PDE204 | |
| ELECTIVES | EBUS61406 ARG204 | EBUS62406 EECF62306 | EBUS61406 ARG204 | EBUS62406 EECF62306 ABR224 | EBUS61406 ARG204 | EBUS62406 EECF62306 | EBUS61406 ARG204 | EBUS62406 EECF62306 |
| YEAR | FIRST | FIRST | THIRD | THIRD | FIRST | FIRST | THIRD | THIRD |
| SEMESTER | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND | FIRST | SECOND |
| COMPULSORY C3 | BKR306 BKR304 POB306 END304 KOF304 KWE304 TBW304 | | BKF304 BOW304 BKR306 BOE304 END304 KWE304 BKS304 | | ABSR3704 CCM306 CEN304 CFNR3704 DCP304 PQM304 PDE304 | | BSC304 CCM306 COE304 CSC304 DQF304 DQS304 PDE304 | |
| ELECTIVES | | | EBUS74407 POB304 | | | | EBUS74407 PQM306 | |

BSc CONSTRUCTION MANAGEMENT (FACILITIES MANAGEMENT)

A degree for the academic preparation of a candidate for the profession of Quantity Surveying and Construction Management. Learning programmes in the BUILDING SCIENCES FIELDS OF INTEREST 1 offers FOUR options,. Each student selects all the compulsory modules (rows C1, C2,

C3) for each study year and chooses modules as supportive electives (E) per semester to obtain at least 120 credits for each study year. Students who register for Facilities Management as focus area/ speciality have to enrol for the following compulsory and elective modules.

| NEW CODE | 42458 | 42458 | | 42458 | 42458 | | 42458 | 42458 |
|-------------------|----------------------------------------------------------|------------------|--|-----------------------------------------------------------------------|------------------------|--|------------------------------------------------------------------------------------------------------|--------|
| OLD CODE | 4392 | 4392 | | 4392 | 4392 | | 4392 | 4392 |
| YEAR | FIRST | FIRST | | SECOND | SECOND | | THIRD | THIRD |
| SEMESTER | FIRST | SECOND | | FIRST | SECOND | | FIRST | SECOND |
| COMPULSORY | COE104 FSK112 PFM106 PQM104 SBE104 STK114 | WTW142 STK124 | | BSC204 CSC204 PFM206 EECF61306 HRG204 PQM204 PDE104 | | | ABSR3704 Coe204 CCM306 CEN304 CFNR3704 DCP304 PQM304 PDE204 PDE304 Pfn306 | |
| ELECTIVES | EACC61406 OR EBUS51305 EECF61306 EGS104 | EACC62406 | | 16 CREDITS OF EBUS61406 ARG204 STK114 | EBUS62406 EECF62306 | | DQF304 EBUS74407 | |

11.4.1.6 BACHELOR OF SCIENCE IN CHEMICAL AND PHYSICAL SCIENCES

PHYSICAL AND CHEMICAL SCIENCES FIELDS OF INTEREST 44017, 44012, 44026, 42140, 42119, 42120, 42129,42139

LEARNING PROGRAMMES PHYSICAL AND CHEMICAL SCIENCES FIELDS OF INTEREST 1

Learning programmes in chemical and physical sciences offer FIVE main options with either

- Physic and Chemistry as the two majors or
- Physic and Engineering Subjects or
- Physics and Astrophysics, as the two majors or
- Chemistry in combination Biological Subjects as the other majors.
- Physics and Agrometeorology, as the two majors or

Each student chooses at least two disciplines and includes all the compulsory modules (rowC1) for all three study years and all other modules in the compulsory row C2. Students need to choose enough electives modules (other science subjects as supportive electives (row E1) per semester from the compulsory row of any other discipline or from their own electives (E) to obtain at least 120 credits per year in the first year and the second year.

(Disciplines follow on next page.)

| DISCIPLINE | PHYSICS | ASTROPHYSICS | AGROMETEOROLOGY | ENGINEERING SUBJECTS | CHEMISTRY | BIOLOGICAL SUBJECTS | PHYSICS | ASTROPHYSICS | AGROMETEOROLOGY | ENGINEERING SUBJECTS | CHEMISTRY | BIOLOGICAL SUBJECTS |
|----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| | 40 | 17 | 12 | 26 | 21 | 19,20,39,29 | 40 | 17 | 12 | 26 | 21 | 19,20,29,39 |
| YEAR | FIRST | | | | | | FIRST | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C1 | FSK114 | FSK154 | | TWG114 | CEM114 | BLGY1513 | FSK124 | FSK164 | GKG124 | TWG124 | CEM124 | BLGY1683 BLGY1643 |
| | WTW114 OR WTW134 | WTW114 | WTW114 OR WTW134 | WTW114 CEM114 CISE1606 QALC1510 | WTW114 OR WTW134 | WTW114 OR WTW134 | WTW124 OR WTW144 | WTW124 OR WTW144 | WTW124 OR WTW144 | WTW124 QEDR1524 QEFO1520 | WTW124 OR WTW144 | BMT124 WTW144 |
| ELECTIVES | RIS114 OR RIS134 WKS114 | RIS114 OR RIS134 WKS114 | | | RIS114 OR RIS134 WKS114 FSK134 | RIS114 OR RIS134 WKS114 FSK134 | RIS124 OR RIS144 WKS124 STK124 GKG124 | RIS124 OR RIS144 WKS124 STK124 | | | RIS124 OR RIS144 WKS124 STK124 FSK144 | |
| REQUIRED *if NBT < 65% | BRS111 & UFS101 *ALN108 OR AFA108 | | | | | | BRS121 | | | | | |
| YEAR | SECOND | | | | | | SECOND | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C2 | FSK214 FSK232 | AST251 AST252 AST255 | LWR214 | TWG214 WTW214 | CEM232 CEM214 | ONE OF: BOC216 MKB216 PLK216 VWS212+VWS232 | FSK224 FSK242 | WTW244 | LWR224 | WTW244 WTW264 | CEM242 CEM224 | ONE OF: BOC226 MKB226 PLK226 VWS222+VWS224 |
| ELECTIVES | WTW214 WTW234 WTW254 WKS216 | WTW214 WTW234 WTW254 WKS216 | WTW214 WTW234 WTW254 WKS216 | QMAD2612 QMSC2613 CISE2613 QMAT2613 | WTW214 WTW234 WTW254 WKS216 | | WTW244 WTW224 WTW264 WKS226 | WTW224 WTW264 WKS226 | WTW244 WTW224 WTW264 WKS226 | QSTR2624 QELT2722 RIN182 QWOR2520 QVAC2520 | WTW244 WTW224 WTW264 WKS226 | |
| YEAR | THIRD | | | | | | THIRD | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C3 | FSK314 FSK332 FSK352 | FSK372 AST354 AST355 | LWR314 | QSM 314 WTW254 WTW374 | CEM314+ CEM334 | ONE OF: BOC314+BOC334 MKB314+ BOC314 PLK314+PLK334 or PLK354 VWS314+VWS334 | FSK324+ FSK342+ FSK362+ | WTW384 FSK382 | LWR324 | Choose ONE stream PHYSICS: FSK324+ FSK342+ FSK362 ENG.: QTHE3724 and QENV3724 | CEM324 CEM344 | ONE OF: BOC324+BOC344 MKB324+ MKB344 or MKB364 OR VWS344 PLK324+PLK344 VWS324+VWS344 |
| C3 | | | | | | | | | | | | |
| ELECTIVES | NEC302 | NEC302 | NEC302 | ONE OF: QSUR3614 and QSTR3714 OR CISE3614 And QSIG3714 | NEC302 | NEC302 | | | | | | |

11.4.1.7 BACHELOR OF SCIENCE IN COMPUTER AND INFORMATION TECHNOLOGY
COMPUTER AND INFORMATION TECHNOLOGY FIELD OF INTEREST I: 42221, 42237, 42238, 42240, 42253

LEARNING PROGRAMMES IN INFORMATION TECHNOLOGY BSc(IT)

Learning programmes in Information Technology offer SIX main options with either

- Information Technology Specialisation
- Information Technology and Mathematics as the majors
- Information Technology and Chemistry as the majors
- Information Technology and Physics as the majors
- Information technology and Business subjects
- Information Technology and Math. Stats. as the majors

Students SELECT ONE option and include all the compulsory modules in row C1,2,3 for all three study years. Students need to SELECT enough elective modules per semester from the compulsory row (C1) of any other subject field or from their own electives (E) to obtain at least 120 credits per year in the first year and the second year.

| DISCIPLINE | CHEMISTRY | MATHEMATICS | MATHEMATICAL STATISTICS | PHYSICS | BUSINESS | CHEMISTRY | MATHEMATICS | MATHEMATICAL STATISTICS | PHYSICS | BUSINESS |
|---------------------------|------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| | 21 | 38 | 37 | 40 | 53 | 21 | 38 | 37 | 40 | 53 |
| YEAR | FIRST | | | | | FIRST | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C1 | RIS114 RIS153 CEM114 ONE OF: WTW114 WTW134 | RIS114 RIS153 WTW114 ONE OF: CEM114 FSK134 | RIS114 RIS153 WKS114 WTW114 | RIS114 RIS153 FSK114 ONE OF: WTW114 WTW134 | RIS114 RIS153 ONE OF: EHRM51405 EBUS51405 ONE OF: STK114 WTW174 WTW134 | RIS124 RIS164 CEM124 ONE OF: WTW144 WTW124 | RIS124 RIS164 WTW124 ONE OF: CEM124 FSK144 | RIS124 RIS164 WKS124 ONE OF: WTW144 WTW124 | RIS124 RIS164 FSK124 ONE OF: WTW144 WTW124 | RIS124 RIS164 ONE OF: EIOP52405 EACC62406 ONE OF: STK124 WTW184 WTW144 |
| ELECTIVES | | | | | | RIS182 | RIS182 | RIS182 | RIS182 | RIS182 |
| REQUIRED *if NBT < 65% | BRS111 & UFS101 *ALN108 OR AFA108 | | | | | BRS121 | | | | |
| YEAR | SECOND | | | | | SECOND | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C2 | RIS214 RIS294 CEM214 CEM232 | RIS214 RIS294 WTW254 WTW214 | RIS214 RIS294 WKS216 | RIS214 RIS294 FSK214 FSK232 | RIS214 RIS294 STK216 EBUS63406 | RIS224 RIS264 CEM224 CEM242 | RIS224 RIS264 WTW224 or WTW244 or WTW264 | RIS224 RIS264 WKS226 | RIS224 RIS264 FSK224 FSK242 | RIS224 RIS264 STK226 EBUS62406 or EBUS66406 |
| ELECTIVES | WTW254 WTW234 | WTW234 | WTW254 WTW214 WTW234 | WTW254 WTW214 WTW234 | EECF61306 | WTW244 RIS242 | RIS242 | WTW244 WTW264 RIS242 | WTW244 RIS242 | EECF62306 RIS242 |
| YEAR | THIRD | | | | | THIRD | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C3 | RIS314 RIS334 CEM314 CEM334 | RIS314 RIS334 WTW374 ONE OF: WTW314 or WTW334) | RIS314 RIS334 WKS314 WKS334 | RIS314 RIS334 FSK314 FSK332 FSK352 | RIS314 RIS334 ONE OF: EBUS77407 + EBUS72507 OR STK316 + STK332 | RIS324 RIS344 CEM324 CEM344 | RIS324 RIS344 WTW324 ONE OF: WTW344 WTW384 | RIS324 RIS344 WKS324 WKS344 | RIS324 RIS344 FSK324 FSK342 FSK362 | RIS324 RIS344 ONE OF: EBUS74407 + ETRG71407 OR STK326 + STK342 |

11.4.1.8 BACHELOR OF SCIENCE IN GEOGRAPHY

GEOSCINCES FIELD OF INTEREST 1: 43360, 43346, 43354, 43312 (4364)

LEARNING PROGRAMMES IN GEOSCIENCES FIELD OF INTEREST I

The learning programmes in Geography and the Environmental sciences are studies of the properties and processes in the earth and on the surface and encompass a holistic study of the human environment and accompanying interactions and relationships. The programme is aimed at students who are interested in various aspects of the environment and can lead to specialisation as environmentalists. Careers in these sciences are divergent because all institutions that are involved with resource utilisation are legally obliged

to examine the impact of their activities on the environment. The connection of geographical information and computer technology simplifies the storage, processing, modelling and presentation of information and expedites decision making.

Each student selects all the compulsory modules (rows C1, C2, C3) for all three study years and chooses modules as supportive electives (E) per semester to obtain at least 120 credits for each year of study.

| DISCIPLINE | GEO-INFORMATICS | GEOGRAPHY AND STATISTICS | GEOGRAPHY AND ENVIRONMENTAL SCIENCES | GEOGRAPHY AND AGROMETEOROLOGY | GEO-INFORMATICS | GEOGRAPHY AND STATISTICS | GEOGRAPHY AND ENVIRONMENTAL SCIENCES | GEOGRAPHY AND AGROMETEOROLOGY |
|----------------------|---------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------|-----------------------------------------------------|---------------------------------------------------|
| NEW CODE | 43360 | 43346 | 43354 | 43312 | 43360 | 43346 | 43354 | 43312 |
| OLD CODE | 4382 | | 4364 | | 4382 | | 4364 | |
| YEAR | FIRST | | | | FIRST | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C1 | GEO114 RIS114 WTW134 FSK114 EBUS51305 | GEO114 RIS134 EBUS51305 STK114 OR WTW134 | GEO 114 EBUS51305 BLG 1513 GLG 114 STK114 OR WTW134 | GEO 114 EBUS51305 BLG 1513 GLG 114 STK114 OR WTW134 | GEO124 RIS124 RIS164 STK124 | GEO124 STK124 RIS 144 GKG124 | GEO124 STK124 BLGY1643 BLGY1663 GKG 124 | GEO124 STK124 BLG1643 BLGY1663 GKG124 |
| REQUIRED | BRS111 UFS101 | BRS111 UFS101 | BRS111 UFS101 | BRS111 UFS101 | BRS121 | BRS121 | BRS121 | BRS121 |
| *if NBT < 65% | *ALN108 OR AFA 104 | *ALN108 OR AFA 104 | *ALN108 OR AFA 104 | *ALN108 OR AFA 104 | | | | |
| YEAR | SECOND | | | | SECOND | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C2 | GEO214 GEO234 KWE204 RIS294 RIS214 | GEO214 GEO234 STK 216 | GEO214 GEO234 GKD214 | GEO214 GEO234 GKD 214 LWR 214 | GEO224 GIS224 EBUS74407 RIS264 | GEO224 GIS224 EBUS74407 STK226 | GEO224 GIS224 GKD224 | GEO224 GIS224 GKD224 LWR224 |
| ELECTIVES E1 | | | PLK216 + PLK202 OR DRK216 | | | | PLK226 OR DRK226 | |
| YEAR | THIRD | | | | THIRD | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C3 | GEO334 GEO314 RIS334 RIS354 | GEO334 GEO314 STK316 STK332 | GEO334 GKD314 | GEO334 GEO314 GKD314 LWR314 | GE 324 GIS324 RIS 364 RIS 344 RIS 384 | GEO324 GIS324 STK326 STK342 | GEO324 GIS324 GKD324 EBUS74407 | GEO324 GIS324 GKD324 LWR324 |
| ELECTIVES E1 | | | PLK302 + PLK314 + PLK334 + OR DRK334 + DRK314 | | | | | |

11.4.1.9 BACHELOR OF SCIENCE IN GEOLOGY

GEOSCIENCES FIELD OF INTEREST 2: 43535, 43528, 43532, 43521, 43533, 43540 (4361, 4362, 4365)

| LEARNING PROGRAMMES IN GEOSCIENCES FIELD OF INTEREST 2 | | | | | | | | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Learning programmes in GEOLOGY FIELD OF INTEREST 1 offer SIX main options with either: | | | | | | | student enrolls for or all compulsory modules in compulsory rows (C1, C2, C3). If electives are available the students need to choose enough elective modules (E) per semester to obtain at least 120 credits in each study year. | | | | | |
| Geology specialisation, Geochemistry, Environmental Geology, Geology and Chemistry as the two majors, Geology and Geography as the other majors, Geology and Physics as the two majors. Each | | | | | | | | | | | | |
| DISCIPLINE | GEOLOGY | GEOCHEMISTRY | ENVIRONMENTAL GEOLOGY | CHEMISTRY | GEOGRAPHY | PHYSICS | GEOLOGY | GEOCHEMISTRY | ENVIRONMENTAL GEOLOGY | CHEMISTRY | GEOGRAPHY | PHYSICS |
| CODE | 43535 | 43532 | 43528 | 43521 | 43533 | 43540 | 43535 | 43532 | 43528 | 43521 | 43533 | 43540 |
| YEAR | FIRST | | | | | | FIRST | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C | GLG114 CEM114 | GLG114 CEM114 FSK114 | GLG114 CEM114 GEO114 | GLG114 CEM114 | GLG114 CEM114 GEO114 | GLG114 CEM114 FSK114 | GLG124 | GLG124 CEM124 or CEM144 WTW144 | GLG124 GKG124 EBUS62406 | GLG124 CEM124 | GLG124 GEO114 | GLG124 FSK124 |
| ELECTIVES E | WTW134 or STK114 | WTW134 | WTW134 or STK114 | WTW134 | WTW134 or STK114 | WTW134 | STK124 | STK124 | STK124 | STK124 | STK124 | STK124 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% *ALN108 OR AFA108 | | | | | | BRS121 | | | | | |
| YEAR | SECOND | | | | | | SECOND | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY | GLG202 GLG212 GLG214 GLG232 GLG252 ONE OF CEM214 GEO234 FSK214 | GLG202 GLG212 GLG214 GLG232 GLG252 CEM232 CEM214 | GLG202 GLG212 GLG214 GLG232 GLG252 GKD214 | GLG202 GLG212 GLG214 GLG232 GLG252 CEM232 CEM214 | GLG202 GLG212 GLG214 GLG232 GLG252 GEO214 GEO234 | GLG202 GLG212 GLG214 GLG232 GLG252 FSK214 FSK232 | GLG222 GLG224 GLG242 GLG244 GIS224 | GLG222 GLG224 GLG242 GLG244 CEM242 | GLG222 GLG224 GLG242 GLG244 GKD224 GIS224 | GLG222 GLG224 GLG242 GLG244 CEM242 CEM224 | GLG222 GLG224 GLG242 GLG244 GEO224 GIS224 | GLG222 GLG224 GLG242 GLG244 FSK224 FSK242 |
| YEAR | THIRD | | | | | | THIRD | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY | GLG314 GLG334 GLG354 GLG374 | CEM314 GLG314 GLG354 GLG374 | GKD314 GLG314 GLG354 GLG374 | CEM314+ CEM334 GLG314 ONE OF GLG334 GLG354 GLG374 | GEO314 GEO334 GLG314 ONE OF GLG334 GLG354 GLG374 | FSK314 FSK332 FSK352 GLG314 ONE OF GLG334 GLG354 GLG374 | GLG324 GLG344 GLG364 GLG384 | GLG324 GLG364 GLG384 ONE OF GLG344 CEM324 | GKD324 GLG324 GLG364 GLG384 | CEM324+ CEM344 GLG324 ONE OF GLG344 GLG364 GLG384 | GEO324 GIS324 GLG324 ONE OF GLG344 GLG364 GLG384 | FSK324+ FSK342+ FSK362+ FSK382 GLG324 ONE OF GLG344 GLG364 GLG384 |

11.4.1.10 BACHELOR OF SCIENCE IN MATHEMATICAL SCIENCES
MATHEMATICAL SCIENCES FIELDS OF INTEREST 1: 43816, 43821, 43837, 43840, 43859 (4331, 4394)

LEARNING PROGRAMMES IN MATHEMATICAL SCIENCES FIELDS OF INTEREST I

Learning programmes in Mathematics offer FIVE main options with a combination of disciplines:

- **Mathematics** and Applied Mathematics
- **Mathematics** and Chemistry
- **Mathematics** and Physics
- **Mathematics** and Mathematics Statistics
- **Mathematics** and Finances

Students SELECT Mathematical Statistics and one other DISCIPLINE and include all the compulsory modules in row (C1, C2, C3) of each of the selected disciplines for all three study years. Students need to SELECT enough elective modules per semester from the compulsory row (C1, C2, and C3) of any other discipline or from the elective row (E) for their selected disciplines to obtain at least 120 credits for each study year.

| DISCIPLINE | MATHEMATICS & APPLIED MATHEMATICS | MATHEMATICS & CHEMISTRY | MATHEMATICS & MATHEMATICAL STATISTICS | MATHEMATICS & PHYSICS | MATHEMATICS & FINANCE | MATHEMATICS & APPLIED MATHEMATICS | MATHEMATICS & CHEMISTRY | MATHEMATICS & MATHEMATICAL STATISTICS | MATHEMATICS & PHYSICS | MATHEMATICS & FINANCE |
|---------------------------|------------------------------------------|--------------------------------------|---------------------------------------|------------------------------------------------|--------------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------|
| OLD CODE | 4331 | 4331 | 4331 | 4331 | 4394 | 4331 | 4331 | 4331 | 4331 | 4394 |
| NEW CODE | 43816 | 43821 | 43837 | 43840 | 43859 | 43816 | 43821 | 43837 | 43840 | 43859 |
| YEAR | FIRST | | | | | FIRST | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C1 | WTW114 TGW114 | WTW114 CEM114 | WTW114 WKS114 | WTW114 FSK114 FSK154 | WTW114 EECF61406 WKS114 EACC61406 | WTW124 TGW124 RIS182 | WTW124 CEM124 | WKS124 RIS182 WTW124 | WTW124 FSK124 FSK164 | WTW124 EECF62406 WKS124 EACC62406 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 OR AFA108 | | | | | BRS121 | | | | |
| YEAR | SECOND | | | | | SECOND | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C2 | WTW214 TGW214 WTW234 WTW254 | WTW214 CEM214 CEM232 | WTW214 WKS216 | WTW214 FSK214 FSK232 | WTW214 EACC60806 EFEC61406 ATW216 | WTW224 WTW264 WTW244 | WTW224 WTW264 CEM224 CEM242 | WTW224 WTW264 WKS226 | WTW224 WTW264 FSK224 FSK242 | WTW224 WTW264 EACC60806 EFEC62406 ATW226 or ATW246 WKS226 |
| ELECTIVES E | | | | | | | | | | |
| YEAR | THIRD | | | | | THIRD | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C3 | WTW314 WTW334 WTW374 | WTW314 WTW334 CEM314 CEM334 | WTW314 WTW334 WKS314 WKS334 | WTW314 WTW334 FSK314 FSK332 FSK352 | WTW314 WTW334 WTW334 EECT71407 | WTW324 WTW344 WTW364 WTW384 | WTW324 WTW344 CEM324 CEM344 | WTW324 WTW344 WKS324 WKS344 | WTW324 WTW344 FSK324 FSK342 FSK362 | WTW324 WTW344 EBUS76407 |

MATHEMATICAL SCIENCES FIELDS OF INTEREST 2: 43712, 43755, 43701, 43773 (4331, 4394, 4396)

LEARNING PROGRAMMES IN MATHEMATICAL SCIENCES FIELDS OF INTEREST 2

Learning programmes in Mathematical Statistics offer FOUR main options with a combination of disciplines:

- **Mathematical Statistics** and Agrometeorology (**Climate Sciences**)
- **Mathematical Statistics** and Investment Sciences (**Investment Science**)
- **Mathematical Statistics** and Economics (**Econometrics**)
- **Mathematical Statistics** and Psychology (**Psychometrics**)

Students SELECT Mathematical Statistics and one other DISCIPLINE and include all the compulsory modules in row (C1, C2, C3) of each of the selected disciplines for all three study years. Students need to SELECT enough elective modules per semester from the compulsory row (C1, C2, and C3) of any other discipline or from the elective row (E) of their selected disciplines obtain of at least 120 credits for each study year.

| DISCIPLINE | CLIMATE SCIENCE | ECONOMETRICS | INVESTMENT SCIENCE | PSYCHOMETRICS | CLIMATE SCIENCE | ECONOMETRICS | INVESTMENT SCIENCE | PSYCHOMETRICS |
|-----------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------|
| OLD CODE | | 4396 | 4332 | 4333 | | 4396 | 4332 | 4333 |
| DISCIPLINE CODE | 43712 | 43755 | 43701 | 43773 | 43712 | 43755 | 43701 | 43773 |
| YEAR | FIRST | | | | 43712 | 43755 | 43700 | 43773 |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C1 | WKS114 RIS134 FSK134 WTW114 | WKS114 EECF61306 EACC61406 WTW114 | WKS114 EECF61406 EFAC61406 FBS114 WTW114 | WKS114 PSY112 PSY152 EHRM51305 WTW114 | WKS124 RIS144 GKG124 WTW124 | WKS124 EECF62406 EACC62406 WTW124 | WKS124 EECF62406 EFAC62406 FBS124 WTW124 | WKS124 PSY124 EFIP51505 WTW114 |
| REQUIRED | BRS111 UFS101 *if NBT < 65% *ALN108 or AFA108 | | | | BRS121 | | | |
| YEAR | SECOND | | | | SECOND | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C2 | WKS216 LWR214 WTW234 ONE OF WTW214 WTW254 | WKS216 WTW254 EECS71407 ONE OF WTW214 WTW234 *EACC60806 EFEC61406 | WKS216 ATW216 EECS71407 *EFAC70807 | PSY212 PSY232 WTW234 ONE OF WTW214 WTW254 | WKS226 LWR224 ONE OF WTW224 WTW244 WTW264 | WKS226 EECS72407 ONE OF *EACC60806 EFEC62406 WTW224 WTW244 WTW264 | WKS226 EECS72407 *EFAC70807 ATW246 WTW244 | WKS226 PSY224 ONE OF WTW244 WTW264 |
| YEAR | THIRD | | | | THIRD | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C3 | WKS314 WKS334 LWR314 ONE OF WTW314 WTW334 WTW374 | WKS314 WKS334 EECT71407 EFET71407 | WKS314 WKS334 *ATW396 ISC354 EFET71407 | WKS314 WKS334 PSY312 PSY332 ONE OF WTW314 WTW334 WTW374 | WKS324 WKS344 LWR324 ONE OF WTW324 WTW344 WTW364 WTW384 | WKS324 WKS344 EECM72407 ONE OF EECT72407 EFET72407 EBUS76407 | WKS324 WKS344 *ATW396 EBUS76407 | WKS324 WKS344 PSY324 ONE OF WTW324 WTW344 WTW364 WTW384 |

MATHEMATICAL SCIENCES FIELDS OF INTEREST 3: 44650, 44655, 44673

LEARNING PROGRAMMES IN MATHEMATICAL SCIENCES FIELDS OF INTEREST 3

Learning programmes in Statistics offers TWO main options with a combination of disciplines:

- **Statistics** and Accounting
- **Statistics** and Economics
- **Statistics** and Psychology

Students Students SELECT Statistics and one other DISCIPLINE and and include all the compulsory modules in row (C1, C2, C3) of each of the selected disciplines for all three study years. Students need to SELECT enough elective modules per semester from the compulsory row (C1, C2, and C3) to obtain at least 120 credits for each study year.

| DISCIPLINE | ACCOUNTING | ECONOMICS | PSYCHOLOGY | ACCOUNTING | ECONOMICS | PSYCHOLOGY |
|----------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------|
| NEW CODE | 44650 | 44655 | 44673 | 44650 | 44655 | 44673 |
| YEAR | FIRST | | | FIRST | | |
| SEMESTER | FIRST | | | SECOND | | |
| COMPULSORY C1 | STK114 WTW114 OR WTW134 EACC61406 ONE OF EECF61406 LEK114 | STK114 WTW114 OR WTW134 EECF61406 ONE OF EACC61406 LEK114 | STK114 WTW114 OR WTW134 PSY112 + PSY152 EHRM51305 | STK124 WTW124 OR WTW144 EACC62406 ONE OF EECF62306 LEK124 | STK124 WTW124 OR WTW144 EECF62406 ONE OF EACC62406 LEK124 | STK124 WTW124 OR WTW144 PSY124 EIOP52305 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | | | BRS121 | | |
| YEAR | SECOND | | | SECOND | | |
| SEMESTER | FIRST | | | SECOND | | |
| COMPULSORY C2 | STK216 WTW234 *EACC60806 ONE OF EFEC61406 EECS71407 LEK214 | STK216 WTW234 EECS71407 ONE OF EFEC61406 LEK214 | STK216 WTW234 PSY212 PSY232 ECAP61406 | STK226 *EACC60806 ONE OF EECS72407 EFEC62406 LEK224 | STK226 EECS72407 ONE OF EFEC62406 LEK224 | STK226 PSY224 ELRM62406 |
| YEAR | THIRD | | | THIRD | | |
| SEMESTER | FIRST | | | SECOND | | |
| COMPULSORY C3 | STK316 STK332 *EACC70807 ONE OF EECT71407 EFET71407 LEK314 | STK316 STK332 EECT71407 ONE OF EFET71407 LEK314 | STK316 STK332 PSY312 PSY332 ETRG71407 | STK324 STK342 *EACC70807 ONE OF EECT72407 EFET72407 LEK324 EECM72407 EBUS7640 | STK326 STK342 EECT72407 ONE OF EFET72407 LEK324 EECM72407 EBUS7640 | STK326 STK342 PSY324 EPPFM72407 |

11.4.2 BACHELOR OF SCIENCE IN AGRICULTURE

11.4.2.1 AGRICULTURAL SCIENCES FIELD OF INTEREST 1: AGROMETEOROLOGY 51213, 51244, 51211, 51251, 51236, 51242

| LEARNING PROGRAMMES IN THE AGROMETEOROLOGY FIELD OF INTEREST 1 | | | | | | | | | | | | |
|----------------------------------------------------------------|----------------------------------------|--------------------------------------------------|--------------------------------------------------|------------------------------------------|----------------------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------------|--------------------------------------------------|------------------------------------------|----------------------------------------|-------------------------------------------------|
| SPECIALISATION | Agrometeorology Agronomy | Agrometeorology Soil Science | Agrometeorology Agricultural Economics | Agrometeorology Agricultural Engineering | Agrometeorology Grassland Science | Agrometeorology Plant Pathology | Agrometeorology Agronomy | Agrometeorology Soil Science | Agrometeorology Agricultural Economics | Agrometeorology Agricultural Engineering | Agrometeorology Grassland Science | Agrometeorology Plant Pathology |
| CODE | 51213 | 51244 | 51211 | 51251 | 51236 | 51242 | 51213 | 51244 | 51211 | 51251 | 51236 | 51242 |
| OLD CODE | 5323 | 5334 | | | 5341 | 5340 | 5323 | 5334 | | | 5341 | 5340 |
| YEAR | FIRST | | | | | | FIRST | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 CEM114 FSK134 WTW134 | LEK114 BLGY5113 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 CEM114 FSK134 WTW134 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | LEK124 BLGY6143 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 |
| REQUIRED *if NBT < 65% *ALN108 or AFA108 | BRS 111 UFS101 *ALN108 or AFA108 | | | | | | BRS121 | | | | | |
| YEAR | SECOND | | | | | | SECOND | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C2 | LWR214 AGR214 GKD214 | LWR214 GKD214 AGR214 | LWR214 LEK214 AGR214 | LWR214 AGR214 GKD214 | LWR214 WDK214 GKD214 | LWR214 AGR214 GKD214 | LWR224 AGR224 GKD224 | LWR224 GKD224 AGR224 | LWR224 LEK224 AGR224 | LWR224 LNG224 GKD224 | LWR224 GKD224 AGR224 | LWR224 PPG224 PLT224 |
| ELECTIVE | ONE OF: BCC214 ENT214 WDK214 | ONE OF: BCC214 ENT214 WDK214 | ONE OF: GKD214 BCC214 ENT214 WDK214 | ONE OF: BCC214 ENT214 WDK214 | ONE OF: AGR214 BCC214 ENT214 | ONE OF: BCC214 ENT214 WDK214 | ONE OF: LNG224 PLT224 PPG224 | ONE OF: LNG224 PLT224 PPG224 | ONE OF: GKD224 LNG224 | ONE OF: AGR224 PPG224 PLT224 | ONE OF: LNG224 PLT224 | ONE OF: AGR224 GKD224 LNG224 |
| YEAR | THIRD | | | | | | THIRD | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C3 | LWR314 AGR314 GKD314 | LWR314 GKD314 AGR314 | LWR314 LEK314 AGR314 | LWR314 LNG314 GKD314 | LWR314 WDK314 GKD314 | LWR314 PPG314 PPG334 | LWR324 AGR324 GKD324 | LWR324 GKD324 AGR324 | LEK324 LWR324 AGR324 | LWR324 LNG324 GKD324 | LWR324 WDK324 GKD324 | LWR324 PPG324 PPG344 |
| ELECTIVE | ONE OF: LNG314 WDK314 | ONE OF: LNG314 WDK314 | ONE OF: GKD314 LNG314 WDK314 | ONE OF: AGR314 WDK314 | ONE OF: AGR314 LNG314 | ONE OF: AGR314 GKD314 PLT314 | ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: GKD324 LNG324 WDK324 | ONE OF: AGR324 PPG324 WDK324 | ONE OF: DVL344 LEK224 LNG324 | ONE OF: AGR324 GKD324 LEK214 PLT324 |
| YEAR | FOURTH | | | | | | FOURTH | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C4 | LWR414 LWR434 GKG414 | LWR414 LWR434 GKG414 | LWR414 LWR434 GKG414 | LWR414 LWR434 GKG414 LNG414 | LWR414 LWR434 GKG414 | LWR414 LWR434 GKG414 | LWR424 LWR444 GKG424 | LWR424 LWR444 GKG424 | LWR424 LWR444 GKG424 | LWR424 LWR444 GKG424 LNG424 | LWR424 LWR444 GKG424 | LWR424 LWR444 GKG424 PPG424 |
| ELECTIVE | ONE OF: AGR414 AGR434 | ONE OF: GKD414 GKD434 | ONE OF: LEK614 LEK624 | | ONE OF: WDK414 WDK434 | ONE OF: PPG414 PPG434 PPG454 | ONE OF: AGR424 AGR444 | ONE OF: GKD424 GKD444 | ONE OF: LEK624 LEK644 | | ONE OF: WDK424 WDK444 | |

11.4.2.2 AGRICULTURAL SCIENCES FIELD OF INTEREST 2: AGRONOMY 51312, 51344, 51311, 51315, 51327, 51329, 51341, 51342

| LEARNING PROGRAMMES IN BACHELOR OF AGRICULTURAL SCIENCES | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------|-------------------------------------------------|----------------------------------------|-----------------------------------------|-------------------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------|----------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| <p>Learning programmes in the Agrometeorology as main field of interest offer 8 options with a combination of Agronomy as a major for specialisation in the fourth year and a minor from either one of Agrometeorology, Soil Science, Agricultural Economics, Animal Science, Entomology, Food Science, Plant Breeding or Plant Pathology. Each student registers for all the compulsory modules (row c1,</p> | | | | | | | | | <p>c2, c3, c4) during the four years of study and combines them with all the compulsory modules for the minor. If a student wants to register for the Agricultural Economics minor, two extra modules for the first year are required.</p> | | | | | | | |
| LEARNING PROGRAMME | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| SPECIALISATION | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology | Agrometeorology |
| NEW CODE | 51312 | 51344 | 51311 | 51315 | 51327 | 51329 | 51341 | 51342 | 51312 | 51344 | 51311 | 51315 | 51327 | 51329 | 51341 | 51342 |
| OLD CODE | 5323 | 5324 | 5321 | 5326 | 5351 | 5329 | 5324 | 5325 | 5323 | 5324 | 5321 | 5326 | 5351 | 5329 | 5324 | 5325 |
| YEAR | FIRST | | | | | | | | FIRST | | | | | | | |
| SEMESTER | FIRST | | | | | | | | SECOND | | | | | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | LEK114 BLGY5113 CEM114 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | LEK124 BLGY6143 CEM144 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | | | | | | | | BRS121 | | | | | | | |
| SEMESTER | SECOND | | | | | | | | SECOND | | | | | | | |
| COMPULSORY C2 | AGR214 GKD214 LWR214 | AGR214 GKD214 LWR214 | AGR214 LEK214 GKD214 | AGR214 VKD214 BCC214 | AGR214 ENT216 GKD214 | AGR214 BCC214 VWS232 VWS212 | AGR214 GKD214 LWR214 | AGR214 GKD214 LWR214 | AGR224 GKD224 LWR224 | AGR224 GKD224 LWR224 | AGR224 LEK224 | AGR224 LWR224 VKD224 | AGR224 ENT224 ENT262 GKD224 | AGR224 VWS222 VWS224 IQM242 | AGR224 PLT224 PPG224 | AGR224 PLT224 PPG224 |
| ELECTIVES | ONE OF: BCC214 ENT214 WDK214 | ONE OF: BCC214 ENT214 WDK214 | ONE OF: BCC214 ENT214 LWR214 WDK214 | ONE OF: ENT214 GKD214 WDK214 | ONE OF: BCC214 LWR214 | ONE OF: ENT214 GKD214 LWR214 WDK214 | ONE OF: BCC214 ENT214 WDK214 | ONE OF: BCC214 ENT214 WDK214 | ONE OF: LNG224 PLT224 PPG224 | ONE OF: LNG224 PLT224 PPG224 | ONE OF: LNG224 LWR224 PLT224 PPG224 | ONE OF: GKD224 LWR224 PPG224 | ONE OF: LWR224 PPG224 | ONE OF: GKD224 LNG224 LWR224 OBS244 | ONE OF: GKD224 LNG224 LWR224 | ONE OF: GKD224 LNG224 LWR224 |
| YEAR | THIRD | | | | | | | | THIRD | | | | | | | |
| SEMESTER | FIRST | | | | | | | | SECOND | | | | | | | |
| COMPULSORY C3 | AGR314 LWR314 GKD314 | AGR314 GKD314 LWR314 | AGR314 GKD314 LEK314 | AGR314 DAF314 DTL314 DVL334 | AGR314 ENT314 ENT354 OR ENT334 | AGR314 VWS314 VWS334 VDG314 | AGR314 PLT314 GKD314 | AGR314 PPG314 PPG334 | AGR324 LWR324 GKD324 | AGR324 GKD324 LWR324 | AGR324 LEK324 GKD324 | AGR324 DAF324 DTL324 DVL344 | AGR324 ENT324 ENT344 | AGR324 VWS324 VWS344 | AGR324 PLT324 PLT344 | AGR324 PPG324 PPG344 |
| ELECTIVES | ONE OF: LNG314 WDK314 | ONE OF: LNG314 WDK314 | ONE OF: LNG314 LWR314 WDK314 | ONE OF: GKD314 LWR314 PLT314 | ONE OF: GKD314 LWR314 PLT314 | ONE OF: LWR314 PPG314 | ONE OF: GKD314 LWR314 PLT314 | ONE OF: LWR314 PPG314 | ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: LNG324 LWR324 PPG324 WDK324 | ONE OF: GKD324 LWR324 PPG324 | ONE OF: GKD324 LNG324 LWR324 PLT324 | ONE OF: GKD324 LNG324 LWR324 PPG324 | ONE OF: GKD324 LNG324 LWR324 PPG324 | ONE OF: GKD324 LNG324 LWR324 PLT324 |
| YEAR | FOURTH | | | | | | | | FOURTH | | | | | | | |
| SEMESTER | FIRST | | | | | | | | SECOND | | | | | | | |
| COMPULSORY C3 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR414 AGR434 GKG414 | AGR424 AGR444 GKG424 | AGR424 AGR444 GKG424 | AGR424 AGR444 GKG424 | AGR424 AGR444 GKG424 | AGR424 AGR444 GKG424 ENT684 | AGR424 AGR444 GKG424 VWS464 | AGR424 AGR444 GKG424 PLT424 | AGR424 AGR444 GKG424 PPG424 |
| ELECTIVES | ONE OF: LWR414 LWR434 | ONE OF: GKD414 GKD434 | ONE OF: LEK414 LEK434 | ONE OF: DAF414 DTL414 DVL434 | ONE OF: ENT654 | ONE OF: PLT414 PLT434 PLT454 | ONE OF: PPG414 PPG434 PPG454 | ONE OF: PPG414 PPG434 PPG454 | ONE OF: LWR424 LWR444 | ONE OF: GKD424 GKD444 | ONE OF: LEK624 LEK644 | ONE OF: DAF424 DTL424 DVL464 | ONE OF: DAF424 DTL424 DVL464 | ONE OF: DAF424 DTL424 DVL464 | ONE OF: DAF424 DTL424 DVL464 | ONE OF: DAF424 DTL424 DVL464 |

11.4.2.3 AGRICULTURAL SCIENCES FIELD OF INTEREST 3: SOIL SCIENCE 54412, 54413, 54411, 54451, 54436, 54442

LEARNING PROGRAMMES IN BACHELOR OF AGRICULTURAL SCIENCES IN SOIL SCIENCE FIELD OF INTEREST 1

Learning programmes in the **Soil Science** as main **field of interest** offer 6 options with a combination of Soil Science as a major for specialisation in the fourth year and a minor from either one of Agrometeorology, Agronomy, Agricultural Economic, Agricultural Engineering, Grassland Science or Plant Pathology. Each student registers for all the compulsory modules (row c1, c2, c3,

c4) during the four years of study and combines it with all the compulsory modules for the minor. If a student wants to register for the Agricultural Economics minor two extra modules for the first year are required.

| LEARNING PROGRAMME | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |
|----------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------------------|------------------------------------------------|----------------------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------|
| SPECIALISATION | Soil Science Agrometeorology | Soil Science Agronomy | Soil Science Agricultural economics | Soil Science Grassland Science | Soil Science Agricultural Engineering | Soil Science Plant Pathology | Soil Science Agrometeorology | Soil Science Agronomy | Soil Science Agricultural economics | Soil Science Grassland Science | Soil Science Agricultural Engineering | Soil Science Plant Pathology |
| NEW CODE | 54412 | 54413 | 54411 | 54436 | 54462 | 54442 | 54412 | 54413 | 54411 | 54436 | 54462 | 54442 |
| OLD CODE | | | | | | | | | | | | |
| YEAR | FIRST | | | | | | FIRST | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 LEK114 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | LEK114 BLGY1513 CEM114 FSK134 WTW134 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 LEK124 | BLGY1643 CEM144 GKG124 VWW124 | BLGY1643 CEM144 GKG124 VWW124 | LEK124 BLGY1643 CEM144 GKG124 VWW124 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | | | | | | BRS121 | | | | | |
| YEAR | SECOND | | | | | | SECOND | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C2 | AGR214 GKD214 LWR214 | AGR214 GKD214 LWR214 | AGR214 GKD214 LEK214 | GKD214 LWR214 WDK214 | AGR214 GKD214 LWR214 | AGR214 GKD214 LWR214 | AGR224 GKD224 LWR224 | AGR224 GKD224 LWR224 | AGR224 GKD224 LEK224 | AGR224 GKD224 LWR224 | AGR224 GKD224 LNG224 | AGR224 GKD224 PPG224 |
| ELECTIVES | ONE OF: BCC214 WDK214 | ONE OF: BCC214 WDK214 | ONE OF: BCC214 LWR214 WDK214 | ONE OF: BCC214 AGR214 VKD214 | ONE OF: BCC214 WDK214 | ONE OF: BCC214 WDK214 | ONE OF: LNG224 PLT224 PPG224 | ONE OF: LNG224 PLT224 PPG224 | ONE OF: LNG224 LWR224 PLT224 PPG224 | ONE OF: LNG224 LWR224 PLT224 PPG224 | ONE OF: LNG224 LWR224 PLT224 PPG224 | ONE OF: LNG224 LWR224 PLT224 |
| YEAR | THIRD | | | | | | THIRD | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C3 | GKD314 LWR314 AGR314 | GKD314 AGR314 LWR314 | GKD314 LEK314 | GKD314 WDK314 AGR314 | AGR314 GKD314 LNG314 | GKD314 PPG314 PPG334 | GKD324 LWR324 AGR324 | GKD324 AGR324 LWR324 | GKD324 LEK324 | GKD324 WDK324 | AGR324 GKD324 LNG324 | GKD324 PPG324 PPG344 |
| | ONE OF: LNG314 WDK314 | ONE OF: LNG314 WDK314 | ONE OF: AGR314 LWR314 ONE OF: LNG314 WDK314 | ONE OF: LNG314 LWR314 | ONE OF: LWR314 WDK314 | ONE OF: AGR314 LWR314 PLT314 | ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: AGR324 LWR324 ONE OF: LNG324 PLT324 PPG324 WDK324 | ONE OF: AGR324 LWR324 ONE OF: LNG324 PLT324 VKD324 | ONE OF: LWR324 PLT324 PPG324 WDK324 | ONE OF: AGR324 LNG324 LWR324 PLT324 WDK324 |
| YEAR | FOURTH | | | | | | FOURTH | | | | | |
| SEMESTER | FIRST | | | | | | SECOND | | | | | |
| COMPULSORY C4 | GKG414 GKD414 GKD434 LWR414 LWR434 | GKG414 GKD414 GKD434 AGR414 AGR434 | GKG414 GKD414 GKD434 LEK314 LEK334 | GKG414 GKD414 GKD434 WDK414 WDK434 | GKG414 AGR434 GKD414 LNG414 | GKG414 GKD414 GKD434 PPG434 | GKG424 GKD424 GKD444 LWR424 LWR444 | GKG424 GKD424 GKD444 AGR424 AGR444 | GKG424 GKD424 GKD444 LEK324 LEK344 | GKG424 GKD424 GKD444 WDK424 WDK444 | GKG424 AGR424 GKD424 LNG424 | GKG424 GKD424 GKD444 PPG424 PPG444 |

11.4.2.4 AGRICULTURAL SCIENCES FIELD OF INTEREST 4: ANIMAL, WILDLIFE AND GRASSLAND SCIENCES 51536, 53615, 51511, 53644

LEARNING PROGRAMMES IN BACHELOR OF AGRICULTURAL SCIENCES IN THE ANIMAL, WILDLIFE AND GRASSLAND SCIENCES FIELD OF INTEREST 4

Learning programmes in the **Animal, Wildlife and Grassland Sciences** FIELD OF INTEREST offers FOUR options with a combination of either **Animal or Wildlife and Grassland Sciences** as a major for specialisation in the fourth year and a minor from either one of them or Agricultural Economics and Soil Science to offer until third year level. Each student registers for all the compulsory modules (row

c1, c2, c3, c4) during the four years of study and combines it with all the compulsory modules for the minor: Animal Sciences, Agricultural Economics, Soil Sciences or Wildlife and Grassland Sciences. All the compulsory modules for the minor is required. Students must register for sufficient modules (supportive electives) to obtain at least 120 credits for each of the first and the second year of study.

| DISCIPLINE | ANIMAL & GRASSLAND SCIENCES | GRASSLAND & ANIMAL SCIENCES | ANIMAL SCIENCES & AGRICULTURAL ECONOMICS | GRASSLAND & SOIL SCIENCES | ANIMAL SCIENCES | GRASSLAND WILDLIFE SCIENCES | ANIMAL SCIENCES & AGRICULTURAL ECONOMICS | GRASSLAND & SOIL SCIENCES |
|---------------------------|--------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| CODE | 51536 | 53615 | 51511 | 53644 | 51536 | 53615 | 51511 | 53644 |
| YEAR | FIRST | | | | FIRST | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW134 LEK114 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 LEK114 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | | | | BRS121 | | | |
| YEAR | SECOND | | | | SECOND | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C2 | VKD214 BCC214 LEK114 WDK214 | WDK214 GKD214 LWR214 VKD214 LEK114 | VKD214 BCC214 LEK214 ONE OF LEK314 LEK334 | WDK214 GKD214 LWR214 ONE OF AGR214 BCC214 LEK114 VKD214 | VKD224 DTL224 BMT124 LEK124 | VKD224 BMT124 GKD224 LEK124 | BMT124 LEK124 LEK224 DTL224 | GKD224 LNG224 ONE OF AGR224 DRK224 ONE OF LEK124 LEK224 |
| YEAR | THIRD | | | | THIRD | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C3 | DAF314 DTL314 DVL334 WDK314 | WDK314 DAF314 GKD314 VKD314 | DAF314 DTL314 DVL334 ONE OF LEK314 LEK334 | WDK314 GKD314 LWR314 ONE OF AGR314 VKD314 | DAF324 DTL324 DVL344 WDK324 DMT322 | WDK324 DMT322 DAF324 GKD324 ONE OF VWW364 VKD324 | DMT322 DTL324 DVL344 DAF324 ONE OF LEK344 LEK324 | GKD324 DMT322 WDK324 TWO OF AGR324 VKD324 LWR324 |
| YEAR | FOURTH | | | | FOURTH | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C4 | DAF414 DTL414 DVL434 VWW403 VWW405 | DAF414 WDK414 WDK434 VWW403 VWW405 | DAF414 DTL414 DVL434 VWW403 VWW405 | WDK414 WDK434 VWW403 VWW405 ONE OF GKD414 GKD434 | DAF424 DTL424 DVL464 | WDK424 WDK444 DAF424 | DAF424 DTL424 DVL464 | WDK444 WDK424 ONE OF GKD424 GKD444 |

11.4.2.5. AGRICULTURAL SCIENCES FIELD OF INTEREST 5: FOOD SCIENCES 52913, 52915, 52918, 52921, 52939

LEARNING PROGRAMMES IN THE FOOD SCIENCES FIELDS OF INTEREST 5

Learning programmes in the **Food Sciences** FIELD OF INTEREST offer FOUR options with a combination of **Food Sciences** as a major for specialisation in the fourth year and a minor from either fields of interest of Agronomy, Animal Sciences, Biochemistry, or Microbiology Each student selects at least a major from Food Sciences and registers for all the compulsory modules (row

C1,C2, C3, C4) the four years of study and combines it with all the compulsory modules for the minor. All the compulsory modules for the minors are required. Students must register for sufficient modules (supportive electives) to obtain at least 120 credits for each of the first and the second year of study.

| DISCIPLINE | FOOD SCIENCE & AGRONOMY | FOOD SCIENCE & ANIMAL SCIENCES | FOOD SCIENCE & BIOCHEMISTRY | FOOD SCIENCE & CHEMISTRY | FOOD SCIENCE & MICROBIOLOGY | FOOD SCIENCE & AGRONOMY | FOOD SCIENCE & ANIMAL SCIENCES | FOOD SCIENCE & BIOCHEMISTRY | FOOD SCIENCE & CHEMISTRY | FOOD SCIENCE & MICROBIOLOGY |
|---------------------------|----------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
| OLD CODE | 5327 | 5463 | 5348 | 5350 | 5349 | 5327 | 5463 | 5348 | 5350 | 5349 |
| NEW CODE | 52913 | 52915 | 52919 | 52921 | 52939 | 52913 | 52915 | 52919 | 52921 | 52939 |
| YEAR | FIRST | | | | | SECOND | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW134 LEK114 | BLGY1513 CEM114 FSK134 WTW134 LEK114 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM124 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | | | | | BRS121 | | | | |
| YEAR | SECOND | | | | | SECOND | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C2 | BCC214 MKB216 AGR214 VWS232 VWS212 | BCC214 MKB216 VKD214 VWS232 VWS212 | BOC216 MKB216 VWS232 VWS212 | BCC214 CEM214 CEM232 MCB214 VWS232 VWS212 | BOC216 MKB216 VWS232 VWS212 | AGR224 VWS222 VWS244 EBUS62064 | VWS222 VWS244 VKD224 ONE OF: DTL 224 LEK124 EBUS62064 | BOC226 IQM242 VWS222 VWS244 | VWS222 VWS244 CEM224 CEM242 | VWS222 VWS244 MKB226 IQM242 |
| YEAR | THIRD | | | | | THIRD | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C3 | AGR314 VWS314 VWS334 EHRM51305 EBUS61406 | VWS314 VWS334 DAF314 ONE OF: EHRM51305 DVL334 | VWS314 VWS334 BOC314 BOC334 | VWS314 VWS334 CEM314 CEM334 | VWS314 VWS334 MKB314 ONE OF: BOC314 MKB334 | VWS324 VWS344 AGR324 DMT322 EBUS62406 | VWS324 VWS344 DAF324 DMT322 DVL344 | VWS324 VWS344 BOC324 BOC344 | VWS324 VWS344 CEM324 CEM344 | VWS324 VWS344 MKB324 MKB344 |
| YEAR | FOURTH | | | | | FOURTH | | | | |
| SEMESTER | FIRST | | | | | SECOND | | | | |
| COMPULSORY C4 | VWS414 VWS454 VWS474 VWS434 VWS403 VWS405 | VWS414 VWS454 VWS474 VWS434 VWS403 VWS405 | VWS414 VWS454 VWS474 VWS434 VWS403 VWS405 | VWS414 VWS454 VWS474 VWS434 VWS403 VWS405 | VWS414 VWS454 VWS474 VWS434 VWS403 VWS405 | VWS464 | VWS464 | VWS464 | VWS464 | VWS464 |

12.4.2.6 AGRICULTURAL SCIENCES FIELD OF INTEREST 6: PLANT BREEDING AND PLANT PATHOLOGY 54113, 54136, 54142, 54213, 54241

LEARNING PROGRAMMES IN PLANT BREEDING AND PLANT PATHOLOGY FIELD OF INTEREST

Learning programmes in **PLANT BREEDING AND PLANT PATHOLOGY FIELD OF INTEREST** offer FOUR options with a combination of either **PLANT BREEDING AND PLANT PATHOLOGY** as a major for specialisation in the fourth year and a minor from either one of the PLANT BREEDING and one of the two fields of interest or from Grassland and Agronomy to offer until third-year level. Each student selects at least a major from **PLANT BREEDING AND PLANT PATHOLOGY** and registers

for all the compulsory modules (row C1, C2, C3, and C4) for the four years of study and combines them with all the compulsory modules for the minor: Agronomy. All the compulsory modules for the minor are required. Students must register for sufficient modules (supportive electives) to obtain at least 120 credits for each of the first and the second year of study.

| DISCIPLINE | PLANT BREEDING & PLANT PATHOLOGY | PLANT PATHOLOGY & AGRONOMY/PLANT BREEDING | PLANT BREEDING & GRASSLAND SCIENCES | PLANT BREEDING & AGRONOMY | PLANT BREEDING & PLANT PATHOLOGY | PLANT PATHOLOGY & AGRONOMY/PLANT BREEDING | PLANT BREEDING & GRASSLAND SCIENCES | PLANT BREEDING & AGRONOMY |
|---------------------------|------------------------------------------------|-------------------------------------------|------------------------------------------------|------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
| OLD CODE | 5346 | 5347 | | | 5346 | 5347 | | |
| CODE | 54142 | 54241 | 54136 | 54113 | 54142 | 54241 | 54136 | 54113 |
| YEAR | FIRST | | | | FIRST | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C1 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1513 CEM114 FSK134 WTW134 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1683 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 | BLGY1623 BLGY1643 CEM144 GKG124 VWW124 |
| REQUIRED *if NBT < 65% | BRS111 UFS101 *ALN108 or AFA108 | | | | BRS121 | | | |
| YEAR | SECOND | | | | SECOND | | | |
| SEMESTER | SECOND | | | | SECOND | | | |
| COMPULSORY C2 | PLK216 GKD214 MKB216 | AGR214 GKD214 MKB216 | PLK216 GKD214 WDK214 | PLK216 GKD214 AGR214 | PLK226 PLT224 PPG224 DTL224 | AGR224 PLT224 DTL224 PPG224 | PLK226 PLT224 DTL224 | AGR224 PLK226 PLT224 DTL224 |
| ELECTIVES | | | BCC214 ENT216 LWR214 VKD214 | BCC214 ENT216 LWR214 | | | PPG224 LWR224 | |
| YEAR | THIRD | | | | THIRD | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C3 | PLT314 PPG314 PPG334 GKD314 | PLT314 PPG314 PPG334 AGR314 | WDK314 PLT314 PLK354 | AGR314 PLT314 PLK354 | PLT324 PLT344 PPG344 PPG324 | PLT324 PPG324 PPG344 AGR324 | WKD324 PLK344 PLT324 PLT344 | AGR324 PLK344 PLT324 PLT344 |
| ELECTIVES | | | GKD314 LWR314 PPG314 PLK354 | PPG314 GKD314 LWR314 | | | | |
| YEAR | FOURTH | | | | FOURTH | | | |
| SEMESTER | FIRST | | | | SECOND | | | |
| COMPULSORY C3 | PLT414 PLT434 PLT454 PLT498 PLT496 | PLT454 PPG434 PPG496 PPG498 | PLT414 PLT434 PLT454 PLT498 PLT496 | PLT414 PLT434 PLT454 PLT498 PLT496 | PLT424 | PPG424 PPG444 | PLT424 | PLT424 |

11.5 LEARNING PROGRAMMES FOR POSTGRADUATE DIPLOMAS

11.5.1 POSTGRADUATE DIPLOMA IN DISASTER MANAGEMENT 46025 (5201)

The Postgraduate Diploma in Disaster Management contains 120 credits and is presented in a minimum period of one year plus another year. The Dean may, however, give special permission that another additional year be granted to complete the qualification. It is the prerequisite to the Master's Degree in Disaster Management.

The programme consists of eight compulsory subjects and a field visit in one of the subjects. The programme requires practical assignments to be completed by candidates and submitted at predetermined dates. Assignments will be marked and graded by the lecturers, who will give candidates feedback in a written format and also orally during contact sessions. Assignments will be part of a continual evaluation process. Apart from the assignments, a formal examination evaluation (written) will take place at the end of each semester, normally during June and November. The Postgraduate Diploma in Disaster Management contains 120 credits and is the prerequisite to the Master's Degree in Disaster Management.

| First Semester | Second Semester |
|-----------------------------------------------------|-------------------------------------------------------|
| DIM601 Research Methodology | DIM605 Disaster Risk Management |
| DIM602 Hazards and Disaster Management | DIM606 Information Technology in Disaster Management |
| DIM603 Strategic Disaster Management | DIM607 Public Health |
| DIM604 Disaster Management principles and practices | DIM608 Management of natural and human-made disasters |

11.6 LEARNING PROGRAMMES FOR BACHELOR HONOURS DEGREES (NQF LEVEL 8)

11.6.1 BACHELOR OF ARCHITECTURE STUDIORUM HONOURS 45314 (4567)

The Baccalaureus Architecturae Studiorum Honores [BArchStudHons] is a full-time postgraduate degree by coursework and involves lectures, projects, and continuous evaluation. The purpose of the qualification is to educate candidates who may register for the degree Magister Architecturae (Professional) that will

enable successful candidates to register as "Candidate Architect" with the South African Council for the Architectural Profession in terms of the provisions of the Architectural Profession Act 44 of 2000. The degree BArchStud provides access to the Magister Architecturae (Professional) degree.

The evaluations and examinations for the degree BArchStudHons are recognised by the minister concerned in terms of the provisions of the Architectural Profession Act (Act 44 of 2000). Training experience after completion of the BArchStudHons degree will be controlled by the conditions of the South African Council for the Architectural Profession. The registrar of this Council will provide information in this regard.

| YEAR | FIRST | SECOND |
|------------|------------------------------------------------------------|-----------------------------|
| COMPULSORY | ONW600 Design | |
| | BOW608 Building Science | |
| | OGT606 History of the Environment | |
| | TAR604 Theory of Architecture EOK404 Property economics | |
| | OMA612 Design methodology | NMA622 Research methodology |

11.6.2 BACHELOR OF AGRICULTURE HONOURS 45352, 45362, 45375

BACHELOR AGRICULTURE HONORES

The aims of this degree are:

- to give the student the opportunity to do in-depth specialisation of his/her choice to broaden his/her knowledge with respect to agriculture, rural development and agricultural management;
- to prepare the student for further postgraduate study;
- to lead the student in independent study of the main subject or field of specialisation; and
- to develop, through the Honours degree in Agricultural Management, the student's managerial skills in a variety of functional areas in agricultural enterprise management and development and the management of agricultural businesses.

A minimum of 120 credits must be obtained over the year and the department will announce the starting dates for classes.

BACHELOR AGRICULTURE HONORES

| | Agricultural Management | Irrigation Management | Wildlife Management |
|----------|-------------------------|-----------------------|---------------------|
| CODE | 45352 | 45362 | 45375 |
| OLD CODE | 5531 | 5532 | 5533 |
| CREDITS | 120 credits | 120 credits | 120 credits |
| | LBB601 | LBB609 | LBB609 |
| | LBB602 | BSB601 | NLB601 |
| | LBB603 | BSB602 | NLB602 |
| | LBB604 | BSB603 | NLB603 |
| | LBB605 | BSB693 | NLB693 |
| | LBB606L | | |
| | BB607 | | |
| | LBB693 | | |

11.6.3 BACHELOR OF CONSUMER SCIENCE HONOURS 45323

To obtain Honours Degree a minimum study period of one year is required. The composition of the student's curriculum and optional courses will be determined at the beginning of each year in consultation with the Head of the Department. A minimum of 120 credits must be presented. The Head of the Department determines how the modules must be distributed over the year and when the department will announce the starting dates for classes.

After completing the Honours learning programmes the graduates will possess the following skills:

- Knowledge of and engagement in an area at the forefront of a field, discipline or practice.
- An understanding of the theories, research methodologies, methods and techniques relevant to the field, discipline or practice; and an understanding of how to apply this knowledge in a particular context.
- An ability to interrogate multiple sources of knowledge in an area of specialisation, and to evaluate knowledge and processes of knowledge production.
- An understanding of the complexities and uncertainties of selecting, applying or transferring appropriate standard procedures, processes or techniques to unfamiliar problems in a specialised field, discipline or practice.
- An ability to critically review information gathering, evaluation and management processes in specialised contexts in order to develop creative responses to problems and issues.
- An ability to present and communicate academic, professional or occupational ideas and texts effectively to a range of audiences, offering creative insights,

rigorous interpretations and solutions to problems and issues appropriate to the context.

A candidate must register for the compulsory research modules of 36 credits and do research on an approved topic in consultation with the Head of the Department. More modules must be selected from the possible electives to obtain at least 120 credits.

| FIRST | SECOND |
|-------------------|----------|
| COMPULSORY | |
| CNCS4809 | |
| CNFD4808 | |
| VDG408 | |
| CNCS4814 | CNCS4824 |
| CNCS4834 | CNCS4844 |
| CNST4814 | CNST4824 |
| CNST4834 | CNST4844 |
| CNST4853 | CNST4864 |

11.6.4 BACHELOR OF SPATIAL PLANNING HONOURS 45345 (4543)

After completing the programme, the graduates will possess the following skills:

- A thorough knowledge of the aims and purpose of urban and regional planning as well as planning theory, urban planning theory, regional planning theory, philosophy and ethics.
- The ability to practically apply theory in urban and regional planning projects e.g. the capacity to analyse issues from a theoretical and/or empirical perspective and to recommend suitable alternatives.
- The ability to apply and understand economics for planners, socio-cultural aspects in planning and environmental planning; and link these to the everyday tasks and activities of urban and regional planners.
- The capacity to communicate clearly and logically, write good planning and research reports and debate these with stakeholders.
- A minimum of 140 credits must be presented for the BHonsSP programme.
- Programmes in Spatial Planning: Residential and Compact Learning can be conducted full-time over 12 months or 24 months part-time or in block weeks where attendance take place in five block weeks in a year.

To obtain the Honours in Spatial Planning a minimum study period of one year is required. Compact learning students must attend compulsory workshop weeks at the department for the duration of the programme at times as determined by the Academic Departmental Head.

Students who register as full-time or part-time will also be expected to attend some classes, sessions, guest lectures, field trips, site visits, tours, tests and examinations during the block weeks.

The Head of the Department determines how the modules must be distributed over the years of study and in all programmes (full-time, part-time and compact learning). The modules may be spread over an additional year if a student does not have the necessary academic background. Compact learning students must attend compulsory workshop weeks at the department for the duration of the programme at times as determined by the Academic Departmental Head. During classes, lectures, tutorials, practicals and discussions will take place. Assignments will be done and tests and examinations may also be written.

This degree does not enable registration at the South African Council for Urban and Regional Planners (SACPLAN).

| | |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Full-time | Compulsory semester modules: URRE6814 / URRE6824 URSC6814 / URSC6824 URLM6814 / URLM6824 UREP6814 / UREP6824 |
| | Compulsory year modules: URRT6805 URUT6804 URPT6804 URBP6806 |
| Compact Learning and Part-Time | Year 1 |
| | Compulsory semester modules: URRE6814 / URRE6824 URSC6814 / URSC6824 URLM6814 / URLM6824 UREP6814 / UREP6824 |
| | Year 2 |
| | Compulsory year modules: URRT6805 URUT6804 URPT6804 URBP6806 |

11.6.5 BACHELOR OF SCIENCE HONOURS

11.6.5.1 BACHELOR OF SCIENCE HONOURS IN AGRICULTURE ECONOMICS 45011

Students must register for **eight** modules of which LEK601 and LEK693 are compulsory. The student must choose a field and successfully complete the three prescribed modules plus three other Honours modules. This degree is awarded in the following fields:

| Agribusiness Management | Agricultural Marketing and International Trade | Agricultural Policy and Development | Farm Management | Resource and Environment Economics |
|--------------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------|-----------------|------------------------------------|
| 5517 | | | | |
| LEK601 | LEK601 | LEK601 | LEK601 | LEK601 |
| LEK693 | LEK693 | LEK693 | LEK693 | LEK693 |
| AGB605 | LEK605 | LEK606 | LEK605 | LEK608 |
| LEK605 | LEK607 | LEK607 | LEK608 | LEK610 |
| LEK609 | LEK609 | LEK608 | LEK609 | LEK611 |
| Plus three other postgraduate modules of which one is an appropriate Honours modules | | | | |
| LEK602 | AGB605 | AGB605 | AGB605 | AGB605 |
| LEK603 | LEK602 | LEK602 | LEK602 | LEK602 |
| LEK606 | LEK603 | LEK603 | LEK603 | LEK603 |
| LEK607 | LEK604 | LEK604 | LEK604 | LEK604 |
| LEK608 | LEK606 | LEK605 | LEK606 | LEK605 |
| LEK610 | LEK608 | LEK606 | LEK607 | LEK606 |
| LEK611 | LEK610 | LEK609 | LEK610 | LEK607 |
| | LEK611 | LEK610 | LEK611 | LEK609 |
| | | LEK611 | | |

11.6.5.2 BACHELOR OF SCIENCE HONOURS LEARNING PROGRAMMES IN BIOLOGICAL SCIENCES

45018, 45019, 45027, 45039, 45049, 45057, 45031, 45020, 45040, 45070, 45042, 45041

Students must register for all compulsory modules plus enough others to obtain at least 120 credits. This degree is awarded in the following fields:

| DISCIPLINE | BIOCHEMISTRY | BOTANY | ENTOMOLOGY | GENETICS | MICROBIOLOGY | ZOOLOGY |
|------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OLD CODE | 4511 | 4530 | 4517 | 4520 | 4526 | 4516 |
| NEW CODE | 45019 | 45020 | 45027 | 45030 | 45039 | 45040 |
| COMPULSORY | BOC614 BOC622 BOC634 BOC674 BOC6936 BOC6928 | PLT654 PLK696 PLK698 | ENT614, ENT622 ENT632, ENT642 ENT6928 | GEN686 GEN693 GEN692 | MKB614 MKB622 MKB6936 MKB6928 | DRK614 DRK622 DRK632 DRK642 DRK6928 |
| ELECTIVES | BOC654 BOC624 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | PLK614 PLK624 PLK634 PLK644 PLK654 PLK664 PLK674 PLK684 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | ENT654 ENT664 ENT674 ENT684 ENT694 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | GEN614 GEN624 GEN634 GEN644 GEN654 GEN674 GGS614 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest.. | MKB634 MKB654 MKB674 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | DRK634 DRK654 DRK664 DRK674 DRK684 DRK694 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. |

| DISCIPLINE | BEHAVIOURAL GENETICS | FORENSIC SCIENCES | PLANT HEALTH ECOLOGY | PLANT PATHOLOGY | PLANT BREEDING | ENVIRONMENTAL REHABILITATION | FOOD SCIENCES |
|------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| CODE | 45018 | 45030 | 45070 | 45042 | 45041 | 45057 | 45029 |
| COMPULSORY | GGS686 GGS692 GGS693 GGS614 GGS634 GEN644 | GDF614 | PPG696 PPG698 PLT654 GKD444 PPG624 | PLT654 PPG696 PPG698 PPG644 PPG624 PPG634 | PLT614 PLT624 PLT634 PLT654 PLT696 PLT698 | GKG414 ORG424 ORH696 ORH698 | VWS601 VWS602 VWS603 VWS604 |
| ELECTIVES | One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | GDF686 GDF692 GDF693 GDF624 GEN654 ENT674 GDF674 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | AGR614 AGR444 ENT654 ENT684 LWR424 PPG634 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | GKD414 GKD424 PLK614 PLK664 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. | VWS605 VWS606 VWS607 VWS693 VWS695 One 16-credit NQF Level 8 module from any other discipline in the biological field of interest. |

11.6.5.3 BACHELOR OF SCIENCE HONOURS IN QUANTITY SURVEYING & OF SCIENCE HONOURS IN CONSTRUCTION MANAGEMENT 45024, 45043

Students must register for all compulsory modules plus enough others to obtain at least 120 credits. This degree is awarded in the following fields:

| | BACHELOR OF SCIENCE HONOURS IN CONSTRUCTION MANAGEMENT | | BACHELOR OF SCIENCE HONOURS IN QUANTITY SURVEYING | |
|-------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| COMPULSORY | BKF404 BKI404 BOE404 BPK404 END404 KWE404 GPB402 GIP404 | POB404 BKI402 BOE404 BPK404 END404 KWE404 GPB404 GIP402 | BKF404 BKI402 BOE404 BPK404 END404 KWE404 GPB404 GIP402 | POB404 BKI402 BOE404 BPK404 END404 KWE404 GPB404 GIP402 |
| ELECTIVES | EWP404 EFB404 KOF404 | EWP404 EFB404 KOF404 BKF404 | EWP404 EFB404 KOF404 | EWP404 EFB404 KOF404 BKF404 |

BACHELOR OF SCIENCE HONOURS IN QUANTITY SURVEYING & OF SCIENCE HONOURS IN CONSTRUCTION MANAGEMENT 45024, 45043 OPEN LEARNING

Students must register for all compulsory modules plus enough others to obtain at least 120 credits. This degree is awarded in the following fields:

| | BACHELOR OF SCIENCE HONOURS IN CONSTRUCTION MANAGEMENT | | BACHELOR OF SCIENCE HONOURS IN QUANTITY SURVEYING | |
|-------------------|------------------------------------------------------------------------------|--|------------------------------------------------------------------------------|--|
| COMPULSORY | PQM404 MCI404 CFN404 PPR404 PDE404 CSC404 APM402 INP404 | | DQF404 MCI404 COE404 PPR404 PDE404 CSC404 APM402 INP404 | |
| ELECTIVES | PVP404 PFM404 | | PVP404 PFM404 CFN404 | |

11.6.5.4 BACHELOR OF SCIENCE HONOURS LEARNING PROGRAMMES IN PHYSICAL AND CHEMICAL SCIENCES

| DISCIPLINE | CHEMISTRY | PHYSICS | ASTROPHYSICS | AGROMETEOROLOGY | ENGINEERING SUBJECTS |
|------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CODE | 45021 | 45040 | 45017 | 45012 | 45026 |
| COMPULSORY | CEM614 CEM634 CEM654 CEM674 CEM624 CEM644 CEM664 CEM684 | FSK692FSK601* FSK602* FSK603* FSK604 FSK605* FSK606* FSK607 FSK608 FSK609* FSK610* FSK611* FSK612 FSK613 FSK614 * Students wanting to do an MSc in Surface Physics are strongly recommended to register for these courses. | FSK625 NB. Successful completion of all the necessary Honours modules of the National Astrophysics and Space Science Programme (NASSP) (www.star.ac.za) will be recognised by crediting the student with FSK625 (120 credits), the only requirement for BScHons (National Astrophysics and Space Science Programme). These students should register under study code. | COMPULSORY LWR601(5) LWR602 LWR695 LWR693 Two from LWR603 LWR604 LWR605 LWR606 An appropriate Honours module from another discipline. | No Honours registered and students registering for the Bachelor of Science's Engineering Sciences cannot transfer directly to a Bachelor of Honours degree; they would have to do at least three physics modules to make the migration possible. |

11.6.5.5 BACHELOR OF SCIENCE HONOURS LEARNING PROGRAMMES IN COMPUTER AND INFORMATION SYSTEM SCIENCES AND MATHEMATICAL SCIENCES

| DISCIPLINE | Computer Information Systems | Actuarial Science | Mathematics and Applied Mathematics | Mathematical Statistics | Statistics |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CODE | 4532 | 4546 | 4537 | | |
| NEW CODE | 45022 | 45010 | 45038 | 45037 | 45046 |
| CREDITS | All compulsory modules plus enough others to obtain at least 120 credits | | | | |
| COMPULSORY | RIS693 RIS620 RIS621 RIS626 | ATW605 ATW608 or ATW396 ATW692 STS613 | | STS692 STS611 STS613 STS624 | STS692 STS614 STS618 |
| | At least five modules from | At least 30 additional credits at NQF Level 8 | | At least TWO modules from | At least THREE modules from |
| | RIS601 RIS622 RIS604 RIS623 RIS606 RIS624 RIS608 RIS625 RIS609 RIS630 RIS610 RIS619 RIS612 RIS613 RIS614 RIS615 RIS616 RIS617 RIS618 | ATW611 STS611 STS616 STS618 STS619 STS622 STS624 STS625 STS626 STS629 | WTW692 WTW601 WTW602 WTW603 WTW604 WTW605 WTW606 WTW607 WTW608 WTW609 WTW610 WTW611 WTW612 WTW613 | WTW614 WTW615 WTW616 WTW617 WTW618 WTW619 WTW620 WTW621 WTW622 WTW623 WTW624 WTW625 WTW644 WTW645 WTW646 | STS614 STS615 STS616 STS618 STS619 STS621 STS622 STS623 STS625 STS626 STS629 STS611 STS612 STS613 STS615 STS616 STS619 STS621 STS622 STS623 STS624 STS625 STS626 STS629 |

11.6.5.6 HONOURS LEARNING PROGRAMMES IN GEOGRAPHY

| | GEO-INFORMATICS 45060 | GEOGRAPHY 45033 | ENVIRONMENTAL SCIENCES 45054 | GRASSLAND SCIENCES 45036 | SOIL SCIENCE 45044 |
|-------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------|
| SEMESTER | FIRST | | | | |
| COMPULSORY | GEO 616 GIS 616 GEO 692 | GEO 616 GEO 692 | PLK696 PLT654 PLK698 OR GEO 692 | GKD615 GKD625 GKD635 GKD645 GKD693 GKD695 | GKG414 GKG424 GKD414 GKD424 GKD434 GKD444 |
| | | GGH 636 GGF 636 GIS 616 | GIS616 GKD414 PLK614 PLK654 DRK614 DRK622 DRK642 | Two 16-credit NQF Level 8 modules from any other related discipline(s). | Two 16-credit NQF Level 8 modules from any other related discipline(s). |
| SEMESTER | SECOND | | | | |
| COMPULSORY | GIS 646 GGF 666 | | GGF 626 | | |
| ELECTIVES | | ENOUGH OF GGF 626, GIS 646, GGF 666 One 16-credit NQF Level 8 module from any other related field. | ENOUGH OF GGF 666 GKD 444 DRK694 | | |

HONOURS LEARNING PROGRAMMES IN GEOLOGY (45035, 45028, 45032) AND GEOHYDROLOGY (45034)

The study starts either in January or July on a date as determined by the Department of Geology and Geohydrology respectively. Modules marked by an asterisk (*) contain a research component. These courses starts on a date as determined by the subject head. Each module must be independently passed. Students compile their own Curricula in consultation with the ADH to obtain at least 60 credits per semester.

| | GEOLOGY | ENVIRONMENTAL GEOLOGY | GEOCHEMISTRY | GEOHYDROLOGY | | GEOLOGY | ENVIRONMENTAL GEOLOGY | GEOCHEMISTRY | GEOHYDROLOGY |
|-------------------|-----------------------------------------------------|-------------------------------|-------------------------------|----------------------------|--|----------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------|----------------------------|
| | FIRST SEMESTER | | | | | SECOND SEMESTER | | | |
| COMPULSORY | GLG616* | GLG616* GLG636* GLG673* | GLG616* GLG636* GLG673* | GHR611 GHR612 GHR613 | | | | GLG646* | GHR622 GHR628 GHR621 |
| ELECTIVES | GLG636* GLG653* GLG656* GLG673* GLG693* | GLG693* | GLG693* | | | GLG623* GLG626* GLG643* GLG646* GLG663* GLG683* | GLG623* GLG626* GLG643* GLG646* GLG663* GLG683* | GLG623* GLG626* GLG643* GLG663* GLG683* | |

11.7 MASTER'S DEGREES (NQF LEVEL 9)

11.7.1 MASTER'S IN ARCHITECTURE 47414, 47314(4710)

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>LEARNING PROGRAMMES FOR MASTER OF SCIENCES THE MAGISTER ARCHITECTURE</p> <ul style="list-style-type: none"> The minimum term of this study is two years and a total of 180 credits are allocated for this degree. A candidate must do research on an approved topic in consultation with the head of the department, for at least one year in preparation for a dissertation that shall be submitted as the only requirement for the degree. | <p>LEARNING PROGRAMMES FOR THE MAGISTER ARCHITECTURE (PROFESSIONAL)</p> <p>The Magister Architecturae (Professional) is a one year full-time Master's degree by coursework and involves lectures, projects, and an investigated design thesis with an advanced design project. The purpose of the qualification is to educate candidates who may register as "Candidate Architect" with the South African Council for the Architectural Profession in terms of the provisions of the Architectural Profession Act 44 of 2000.</p> <p>The evaluations and examinations for the degree MArch(Prof) are recognised by the minister concerned in terms of the provisions of the Architectural Profession Act (Act 44 of 2000). Training experience after completion of the degree MArch(Prof) will be controlled by the conditions of the South African Council for the Architectural Profession. The registrar of this Council will provide information in this regard.</p> |
| <p>YEAR 1</p> | <p>YEAR 1</p> |
| <p>ARG700</p> | <p>SKR791 BOW708 TAR704 BPK514 PAK704</p> |

11.7.2 MASTER'S IN AGRICULTURE 57352, 57362, 57375 (5725)

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|
| <p align="center">LEARNING PROGRAMMES FOR MAGISTER AGRICULTURAE</p> | | |
| <p>The aims of this degree study are:</p> | | |
| <ul style="list-style-type: none"> (a) to present specialised post-degree agricultural management training; (b) to guide the candidate in such a way that he/she will be able to successfully integrate, communicate and apply the principles, concepts and knowledge of agricultural and management science; and (c) to enhance applicable research skills in order to enable the candidate to qualify as a specialist in his/her field. | | |
| <p>A candidate who registers for the MAgric degree and presents a dissertation (180 credits), must use one of the following codes:</p> | | |
| <p align="center">RESEARCH</p> | | |
| <p>57352</p> | <p>57362</p> | <p>57375</p> |
| <p>AGRICULTURAL MANAGEMENT</p> | <p>IRRIGATION MANAGEMENT</p> | <p>WILDLIFE MANAGEMENT</p> |
| <p>LBB700</p> | <p>BSB700</p> | <p>NLB700</p> |

11.7.3 MASTER'S IN DISASTER MANAGEMENT 47425(5703)

LEARNING PROGRAMMES FOR MASTER OF DISASTER MANAGEMENT

The main aim of the programme is to provide disaster management practitioners, or those who may have future disaster management responsibilities, training in a holistic approach towards disaster management to enable them to manage all kinds of disasters by implementing proactive disaster management strategies in terms of relevant legislation, policies and directives, and effectively co-ordinate.

The degree can be offered over a minimum period of one year (full-time). Students will be allowed to take the degree over a two-year period (part-time) by registering for fewer subjects per year.

Prospective part-time candidates need to clarify their part-time studies with the Director of DiMTEC. Candidates will have two formal contact sessions of plus or minus five days each year.

The programme consists of eight electives from which a student should elect a minimum of two subjects. The programme also consists of a compulsory research project reported in an extended research essay format.

Compulsory

DIM791

Electives (choose any two):

DIM701

DIM702

DIM703

DIM704

The programme consists of eight electives from which a student should elect a minimum of two subjects. The programme also consists of a compulsory research project reported in an extended research essay format.

MASTER'S IN ENVIRONMENTAL MANAGEMENT 47456(4775; 4776)

LEARNING PROGRAMMES FOR MAGISTER IN ENVIRONMENTAL MANAGEMENT (MEM)

Upon completion of the degree the candidate should be able to:

- Apply a holistic, integrated approach when solving complex environmental problems, conducting environmental assessments, evaluating environmental assessment processes or report, or related activities.
- Identify, interpret and apply the theory and applied knowledge to suite environmental assessment tools, procedures and methods.
- Make informed decisions, guided by ethical standards, scientific evidence and societal needs within the context of Environmental Management.
- Communicate effectively with a variety of audiences, including those from the academia, private and public sectors.

- Demonstrate the ability to conduct research on an environmental management-related problem.

The programme offered is interdisciplinary and will be presented by the Faculty of Natural and Agricultural Sciences in conjunction with the Faculties of Health Sciences, Economic and Management Sciences, Law and Humanities under the control of the Centre for Environmental Management and a Management Committee. It is offered over a minimum period of two years with a total of 240 credits

At the start of each semester candidates will spend two weeks at the campus in Bloemfontein where the introductory lectures, tutorials, practicals and discussions will take place and the work programme finalised. In the second semester of the first year, students will have to come to the campus for an additional week in October/November.

| Magister Scientiae (Environmental Management) by dissertation (4775) | Structured Magister Scientiae (Environmental Management), register under the code (4776) | | | |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------|------------------------------------------------|------------|
| Year 1 and Year 2 | Semester 1 | Semester 2 | Semester 3 | Semester 3 |
| MEM 700 | MOB707 | MOB708 | MOB771 One of MOB741 MOB743 MOB745 | MOB771 |

11.7.4 MASTER'S IN SUSTAINABLE AGRICULTURE 47447(5710)

LEARNING PROGRAMMES FOR MAGISTER IN SUSTAINABLE AGRICULTURE MSA

The aim of this multi- and interdisciplinary postgraduate degree in Sustainable Agriculture is to present training in the development, maintenance and management of sustainable agricultural production systems. This process involves the sustainable utilisation of natural, economic and human resources for the production of sufficient and safe food and fibre products in all the climatic conditions of Southern Africa, but particularly the high-risk semi-arid regions. Applicable research will stimulate analytical and critical thought.

Modules are presented with limited contact by means of assignments and residential sessions.

This training programme consists of five compulsory modules, three optional modules and an

extended research essay consisting of a module on research methodology, a complete research project proposal and a final research report in the form of an extended research essay or article.

Examination (written and/or oral) is done by means of a formal examination as well as the assignments of each theoretical module. The extended research essay is presented and examined under supervision of a supervisor and supervision committee.

Modules will be offered as year or semester modules as indicated in the different study guides.

The study is presented over a minimum period of two years, during which 240 credits must be earned.

| Compulsory | | Elective modules: Three modules (24 credits each) from any focus area | | | | |
|--------------|-------------------------|-----------------------------------------------------------------------|-------------|-------------------------|------------------|-------------------|
| Core modules | Extended research essay | Rural development | Value added | Agribusiness management | Plant production | Animal production |
| MVL720 | MVL791 | MVL730 | MVL740 | MVL750 | MVL761 | MVL770 |
| MVL721 | or | MVL731 | MVL741 | MVL751 | MVL762 | MVL771 |
| MVL722 | MVL792 + MVL793 | MVL732 | | MVL752 | | |
| MVL723 | | MVL733 | | | | |
| MVL724 | | | | | | |

MASTER'S IN LAND AND PROPERTY DEVELOPMENT MANAGEMENT MLPM 47464 (4778)

These learning programmes aim to:

- Provide the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and as well as that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.
- Develop the candidate, who will be able to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

The minimum term of this study is two years and a total of 180 credits are allocated for this degree. The candidate may do a research Master's programme with a full dissertation or a structured

Master's programme depending on the discipline they want to register. In cases where an MSc degree consists only of a dissertation the programme code will start with 471 and in the case where the MSc degree consists of both course work and research the programme code will start with 472.

Research Master's: A candidate must do research on an approved topic selected in consultation with the head of the department for at least two years, in preparation for a dissertation that shall be submitted as the only requirement for the degree. The degree is also available as a residential and/or open learning programme.

Structured Master's: The Head of the Department determines how the modules must be distributed over the years of study if the student wants to digress from the prescribed curriculum. The programme can also be completed by means of distance education. The programme is presented over a period of two years. Four workshops per year of one week during the two years of the programme are compulsory and these will be determined by the Head of the Department. These workshops must also be attended at the department.

| Research Master's | Structured Master's or 4778 | | | |
|-------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------------|
| PRO700 | END704 CCP702* CIN702 BSP702 | BOE704 GKD708 BTR704 LEK720 | END773 NLE773 END772 LEK773 | ENW773 CIN773 ISR702 |
| | Select 24 credit | | | |
| | PPY702* DPR702 TRB704 LSF773 | | | BGR704 GSP702 BEH704 RBT702 VVB702 |
| | Candidates who register for Project Management as focus area/speciality have to enrol for this modules. | | | |
| | *Compulsory module to register with the SA Council for Valuers. Focus area/speciality: Endorsement (Project Management) | | | |

MASTER'S IN MINERAL RESOURCE THROUGHPUT MANAGEMENT 47468(4709)

- Effective mining and mineral beneficiation is dependent on functional integrated management practices that include aspects such as geology, mining, mineral processing, financial management and mining-related legislation, among others (including all MRM practices).
- Mining has traditionally consisted of various disciplines, which have been managed, in a fragmented fashion. The results of fragmented management led to task duplication and non-coordination of activities that span the whole spectrum of mining functions. These actions invariably resulted in the development of a high cost structure.
- The main objective of the Magister in Mineral Resource Throughput Management is to effectively integrate the relevant fields of expertise so as to manage mining activities in the most cost effective manner possible.

The programme will consist of four separate parts taken over a period of at least two years. In **phase one**, candidates will be exposed to basic Geology, Mining, Metallurgy and Business Principles as an introduction before being exposed to more detail in the applied modules. **Phase two and three** modules will contain more detail and will also address other skill deficiencies of the candidates. Some of the modules have compulsory contact time for lectures, case studies, practicals, tasks and tutorials, while others will be interactive and internet-based. The **fourth phase** comprises the completion of an extended research essay.

Upon the successful completion of the compulsory modules in phase one, five modules from phase two, two modules from phase three and phase four, the candidate will obtain a Magister qualification in Mineral Resource Throughput Management.

| PHASE1 | PHASE2 | PHASE3 | PHASE4 |
|------------------------------------------------|----------------------------------------------------------|--------------------------------------|--------|
| GLG711 GLG712 GLG713 GLG714 GLG715 | GLG721 GLG722 GLG723 GLG724 GLG725 GLG726 | GLG731 GLG732 GLG733 GLG734 | GLG791 |

MASTER OF HUMAN SETTLEMENTS 47363 (4761)

These learning programmes aim to:

- (a) Provide the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and as well as that of others by production of a thesis, which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.

- (b) Develop the candidate, who will be able to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

A candidate must do research on an approved topic in consultation with the head of the department for at least two years, in preparation of a full dissertation.

YEAR 1+2

HSS700

MASTER'S IN URBAN AND REGIONAL PLANNING (Research) MURP 47348

LEARNING PROGRAMMES FOR MASTER'S DEGREE IN URBAN AND REGIONAL PLANNING (Research)

These learning programmes aim to:

- (a) Provide the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and as well as that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.
- (b) Develop the candidate to be able to demonstrate knowledge and understanding of

supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

A candidate must do research on an approved topic in consultation with the head of the department for at least two years, in preparation of a full dissertation that shall be submitted as the only requirement for the degree.

Compulsory major modules

YEAR 1+2

SSS700

Through the publication (or acceptance for publication) of an article in an accredited journal. The article must be accepted by an accredited journal as a scientific article before it will be accepted as an alternative to the script

11.7.5 MASTER OF SCIENCES

These learning programmes aims at:

- (a) Providing the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.
- (b) Developing the candidate in order to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

The minimum term of this study is 2 years and a total of 180 credits is allocated for this degree. The candidate may do a research Masters programme with a full dissertation or a structured

Masters programme depending on the discipline for which they want to register. In cases where an MSc degree consists only of a dissertation, the programme code will start with 471 and in the case where the MSc degree consists of both course work and research the programme the code will start with 472.

- If the full dissertation option is followed the candidate must do research on an approved topic for at least two semesters, in consultation with the Academic Departmental Head, in preparation for a dissertation that shall be submitted as the only requirement for the degree. Candidates may be required to present at least one seminar/research report in each year in accordance with departmental rules.
- If the structured Master programme is all prescribed modules, a compulsory research essay must be completed. The topic for the research must be determined in consultation with the Academic Departmental Head. Candidates may be required to present at least one seminar/research report.

STRUCTURED MASTERS

| | ASTROPHYSICS | COMPUTER INFORMATION SYSTEMS | MATHEMATICS OR APPLIED MATHEMATICS |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROGRAMME CODE | 47217 | 47222 | 47238 or 47216 |
| COMPULSORY | FSK725 FSK771 | RIS771 | WTW772 |
| ELECTIVES | Candidates in the National Astrophysics and Space Science Programme (NASSP) must do an Extended research essay (FSK791) (100 credits) on an approved subject, in consultation with the Academic Departmental Head, after having already completed a theoretical course component (FSK725 – Astrophysics and Space Science) (80 credits) presented by the University of Cape Town (UCT) consisting of a total of 5 UCT weight points from the NASSP Master's programme (www.star.ac.za). An oral examination may be required which will be arranged with the candidate after the extended research essay has been submitted. | At least 2 of RIS701 RIS704 RIS705 RIS706 RIS708 RIS709 RIS710 | At least Four 24 credit modules WTW701 WTW702 WTW703 WTW704 WTW705 WTW706 WTW707 WTW708 WTW709 WTW710 WTW711 WTW712 WTW713 WTW714 WTW715 WTW716 WTW717 WTW718 WTW719 WTW720 WTW721 WTW722 WTW723 WTW724 WTW725 WTW744 WTW745 WTW746 One 24 credit module from another discipline |

| | MATHEMATICAL STATISTICS RISK ANALYSIS | | | MATHEMATICAL STATISTICS | | | STATISTICS | | |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|-----------------------------|--------|--------|
| PROGRAMME CODE | 47274 | | | 47237 | | | 47246 | | |
| COMPULSORY | STS791 STS715 STS721 STS726 (If STS615, STS621, STS626 was not part of the honour degree else any other NQF LEVEL 9 STS MODULE) | | | STS791 STS714 STS726 | | | STS791 STS716 | | |
| ELECTIVES | At least one of | | | At least four themes | | | At least four themes | | |
| | STS711 | STS719 | STS725 | STS711 | STS721 | STS725 | STS729 | STS711 | STS721 |
| | STS713 | STS722 | STS729 | STS713 | STS722 | STS729 | | STS713 | STS722 |
| | STS714 | STS723 | WTW723 | STS715 | STS723 | | | STS714 | STS723 |
| | STS716 | STS724 | ECO724 | STS716 | STS724 | | | STS715 | STS724 |
| | STS718 | | RIS712 | STS718 | | | | STS718 | STS726 |
| | | | | STS719 | | | | STS719 | |
| | A written examination paper on four themes from the following and a compulsory short dissertation on an approved topic, themes should be chosen such that the module content does not overlap with a successfully completed honours-level module, e.g. STS711 may not be chosen if STK611 was successfully completed. Themes are selected in consultation with the Academic Departmental Head | | | A written examination paper on four themes from the following and a compulsory short dissertation on an approved topic, themes should be chosen such that the module content does not overlap with a successfully completed honours-level module, e.g. STS711 may not be chosen if STK611 was successfully completed. Themes are selected in consultation with the Academic Departmental Head. | | | | | |

| RESEARCH MASTERS 2 YEARS | | | | | | | | |
|------------------------------|-------|---------|----------------------------|-------|--------|----------------------------------------|-------|---------|
| Actuarial Sciences | 47110 | ATW700 | Forensic Sciences | 47130 | GDF700 | Microbiology | 47139 | MKB700 |
| Agricultural Economics | 47111 | LEK700 | Forensic Chemistry | 47130 | GDF720 | Mathematics | 47138 | WTW700 |
| Applied Mathematics | 47116 | MTHA700 | Forensic Entomology | 47130 | GDF727 | Microbial Biotechnology | 47167 | BTG700 |
| Agrometeorology | 47112 | LWR700 | Forensic Genetics | 47130 | GDF731 | Mineral Resource Throughput Management | 47168 | MRTM700 |
| Astronomy | 47117 | AST700 | Forensic Interdisciplinary | 47130 | GDF799 | Plant Health Ecology | 47170 | PPG701 |
| Behavioural Genetics | 47118 | GG5700 | Genetics | 47131 | GEN700 | Plant Breeding | 47141 | PLT700 |
| Biochemistry | 47119 | BOC700 | Geochemistry | 47132 | GCE700 | Plant Pathology | 47142 | PPG702 |
| Botany | 47120 | PLK700 | Geography | 47133 | GEO700 | Physics | 47140 | FSK700 |
| Chemistry | 47121 | CEM700 | Geoinformatics | 47160 | GIS700 | Property Sciences | 47172 | PRO700 |
| Computer Informatics Systems | 47122 | RIS700 | Geology | 47135 | GLG700 | Quantity Surveying | 47143 | BOR700 |
| Construction Management | 47124 | KOB700 | Geohydrology | 47134 | GHR700 | Soil Sciences | 47144 | GDK700 |
| Entomology | 47127 | ENT700 | Grassland Sciences | 47136 | WDK700 | Statistics | 47146 | STS700 |
| Environmental Rehabilitation | 47157 | EVR700 | Limnology | 47166 | LIM700 | Wildlife Management | 47175 | WDK700 |
| Food Science | 47129 | VWS700 | Mathematical Statistics | 47137 | STS700 | Zoology | 47149 | DRK700 |
| Consumer Science | 47123 | CNCS700 | | | | | | |

| NANOSCIENCE | |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROGRAMME CODE | 47269 |
| COMPULSORY | <p>Study code 4719: This qualification forms part of the National Nanoscience Postgraduate Teaching Platform (NNPTP) and is offered in collaboration with the University of the Western Cape, the University of Nelson Mandela Metropole and the University of Johannesburg. Candidates are subjected to a selection process. The programme consists of a theoretical coursework component (80 Credits) and a research dissertation (100 Credits).</p> <p>(b) Research Project</p> <p><i>*Currently not available at the University of the Free State.</i></p> <p>On successful completion of the coursework component, candidates must do an approved research project (dissertation) (NSRP7900) (100 credits) in Nanoscience (in consultation with the Academic Departmental Head) at the University of the Free State.</p> |
| | <p>a) Theoretical Coursework</p> <p>The coursework component is presented at the University of the Western Cape (UWC). NSCC7911 and NSMN7911 are compulsory. Candidates register for a major field of specialization (NSFC7911, NSFP7911 or NSTC7914) and the applicable Experimental Techniques module. To complete the theoretical coursework component candidates have to enrol for the two foundation courses that are not part of the major field of specialization. For example: Candidates opting for Advanced Nanophysics (NSAP7900) accordingly select Foundations of Nano-biomedical Sciences for non-biologists (NSTC7914) and Foundations of Nanochemistry for Non-chemists (NSCC7911). The coursework component incorporates the following modules:</p> |
| | <p>NSCC7911 – Central Concepts in Nanoscience NSMN7911 – Management for Nanoscientists NSFB7911 – Foundations of Nano-biomedical sciences for Non-biologists NSFC7911 – Foundations of Nanochemistry for Non-chemists NSFP7911 – Foundations of Nanophysics for Non-physicists NSTC7914 – Experimental Techniques in Nanochemistry NSTP7914 – Experimental Techniques in Nanophysics NSAP7900 – Advanced Nanophysics NSRP7900 – Nanoscience Research Project</p> |

11.7.6 MASTER OF AGRICULTURAL SCIENCE 57112, 57113, 57115, 57136, 57141, 57142, 57144, 57146, 57148

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>These learning programmes aim at:</p> <ul style="list-style-type: none"> providing the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny developing the candidate in order to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature | <p>The minimum term of this study is 2 years and a total of 180 credits are allocated for this degree. Regulations: The candidate may do a research Masters programme with a full dissertation or a structured Masters programme depending on the discipline in which they want to register. In cases where an MSc degree consists only of a dissertation the programme code will start with 571 and in the case where the MSc degree consists of both course work and research the programme code will start with 592.</p> <ul style="list-style-type: none"> If the full dissertation option is followed the candidate must do research on an approved topic for at least two semesters, in consultation with the Academic Departmental Head, in preparation for a dissertation that shall be submitted as the only requirement for the degree. Candidates may be required to present at least one seminar/research report in each year in accordance with departmental. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

RESEARCH

| | | | | | | | | |
|-----------------|-------|--------|-------------------|-------|--------|---------------------|-------|--------|
| Agrometeorology | 57112 | LWR700 | Grassland Science | 57136 | WDK700 | Soil Science | 57144 | GKD700 |
| Agronomy | 57113 | AGR700 | Plant Breeding | 57141 | PLT700 | Wildlife Management | 57148 | NLB700 |
| Animal Science | 57115 | VKD700 | Plant Pathology | 57142 | PPG702 | | | |

11.7.7 MASTER OF SCIENCES IN CONSUMER SCIENCES 47123

These learning programmes aims at:

- (a) providing the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.
- (b) developing the candidate in order to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

The minimum term of this study is 2 years and a total of 180 credits are allocated for this degree.

The candidate may do a research Masters programme with a full dissertation or a structured Masters programme depending on the discipline in which they want to register. In cases where an MSc degree consists only of a dissertation the programme code will start with 471 and in the case where the MSc degree consists of both course work and research the programme code will start with 472.

- If the full dissertation option is followed the candidate must do research on an approved topic for at least two semesters, in consultation with the Academic Departmental Head, in preparation for a dissertation that shall be submitted as the only requirement for the degree. Candidates may be required to present at least one seminar/research report in each year in accordance with departmental.

If the structured Master programme is all prescribe modules, a compulsory research essay must be completed. The topic for the research must be determined in consultation with the Academic Departmental Head. Candidates may be required to present at least one seminar/research report.

| RESEARCH | STRUCTURED |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------|
| MASTER OF SCIENCE IN CONSUMER SCIENCES MSc(Consumer) 47123 (4771) | MASTER OF SCIENCE IN HOME ECONOMICS MSc(Consumer) 47223 (4772) |
| CNS700 | CNS701 VWS701 VWS702 VWS703 or HDK701 or VDG701 HDK771 |

11.7.8 MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT AND QUANTITY SURVEYING 47124, 47143

MSc (Construction Management and QS) is an advanced academic degree focused on specialisation in the construction science to prepare candidates to act as leaders in the profession and serve as specialists in different fields or in the science of quantity surveying.

These learning programmes aims at:

- (c) providing the candidate with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.

- (d) developing the candidate in order to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

A candidate must do research on an approved topic in consultation with the head of the department for at least two years, in preparation of a full dissertation that shall be submitted as the only requirement for the degree.

| MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT MSc (Constr) 47124 (4780) | MASTER OF SCIENCE IN QUANTITY SURVEYING MSc (QS) 47143 (4720) |
|------------------------------------------------------------------------|---------------------------------------------------------------|
| YEAR 1 + YEAR 2 | YEAR 1 + YEAR 2 |
| BOR700 | KOB700 |

11.7.9 MASTER OF URBAN AND REGIONAL PLANNING (Professional) MURP 47448

After completing the MURP programme, the graduates will obtain a professional degree and will possess the following skills:

- The capacity to complete practical urban and regional planning projects including spatial frameworks, development plans and layouts
- The capacity to analyse issues from a theoretical and/or empirical perspective and to recommend suitable alternatives
- The capacity to communicate clearly and logically, write good planning and research reports, and debate these with stakeholders
- The ability to critically evaluate information and theories and to apply relevant concepts from different disciplines in innovative approaches to planning issues

The period of this study can be:

- Full Time 12 months,
- Part Time 24 months or

- Compact learning- block sessions 24 months presented as 4 - 5 workshop weeks per year

The Head of the Department determines how the modules must be distributed over the years of study and in all programmes (Full time, Part time and Compact Learning). The modules may be spread over an additional year if a student does not have the necessary academic background. Compact learning students must attend compulsory workshop weeks at the department for the duration of the programme at times as determined by the Academic Departmental Head. During these workshop lectures, tutorials, practicals and discussions will take place. Assignments will be done and tests and examinations may also be written.

Students that register as full time or part time will also be expected to attend some classes, sessions, guest lectures, field trips, site visits, tours, tests and examinations during the block weeks.

After sufficient practical training the graduate will be able to register as Urban and Regional Planner at the South African Council for Urban and Regional Planners (SACPLAN).

Compulsory major modules

| | |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Full time | Compulsory semester modules: URRM7914 / URRM7924 URPP7914 / URPP7924 URHS7913 / URHS7923 URDP7912 / URDP7922 |
| | Compulsory year modules: URRP7906 URUP7906 URGI7904 URMD7900 |
| Compact Learning and Part Time | Year 1 |
| | Compulsory semester modules: URRM7914 / URRM7924 URDP7912 / URDP7922 Compulsory year modules: URRP7906 URUP7906 |
| | Year 2 |
| | Compulsory semester modules: URPP7914 / URPP7924 URHS7913 / URHS7923 Compulsory year modules: URGI7904 URMD7900 |

11.8 DOCTOR OF SCIENCES DEGREES (NQF LEVEL 10)

11.8.1 DOCTOR OF ARCHITECTURE DArch (4910) 49014

This learning programme aims to:

- (a) Provide the opportunity for candidates who have already obtain a NQF Level 10 qualification and have contributed extensive publications of exceptional quality in the specific subject field or discipline over a considerable period of time:

Candidates can register for a Doctoral degree with specialisation in one of the following areas:

| | | |
|---------------------|-------|--------|
| Architecture | 49014 | ARG900 |
|---------------------|-------|--------|

11.8.2 DOCTOR OF SCIENCE (DSc) 49011–49064

These learning programmes aims to:

- (a) Provide the opportunity for candidates who have already obtain a NQF Level 10 qualification and have contributed extensive publications of exceptional quality in the specific subject field or discipline over a considerable period of time:

Candidates can register for a Doctoral degree with specialisation in one of the following areas:

| | | | | | | | | |
|------------------------------|-------|---------|-------------------------------------|-------|------------------|-----------------------------|-------|--------|
| Actuarial Sciences | 49010 | ATW900 | Entomology | 49027 | ENT900 | Microbiology | 49039 | MKB900 |
| Agricultural Economics | 49011 | LEK900 | Environmental Geology | 49028 | | Microbial Biotechnology | 49067 | BTG900 |
| Agrometeorology | 49012 | LWR900 | Environmental Rehabilitation | 49057 | EVR900 | Physics | 49040 | FSK900 |
| Agronomy | 49013 | AGR900 | Food Science | 49029 | VWS900 | Plant Breeding | 49041 | PLT900 |
| Animal Science | 49015 | VKD900 | Forensics Sciences | 49030 | GDF900 GDF999 | Plant Health Ecology | 49070 | PPG901 |
| Applied Mathematics | 49016 | MTHA900 | Genetics | 49031 | GEN900 | Plant Pathology | 49042 | PPG900 |
| Astronomy | 49017 | AST900 | Geochemistry | 49032 | GCE900 | Property Sciences | 49072 | PRO900 |
| Behavioural Genetics | 49018 | GG900 | Geography | 49033 | GEO900 | Quantity Surveying | 49043 | BOR900 |
| Biochemistry | 49019 | BOC900 | Geography and Environmental Science | 49054 | ENV901 | | | |
| Botany | 49020 | PLK900 | Geohydrology | 49034 | GHR900 | Sustainable Agriculture | 49047 | VHL900 |
| Chemistry | 49021 | CEM900 | Geology | 49035 | GLG900 | Soil Science | 49044 | GKD900 |
| Computer Informatics Systems | 49022 | RIS900 | Grassland Science | 49036 | WDK900 | Statistics | 49046 | STK900 |
| Consumer Sciences | 49023 | CMS900 | Limnology | 49066 | LIM900 | Urban and Regional Planning | 49048 | SSS900 |
| Construction Management | 49024 | KOB900 | Mathematical Statistics | 49037 | STS900 | Wildlife Management | 49075 | NLB900 |
| | | | Mathematics | 49038 | WTW900 | Zoology | 49049 | DRK900 |

11.8.3 PHILOSOPHIAE DOCTOR (PhD) 49111-49164

This learning programme aims to:

- (a) Provide the candidate with the opportunity to prove her/his ability to plan and do research independently and to report the results.
- (b) Enable the candidate to make an original contribution to the discipline.

The minimum term of this study is three years and a total of 360 credits is allocated for this degree. The candidate must do research for at least four semesters on an approved topic selected in consultation with the departmental chair in preparation to complete the thesis (360 credits). The degree study period therefore lasts three years. The candidate will present at least one seminar/ research report in each year of study in accordance with departmental regulations.

Candidates can register for a PhD with specialisation in one of the following areas:

| | | | | | | | | |
|------------------------------|-------|---------|-------------------------------|-------|------------------|----------------------------------------|-------|--------|
| Actuarial Sciences | 49110 | ATW900 | Environmental Geology | 49128 | MEM900 | Microbiology | 49139 | MKB900 |
| Agricultural Economics | 49111 | LEK900 | Environmental Rehabilitation | 49157 | ENR900 | Microbial Biotechnology | 49167 | BTG900 |
| Agricultural Management | 49152 | LBB900 | Facilities Management | 49158 | FMT900 | Mineral Resource Throughput Management | 49168 | MRM900 |
| Agrometeorology | 49112 | LWR900 | Food Science | 49129 | VWS900 | Nanosciences | 49169 | NNS900 |
| Agronomy | 49113 | AGR900 | Forensics Sciences | 49130 | GDF900 GDF999 | Physics | 49140 | FSK900 |
| Architecture | 49114 | ARG900 | Genetics | 49131 | GEN900 | Plant Breeding | 49141 | PLT900 |
| Animal Science | 49115 | VKD900 | Geochemistry | 49132 | GCE900 | Plant Health Ecology | 49170 | PLK900 |
| Applied Mathematics | 49116 | MTHA900 | Geography | 49133 | GEO900 | Plant Pathology | 49142 | PPG900 |
| Astronomy | 49117 | AST900 | Geohydrology | 49134 | GHR900 | Polymer Sciences | 49171 | PLS900 |
| Behavioural Genetics | 49118 | GGG900 | Geoinformatics | 49160 | GIS900 | Property Sciences | 49172 | PTS900 |
| Biochemistry | 49119 | BOC900 | Geology | 49135 | GLG900 | Risk Analysis | 49174 | RSA900 |
| Botany | 49120 | PLK900 | Grassland Science | 49136 | WDK900 | Quantity Surveying | 49143 | BOR900 |
| Chemistry | 49121 | CEM900 | | | | Sustainable Agriculture | 49147 | VHL900 |
| Computer Informatics Systems | 49122 | RIS900 | Irrigation Management | 49162 | BSB900 | Soil Science | 49144 | GKD900 |
| Consumer Sciences | 49123 | CMS900 | Human Settlements | 49163 | LHD900 | Spatial Planning | 49145 | SPP900 |
| Construction Management | 49124 | KOB900 | Land and Property Development | 49164 | LPD900 | Statistics | 49146 | STS900 |
| Disaster Management | 49125 | DMT900 | Limnology | 49166 | LIM900 | Urban and Regional Planning | 49148 | SSS900 |
| Ecology | 49152 | BIOG900 | Mathematical statistics | 49137 | STS900 | Wildlife Management | 49175 | NLB900 |
| Entomology | 49127 | ENT900 | Mathematics | 49138 | WTW900 | Zoology | 49149 | DRK900 |

12. MODULE CONTENT FOR UNDERGRADUATE MODULES ALPHABETICALLY PER INTEREST FIELD AND DEPARTMENT

ABBREVIATION AND NUMBERING SYSTEM

Each module of the subject is represented by a three-digit module code, in which the year of study and semester of presentation (unless otherwise stated) are combined. In addition, the credit value, NQF level, CESM code, prerequisite pass and/or prerequisite and co-requisite modules for each, modular name, contact sessions, content and assessment for each module are given.

This is a promotion module: if a candidate participates in all assessments and obtains an average semester mark above 75%, this candidate need not write the final exam – their semester mark will become their final mark.

Key:

| Subject | | | | | | |
|-------------|--------------|-----------|-----------|-------------------------------------------------------------------------|-------------|------------------|
| Module code | Credit value | NQF-level | CESM code | Prerequisite pass and/or prerequisite and co-requisite modules for each | Module name | Contact sessions |
| Content | | | | | | Assessment |

Example:

| | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|--------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------|
| BOC 216 | 24 | 6 | CESM: 130201 | Two of the following: BLG114, BLG124, BLG144 and (CEM124 OR 60% pass in CEM144 or CHE132+CHE122+CHE161) | Biochemistry of biological compounds | 3L, 4P |
| An introduction to the most important principles governing biochemistry. The module is designed to expand on the foundation that the student has acquired in chemistry and biology modules and to provide a biochemical framework that allows understanding of new phenomena. | | | | | Semester tests and class tests. One examination paper of three hours. | |

Explanation

Subject: Biochemistry: Module BOC216:

Module code

- First digit: 2 – refers to the year of study in which the module is presented.
- Second digit: is a number that discriminates between modules of the same subject in the same year of study and refers to the semester (unless stated otherwise), according to the following pattern explained earlier (p. XXXX), (Uneven numbers: modules offered in the first semester; Even numbers: modules offered in the second semester; 0,9: modules offered over two semesters, i.e. a year module).
- Third digit: multiply by 4 to indicate the credits.

Contact sessions

- The number of contact sessions of each module is indicated in the square following the module subject.
- The following abbreviations are used:
- L – lectures lasting 50 minutes each (e.g. 1L, 2L)

- P – practical periods lasting 50 minutes each (e.g. 1P, 2P, 3P)
- S – seminars lasting 50 minutes (e.g. 1S)
- T – tutorials lasting 50 minutes each (e.g. 1T, 2T)
- D – discussion lasting 55 minutes each (e.g. 3D)
- B – block sessions over one week (e.g. 3B)

- BOC216 is therefore offered as a module during the first semester of the second year and a student will acquire 24 credits on completion at NQF Level 6.
- Before a student can register for this module the following prerequisites need to be met: two of the following BLG114, BLG124, BLG144 and (CEM124 OR 60% pass in CEM144 or CHE132+CHE122+CHE161)
- The contact sessions of BOC216 amount to three lectures plus four practicals per week for the duration of the module, i.e. one semester.
- The content of the module as well as the assessment mode is indicated in the next two blocks.

12.1 AGRICULTURAL SCIENCES

12.1.1 DEPARTMENT OF AGRICULTURAL ECONOMICS

AGRICULTURAL DATAMETRY

| | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|-------------------|-------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DMT214 | 16 | 6 | CESM: 0199 | National Senior Certificate with at least Mathematics performance on level 3 | Introduction to Agricultural Datametry | 3L,3P |
| During this course the student will: <ul style="list-style-type: none"> learn how to calculate and interpret statistics (mean, variance, analysis of variance (ANOVA) and multiple comparison of means) from various experimental designs. Data sets will be analysed during tutorials to illustrate the techniques learned. | | | | | | Formative assessment: Assignments and two semester tests. Summative assessment: One examination paper of three hours. |
| DMT224 | 16 | 6 | CESM: 0199 | National Senior Certificate with at least Mathematics performance on level 3 | Agricultural Datametry | 3L,3P |
| During this course the student will: <ul style="list-style-type: none"> learn about regression (simple linear regression and multiple regression), correlation and co-variance analysis. Data sets will be analysed during tutorials to illustrate the techniques learned. | | | | | | Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of three hours. |
| DMT322 | 16 | 6 | CESM: 0199 | National Senior Certificate with at least Mathematics performance on level 3 | Statistical Analyses | 1L,3P |
| After completion the student will be able to: <ul style="list-style-type: none"> use software packages in the analyses of ANOVA designs (fully randomised design, randomised complete block design, Latin squares, factorial experiments, (co) variance analyses), regression analyses (linear, nonlinear, multi linear), frequency tables and Chi square analyses of categorical data, graphical presentations, univariate and mixed model analyses applicable to Agricultural related industries. The ability to interpret and to make inferences regarding the analysed data will also be mastered. | | | | | | Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of two hours (Including analysis of data on a computer). |

AGRICULTURAL ECONOMICS

| | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|---------------------|-------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| LBB314 | 16 | 7 | CESM: 010199 | None | Business Management and Entrepreneurship | 3L,3P |
| After completing this course the student will understand: <ul style="list-style-type: none"> demonstrate his/her expertise in entrepreneurship relating to the basic principles and historical development and application thereof given the entrepreneurial environment, interpret the concept entrepreneurship along with the characteristics of the entrepreneur argue the importance of creativity and innovation as well as feasibility and viability in entrepreneurship develop an effective business plan in order to enter the business world with all the attachments thereof, employ all the different management and operational aspects that are part of starting and growing business and demonstrate the different ways that exist when he/she wants to start a business | | | | | | Formative assessment: Quizzes, assignments and two semester tests. Summative assessment: One examination paper of two hours. |
| LBB324 | 16 | 7 | CESM: 010199 | None | Innovation Management | 3L,3P |
| After completing this course the student will understand: <ul style="list-style-type: none"> Think innovatively and creatively in order to generate sustainable business ideas that will ensure a competitive advantage and growth in a business. Analyse and apply the innovation process. Identify and evaluate the barriers as well as success factors to innovation | | | | | | Formative assessment: Quizzes, assignments and two semester tests. Summative assessment: One examination paper of two hours. |

| | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|---------------------|------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| LBB344 | 8 | 7 | CESM: 010199 | None | Strategic Agricultural Management | 3L,3P |
| After completing this course the student will understand: <ul style="list-style-type: none"> Strategic thinking is, in the present turbulent agricultural environment, of crucial importance. In this module the student will gain knowledge about implementing the steps in strategic management as well as the tasks of the strategic manager; strategic management of new technologies; developing creative and innovative thoughts; setting a paradigm shift for a farm; re-engineering of a farm; drawing a scenario for any agricultural product or possible outcomes in the future; discounting droughts strategically in the decision-making process; developing a community development programme for any community (commercial agriculture) in the form of an executable plan. Practical work: Development of a paradigm shift, re-engineering, scenarios and strategic plan for a farming business and a community development project as well as creativity exercises; practical demonstrations of new technologies in agriculture. | | | | | | Formative assessment: Quizzes, assignments and two semester tests. Summative assessment: One examination paper of three hours. |
| LBB362 | 8 | 7 | CESM: 010199 | None | Seminar in Agricultural Management | 2L |
| After completing this course the student will understand: After completion of this module the student will be able to develop an integrated farm management model on a spreadsheet and to defend the model in an oral exam. | | | | | | Written seminar plus an oral examination. Time |
| LBB601 | 15 | 8 | CESM: 010199 | Selection for Honours | Advanced Agricultural Management | 2S |
| Effective management styles, leadership and information systems. | | | | | | An examination paper of three hours |
| LBB602 | 15 | 8 | CESM: 010199 | Selection for Honours | Financial Management | 2S |
| A critical analysis and interpretation of the financial statements of an agribusiness by using key financial ratios. The evaluation of the impact and financial feasibility of new projects, growth strategies on the key financial ratios and the long term well-being of the business by taking into account the changing macro-economic environment. At the end of the course the student must submit an assignment and do a presentation illustrating the application of these principles on an agribusiness of his/her choice. | | | | | | An examination paper of three hours |
| LBB603 | 15 | 8 | CESM: 010199 | Selection for Honours | Production Management | |
| After the successful completion of this module the student will understand the theoretical concepts of production economics, which include, amongst others, input/output, input/input, and output/output relationships; economic optimal input and output levels; and economies of scale. The student will be able to compile comprehensive enterprise budgets for cash and perennial crops, pastures and livestock enterprises with special reference to the consideration of the availability, and the quality of available natural resources. With the aid of actual case studies, the student will understand how theoretical concepts are applied in practice when making management decisions to choose between different production alternatives, production processes, and the adoption of new production technology. The student will be able to assess the financial impact of management decisions within a case study of his/her choice. | | | | | | An examination paper of three hours |
| LBB604 | 15 | 8 | CESM: 010199 | Selection for Honours | Project Management | |
| Project management is the process by which projects are defined, planned, implemented, monitored and controlled to realise project objectives. After completing this module the student will be able to develop a project plan, define the scope of the project, set objectives, develop a time-schedule and a budget, manage resources, measure progress and manage the project to complete the project successfully. | | | | | | An examination paper of three hours |
| LBB605 | 15 | 8 | CESM: 010199 | Selection for Honours | Marketing Management | |
| After completion of this module the students will be equipped with the decision-making skills and knowledge needed to perform a complete marketing plan for an agri-business. More specifically, the module encompasses the analysis of the macro and internal environment in which marketing takes place, strategic marketing process and the development of marketing plan. Supplementation will take place by giving real life case studies. | | | | | | An examination paper of three hours |
| LBB606 | 15 | 8 | CESM: 010199 | Selection for Honours | Human Resource Management | |
| After the completion of this module the student will be able to have a comprehensive knowledge of human resource management in South Africa. Students will be able to analyse and confidently manage challenges pertaining to the management of their staff in terms of employment relationships, workforce planning, establishing employee relationships (recruiting, appointing and orientating), utilising and developing employees (motivating, leading and training) and the influence of Labour Laws and policies. | | | | | | An examination paper of three hours |
| LBB607 | 15 | 8 | CESM: 010199 | Selection for Honours | Business Management | |
| After completion of this module the student will have a comprehensive knowledge of strategic management theories and methods. The student will be able to practically apply strategic management concepts in terms of production, processing, retail and service sectors of businesses in various industries. | | | | | | An examination paper of three hours |

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| LBB609 | 24 | 8 | CESM: 010199 | Selection for Honours | Financial Management | |
| <p>A critical analysis and interpretation of the financial statements of an agribusiness by using key financial ratios. The evaluation of the impact and financial feasibility of new projects, growth strategies on the key financial ratios and the long term well-being of the business by taking into account the changing macro-economic environment. At the end of the course the student must submit an assignment and do a presentation illustrating the application of these principles on an agribusiness of his/her choice.</p> | | | | | | An examination paper of three hours |
| LBB693 | 15 | 8 | CESM: 010199 | Selection for Honours | Research Project | |
| <p>An integrated business plan under the guidance of a supervisor will be completed. The students will become skilled in problem identification, development of research objectives and hypotheses, identification and reviewing of relevant information sources, the design of a business plan, methods of data collection, the analysis of data and the presentation and interpretation of results in a business plan.</p> | | | | | | No formal examination |

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| LBB700 | 180 | 9 | CESM: 010101 | Honours Degree | Extended Dissertation | |
| <p>Topic is chosen in consultation with the supervisor and department.</p> | | | | | | A single document submitted to the supervisor and external moderator. |
| LEK114/LEC114 | 16 | 5 | CESM: 010101 | National Senior Certificate with at least Mathematics performance on level 3 | Economic Management of Resources | 3L,3P |
| <p>After completing this course the student will understand:</p> <ul style="list-style-type: none"> the role of resources in the agricultural economy, supply and demand of agricultural products, marketing and the determination of price, farm management- and financial principles, the current agricultural-, trade- and development policies in South Africa. <p>Practical assignments will be given which to complement the theory done in class.</p> | | | | | | Formative assessment: Quizzes, assignments and two semester tests. Summative assessment: One examination paper of two hours. |
| LEK124 | 16 | 6 | CESM: 010101 | LEK 114 | Agricultural Finances | 3L,3P |
| <p>After completion of this module the student will have knowledge:</p> <ul style="list-style-type: none"> about the purpose and components of a farm record keeping system. The handling of depreciation, also in terms of the income tax act as well as the procedure for taking the impact of inflation into consideration. A basic overview of income tax as well as the handling of Value Added Tax (VAT) is also covered. The purpose, components, completion and analysis of each of the financial statements. An economic and financial analysis of a farming business with interpretation and advice on the results. Budgets for different enterprises (both livestock and crops). <p>Practical work: Upkeep and analysis of farming records and application of different techniques, also by means of a personal computer.</p> | | | | | | Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of three hours. |
| LEK134 | 16 | 6 | CESM: 010101 | None | Business functions for Agribusiness | 3L,3P |
| <p>This module contains fundamental knowledge, theories, principles and practices of Agricultural Economics, including: Introduction to management as well as the environments, in which a business operates. Special focus will be given to eight management functions which include the following; Marketing, Financial Management, Human Resource Management, Operational Management, Logistics Management, Administration, Public Relations and General Management.</p> | | | | | | Formative assessment: assignments and 2 semester test. Summative assessment: One examination paper of two hours. |
| LEK214 | 16 | 6 | CESM: 010102 | LEK114 | Farm Planning and Management | 3L,3P |
| <p>The main purpose of this module is to enable the student to analyse and plan changes (risks and opportunities) within a farming business. The module is divided into two sections: Section I, which consists of the planning of livestock and crop production enterprises, and Section II, which consists of the composition of livestock and crop production enterprises in a whole farm production plan, given the marketing and financial plans, which include mechanisation and human resource planning as well as the planning of the business agreement. The focus is further placed on all aspects of human resource management.</p> <p>Practical work: The development of enterprise budgets, mechanisation planning, human resource planning and practical exercises to apply risk management instruments in practice.</p> | | | | | | Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of two hours. |

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| LEK224 | 16 | 6 | CESM: 010102 | LEK114 | Introduction to Agricultural Marketing | 3L,3P |
| <p>The objective of this module is (a) to provide the student with knowledge on the nature and dynamics of the food marketing system, from the production of agricultural commodities to the final consumption of food products and services; (b) to enable the student to plan and employ programmes to manage the price risks of agricultural commodities through the use of forward contracts, futures, and option strategies; and (c) to introduce the students to the forecasting of agricultural product prices. The student will understand how to do analysis and interpretations of demand and supply, price and income elasticity. Knowledge of the quantification of agricultural marketing questions, the fitting of supply and demand curves, identification of variables that influence agricultural prices, the interdependence of the agriculture sector with the rest of the economy, the international environment and strategic planning will be obtained.</p> <p>Practical work: Forecasting the prices of grains and oilseeds and trading on SAFEX. Analysing of supply, demand and price by means of basic econometric techniques. Compiling a marketing plan for an agricultural product taking cognisance of the financial implications.</p> | | | | | | <p>Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of two hours.</p> |
| LEK314 | 16 | 7 | CESM: 010102 | LEK114 | Managerial Economics | 3L,3P |
| <p>The student will understand how:</p> <ul style="list-style-type: none"> micro economics provides the framework for "economic" ways of thinking and how this basic knowledge was developed in techniques such as linear programming (LP) that solve agricultural economic problems to make efficient decisions. In addition, the student will have an understanding of the principles underlying decision-making under uncertainty. <p>Practical work: Spreadsheet models of production and cost functions. Fitting of production functions by means of regressions. Application of LP models. Measurement of risk with subjective probabilities. Forecasting.</p> | | | | | | <p>Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of three hours.</p> |
| LEK316 | 16 | 7 | CESM: 010102 | | Seminar in Agricultural Economics | 6S |
| <p>After the completion of this module the student will understand how to do a written assignment on specific agricultural economic and related topics.</p> | | | | | | <p>Continuous assessment during presentations. No formal examination is required.</p> |
| LEK324 | 16 | 7 | CESM: 010102 | LEK114 | Resource Economics | 3L,3P |
| <p>After the completion of this module the student will have knowledge:</p> <ul style="list-style-type: none"> on the theory of natural resource and environmental economics. Aspects that will be addressed include: property rights, externalities and environmental problems, market and government failures, optimal use/management of natural resources and the environment with special reference to water, soil, natural vegetation, fisheries and other species, and pollution. <p>Practical work: Application of measuring techniques to determine the economic effects of natural resource and environmental problems. Evaluation of alternative solutions to problems.</p> | | | | | | <p>Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of three hours.</p> |
| LEK334/LBB334 | 16 | 7 | CESM: 010102 | LEK114 | Agribusiness Management | 3L,3P |
| <p>Analyse and confidently handle challenges pertaining to the agribusiness system such as entrepreneurship, strategic management in agriculture, quality management, role and importance of value chains, competitiveness of SA agriculture, choice of legal business forms (sole proprietorship, partnership, close corporation, private company, business trust, cooperative, new generation cooperative) and handling collaboration structures in the value chain, as well as human resource management within a modern transformed society.</p> <p>Practical work: Develop a detailed and coherent business plan for an agribusiness deploying a wide range of agricultural economics techniques.</p> | | | | | | <p>Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of two hours.</p> |
| LEK344 | 16 | 7 | CESM: 010102 | LEK114 | Agricultural Policy and Development | 3L,3P |
| <p>Knowledge will be gained in this module about the involvement of the government in agriculture, reasons for government interference, how agricultural policy causes distortions and the spill over effect of it, the effect of policy on the welfare of populations and on the competitiveness of agriculture, factors that prevent small scale farmers from becoming surplus producers, transaction costs and the utilisation of new technologies, the role of research in developing countries, the development of human capital and poverty.</p> <p>Practical work: Discussion of reading material and analyses of agricultural policy on computers.</p> | | | | | | <p>Formative assessment: assignments and two semester tests. Summative assessment: One examination paper of two hours.</p> |
| LEK601 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Quantitative Techniques | L, P, S |
| <p>The learner will be competent in demonstrating knowledge about microeconomic concepts, market structures, and concentration in the South African economy.</p> | | | | | | <p>An examination paper of three hours.</p> |
| LEK602 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Production and Consumer Economics | L, P, S |
| <p>This module aims to build the capacity of the student to econometrically estimate production, cost and profit functions and to apply those functions to identify optimal input and output levies. The student will be able to motivate a choice of a specific functional form and to derive product supply and factor demand functions using both the primal and dual approaches.</p> | | | | | | <p>An examination paper of three hours.</p> |

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| LEK603 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Operational Research | L, P, S |
| The primary learning outcome of this course is to build the capacity of the student to synthesise information regarding complex agricultural problems, to represent these problems mathematically within a linear, mixed integer, dynamic linear or a risk programming framework as appropriate, to solve these problems using the General Algebraic Modelling System (GAMS) and to interpret the results. To build the capacity of the student to represent a specific problem using mathematical notation specific to the GAMS modelling language , solve the model and interpret the results for various problem sets. | | | | | | An examination paper of three hours. |
| LEK604 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Agricultural Econometrics | L, P, S |
| This is an applied course in basic regression analysis and other econometric techniques and models. The module contains lessons that you can apply to a wide range of empirical economic problems. The course consists of both theoretical and practical application, where the student will be able to use various computer programmes to solve economic problems. Econometrics gives empirical content to most economic theory. The students must be able to familiarise themselves with the nature and structure of the data in question and be able to apply various techniques in data transformation and modelling. | | | | | | An examination paper of three hours. |
| LEK605 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Agricultural Financing | L, P, S |
| After completion of this module, the student will be able to critically analyse and independently evaluate an agribusiness's financial position, and propose recommendations on the growth and protection of equity capital in a risky macroeconomic environment | | | | | | An examination paper of three hours. |
| LEK606 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Agricultural Policy | L, P, S |
| After completion of this course the student should understand the agricultural policy process and have a good theoretical knowledge about agricultural policy; know the South African agricultural policy and have a thorough understanding of it; be able to evaluate agricultural policy by using different methods; and be able to evaluate the effect of agricultural policy on agricultural development. | | | | | | An examination paper of three hours. |
| LEK607 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | International Agricultural Trade | L, P, S |
| After completion of this learning programme the student will have the necessary knowledge base, a deep understanding of the complexities of international trade and have the skills to analyse international trade independently. | | | | | | An examination paper of three hours. |
| LEK608 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Agricultural Development | L, P, S |
| Using the theoretical and empirical knowledge gained from the unit, students will be able to analyse agricultural households, rural markets and institutions, evaluate the ability of alternative policies to engender agricultural and economic development based on their understanding of how agricultural households and rural organisations and institutions function. | | | | | | An examination paper of three hours. |
| LEK609 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Agricultural Marketing and Price Analysis | L, P, S |
| After completion of this learning programme the student will have the necessary knowledge base, a deep understanding of the complexities of marketing agricultural products and have the skills to do compile an all-encompassing marketing plan. | | | | | | An examination paper of three hours. |
| LEK610 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Advanced Resources and Environmental Economics | L, P, S |
| With an understanding of the theory of environmental and natural resource economics learners will be able understand concept of value as it applies to these resource and the role the importance of economic values in guiding resource allocation and management. Students will gain an understanding of valuation techniques such as the travel cost method, hedonic price methods and contingent valuation, and the capacity to use these techniques to determine the benefits to society from different natural resource management and environmental improvement policies and programmes. | | | | | | An examination paper of three hours. |
| LEK611 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Project Planning and Analysis | L, P, S |
| The objectives of this unit are to introduce learners to the principles of project design, planning and management, project design concepts and methods that effectively link projects to rural and economic development strategies | | | | | | An examination paper of three hours. |
| LEK693 | 15 | 8 | CESM: 010102 | Agricultural Economics at third year level | Research Project in Agricultural Economics | L, P, S |
| Students will complete a research project under the guidance of a supervisor and will become skilled in problem identification, development of research objectives and hypotheses, identification and reviewing of relevant literature, specification of a conceptual and analytical framework, locating sources of data, sampling concepts and design, methods of data collection including questionnaire design and testing, analysis of data, presentation and interpretation of research results, and report writing. | | | | | | An examination paper of three hours. |
| AGB605 | 15 | 8 | CESM: 010199 | Agricultural Economics at third year level | Agribusiness Management | L, P, S |
| The overall learning outcome of this module is to obtain a comprehensive knowledge of strategic management principles and methods for production, processing, wholesaling, retailing and service forms in the context of the markets of these firms, thus across specialised areas in agriculture | | | | | | An examination paper of three hours. |

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| LEK900 | | | | | |
| LBB700 | 180 | 10 | | Dissertation | |

AGRICULTURAL ENGINEERING

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| LNG224 | 18 | 6 | CESM: 0199 | LWL164 or WTV164 60% or WTV134 | Engineering Principles in Agricultural Practices | 3L,3P |
| <p>Engineering skills in aspects of soil and water conservation. The design of waterways, terraces, contours in conservation farming practices. The learning of how to determine flow and the protection of soil conservation works, weirs and farm dams. Recovery of erosion trenches with the help of mechanical control measures. Basic hydraulics and the practical design of stock-watering systems and pipelines.</p> <p>Practical work: The development of designer skills and the application of calculations. Measurements and standardisation with specific application in the agriculture.</p> | | | | | | <p>Formative assessment: assignments and two semester tests.</p> <p>Summative assessment: One examination paper of three hours.</p> |
| LNG314 | 18 | 6 | CESM: 0199 | LNG224 | Hydraulics | 3L,3P |
| <p>Knowledge of basic hydraulics and the solving of problems. Applications of hydraulics in the instalment of agricultural networks, pumps and electrical motors. The student must be familiar with the practical implementation and application of Eskom networks and tariffs.</p> <p>Practical work: Introduction with irrigation systems, solving of hydraulic problems, determining of HQ curves of pumps, deciding on pumps and the power requirements of pumps. Practical calculations of electricity tariffs.</p> | | | | | | <p>Formative assessment: assignments and two semester tests.</p> <p>Summative assessment: One examination paper of three hours.</p> |
| LNG324 | 16 | 6 | CESM: 0199 | LNG314 | Irrigation Systems and Irrigation Surveying | 3L,3P |
| <p>Ability to determine the use of the relevant irrigation systems in specific circumstances and conditions. Practical experience in the basic planning and design of irrigation systems.</p> <p>Practical work: The learning of methods in the selection of the correct irrigation systems and the determining of the cost effectiveness of the different systems. Practical surveying and design.</p> | | | | | | <p>Formative assessment: assignments and two semester tests.</p> <p>Summative assessment: One examination paper of three hours.</p> |
| LNG414 | 18 | 6 | CESM: 0199 | LNG324 | Flood and Mechanised Irrigation | 2L,3P |
| <p>Knowledge on the subject, management and evaluation of specific flood and mechanised irrigation systems. The study and application of SAIB norms and principles.</p> <p>Practical work: Design and evaluation of flood and sprinkler systems. Determining the effectiveness of above-mentioned systems.</p> | | | | | | <p>Formative assessment: assignments and two semester tests.</p> <p>Summative assessment: One examination paper of three hours.</p> |
| LNG424 | 16 | 8 | CESM: 0199 | LNG414 | Specialised Micro, Drip and Underground Irrigation Systems | 2L,3P |
| <p>Ability to design, manage and evaluation of drip and micro-irrigation systems. Application of practice directed norms and principles.</p> <p>Practical work: Design and evaluation of drip and micro-irrigation systems. Determining of the effectiveness and cost effectiveness of the above-mentioned systems.</p> | | | | | | <p>Formative assessment: assignments and two semester tests.</p> <p>Summative assessment: One examination paper of three hours.</p> |

AGRICULTURAL EXTENSION

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| LBV224 | 16 | 6 | CESM: 010106 | None | Communication and Agricultural Extension | 3L,3P |
| <p>After completing this course the student will understand:</p> <p>Communication: Frame of reference of the sender/receiver; what has to be communicated in a farming enterprise; communication channels/media/aids (labour councils regarding the transfer and feedback process in communication); communication systems and strategies in a farming enterprise.</p> <p>Agricultural extension: Synopsis of extension and historical development; applied learning theories in extension; communication strategies (diffusion of innovations); extension techniques and methodology (mass communication, group handling, individual contracts); programme planning (work with people); leadership development and leadership identification; management of extension organisations.</p> | | | | | | <p>Formative assessment: Quizzes, assignments and two semester tests.</p> <p>Summative assessment: One examination paper of three hours.</p> |

12.1.2 DEPARTMENT OF ANIMAL, WILDLIFE AND GRASSLAND SCIENCES

AGRICULTURAL SCIENCE

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| LWL114 | 16 | 5 | CESM: 0199 | NCS Mathematics level 3 | Biological Principles in Agriculture | 3L,3P |
| <p>After completion the students will be able to apply the principles of the physiology of farm animals and agricultural and horticultural crops within the different disciplines in agriculture. The different body systems of the animal and other aspects, i.e. histology, endocrinology, cardiology, urology and reproductive physiology are addressed. The aim is to give background knowledge on the functioning, optimal utilisation and possible manipulation of the physiological processes in farm animals. The inherent physiological differences in plants are demonstrated, the establishment and vegetative and reproductive growth are discussed, while the surveying, transport and working of fertilisers, water and pesticides are addressed. Factors that are involved with crop production, basic principles of breeding theory and relevant parasitic micro-organism are also dealt with.</p> <p>Practical work: Knowledge of the general anatomy of the mammal will be gained from demonstrations of respiratory, circulatory, neurological functioning and physiological principles that are involved in the body. The most important theoretical aspects of crops are practically conducted in the laboratory and greenhouse.</p> | | | | | | One examination paper of three hours |
| LWL124 | 16 | 6 | CESM: 0199 | NCS Mathematics level 3 | Mathematical and Biometrical Principles in Agriculture | 3L,3P |
| <p>Skills will be developed in mathematical and statistical calculations. The use of algebraic and graphical solutions of problems as applied to linear and quadratic equations. Calculation of surface areas and volumes for application in the determination of maximum perimeters, areas and volumes. Basic knowledge of logarithms and exponents. The use of descriptive statistics, with attention to central and dispersion parameters (mean and variance). Use and application of ANOVA, regression and correlation to solve agriculturally-related problems.</p> <p>Practical work: Calculations will be done applying the theoretical knowledge in solving agriculturally orientated mathematical and statistical problems. Tutorials will include collection and analysis of data using a pocket calculator as well as introductory level use of statistical functions in Excel.</p> | | | | | | One examination paper of three hours |
| LWL134 | 16 | 5 | CESM: 0199 | NCS Mathematics level 3 | Chemical Principles in Agriculture | 3L,3P |
| <p>Students will be equipped with simple chemical principles, concepts, processes and calculations that are important in agriculture sciences, especially with respect to soils, plants, animals and food.</p> <p>Practical work: Students will acquire laboratory skills which will be used to do simple chemical experiments that bear reference to soils, plants, animals and food. Reports of these experiments will be submitted for evaluation.</p> | | | | | | One examination paper of three hours |
| LWL154 | 16 | 5 | CESM: 0199 | NCS Mathematics level 3 | Physical and Mechanised Principles in Agriculture | 3L,3P |
| <p>The learners will be equipped to apply the basic physical concepts with respect to mechanics, hydrodynamics and hydrostatics, electricity, energy and the application of the gas laws in agriculture and agricultural sciences. This knowledge will be used to explain the influence of these processes on the behaviour of animals, plants and the natural resources. The student will be familiar with the SI-system.</p> <p>Practical work: The students will gain practical experience by performing laboratory experiments and calculations will be done to illustrate some of the key concepts mentioned above.</p> | | | | | | One examination paper of three hours |
| LWL164 | 16 | 6 | CESM: 0199 | NCS Mathematics level 3 | Microbiological Principles in Agriculture | 3L,3P |
| <p>Students who successfully complete this module will be qualified to describe the basic characteristics and importance of micro-organisms, with specific reference to their role in agriculture. This knowledge is based on the introductory cell structure, taxonomy, nutrition, microbial physiology, interaction between micro-organisms and plants or animals, the production of high-quality food products, as well as the factors that corrupt food.</p> <p>Practical work: Students that complete the practical part successfully will be equipped to conduct basic microbiological investigations. The students will also understand the agricultural importance of micro-organisms by virtue of demonstrations of their utilisation/application in food production.</p> | | | | | | One examination paper of three hours |

ANIMAL SCIENCE

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| DAF314 | 16 | 7 | CESM: 010601 | Animal Anatomy and Physiology of Farm Animals | 3L,3P |
| <p>After completion the student is familiar with the micro- and macroscopic studying of the animal body according to the systematic method; the physiology of the nervous system, muscle system, blood and circulatory system, respiratory system and the basic endocrine control of growth, metabolism, behaviour and reproduction. Practical work: The student performs macro- and microscopic studies and dissections of tissues and organs. Basic physiological concepts such as muscle contraction, blood pressure, blood composition, heart action and endocrine glands are demonstrated.</p> | | | | | One examination paper of three hours and an oral examination. |
| DAF324 | 16 | 7 | CESM: 010603 | Animal Health | 3L,3P |
| <p>After completion the student is familiar with the causes, symptoms, lesions, diagnoses and control measures of the most important animal diseases in farm animals; vaccination and dosing of farm animals; general characteristics of the immune reaction; resistance against parasites and pathogens; dystocia. Practical work: Elementary diagnostic procedures and post mortem procedures and simple surgery and obstetrics are performed. RIA determinations and other immunological techniques are studied.</p> | | | | | One examination paper of three hours |
| DAF414 | 16 | 8 | CESM: 010601 | Applied Reproduction Physiology in Farm Animals | 3L,3P |
| <p>After completion the student is familiar with concepts such as rate of reproduction efficiency and means of increasing it in farm animals and poultry; gametogenesis; endocrine control of reproduction; puberty; factors influencing normal reproduction; teratology; principles and application of synchronisation, artificial insemination, super-ovulation and embryo transfer in sheep goats, cattle and pigs; mating systems and management practices; pregnancy diagnosis; reproduction abnormalities. Practical work: Macroscopic examination of sex organs; semen evaluation, demonstration of synchronisation, laparoscopy and pregnancy diagnosis in sheep and cattle are performed. Visits are brought to AI stations, pig and poultry production units and dairies.</p> | | | | | One examination paper of three hours |
| DAF424 | 16 | 8 | CESM: 010605 | Growth and Lactation Physiology | 3L,3P |
| <p>After completion the student is familiar with the endocrine control of growth and lactation; embryology; histology of muscle and mammary gland tissue and manipulation of growth; milk production and the biological efficiency of milk production; theoretical aspects regarding milk production; lactation disturbances and mammary gland abnormalities; managerial aspects of sustained high milk yield and the manipulation of growth. Practical work: Visits are brought to production units and the evaluation of production practices.</p> | | | | | One examination paper of three hours. |
| DAF601 | 20 | 8 | CESM: 010601 | General Animal Physiology | |
| Following completion of this module the student will have in depth knowledge of the physiological functioning of the different physiology systems (e.g. circulatory, respiratory, urinary, digestive system, etc.) of the animal body. | | | | | |
| DAF602 | 20 | 8 | CESM: 010601 | Endocrinology | |
| Following completion of this module the student will have insight and understand the mechanisms regulating the endocrine system, its glands and hormones and the relevant control of the most important physiological functions in the body. | | | | | |
| DAF603 | 20 | 8 | CESM: 010602 | Applied Reproduction Physiology | |
| Following completion of this module the student will understand the application of certain physiological principles in the manipulation of assisted reproductive techniques in farm animals. | | | | | |
| DLT314 | 16 | 7 | CESM: 010602 | Theory of Animal Breeding | 3L,3P |
| <p>After completion the student is familiar with concepts such as Mendelian inheritance, gene and genotypic frequencies, simply inherited and polygenic traits, selection for simply inherited traits, the resemblance between relatives; heritability and repeatability; prediction of selection response; short and long term results of selection; inbreeding and crossbreeding; threshold values and scale effects; genetic and environmental correlations; correlated responses; natural selection; major genes. Practical work: The student estimates heritability; genetic and phenotypic correlation and other parameters.</p> | | | | | One examination paper of three hours. Group work assignments, class tests and semester tests. |
| DTL324 | 16 | 7 | CESM: 010602 | New Technologies in Animal Breeding | 3L,3P |
| <p>Reproductive technologies, cloning, molecular genetic technologies, genetic markers, major genes and the ethical aspects of new technologies in livestock improvement. Practical work: The student gains new knowledge of the practical aspects of this new technology through demonstrations.</p> | | | | | One examination paper of three hours. |

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| DTL414 | 16 | 8 | CESM: 010602 | DTL314 | Animal Breeding: Mixed Model Theory | 3L,3P |
| <p>After completion the student is familiar with the genetic model for quantitative traits, the use of matrix algebra in breeding value prediction; statistics and their use in animal breeding; importance of heritability and repeatability in animal breeding; methodologies for genetic prediction: selection index and BLUP; comparison of contemporaries; correction factors and optimisation of selection; prediction of breeding values and the principle of mixed models: Sire model, animal model, Bayes theory, QTLs. Accounting for genomic information.</p> <p>Practical work: The student estimates breeding values and is familiarised with the application of breeding values. The use of computer programmes is mastered.</p> | | | | | | <p>One examination paper of three hours. Group work assignments, class tests and semester tests.</p> |
| DTL424 | 16 | 8 | CESM: 010602 | | Animal Breeding: Practical Application | 3L,3P |
| <p>After completion the student is familiar with the basics of practical animal breeding; selection objectives; selection trials; mating systems; selection techniques; national livestock improvement schemes; selection for growth and efficiency; genotype x environment interactions; unique breeding problems in different breeds and species; linear type traits; genomic selections; wildlife breeding. Practical work: The student interprets performance test data and herd profiles; conduct practical selection of breeding stock; evaluates breeding programmes. Demonstration of commercial herd/flock management software as used in different livestock industries.</p> | | | | | | <p>One examination paper of three hours. Group work assignments, class tests and semester tests.</p> |
| DTL224 | 16 | 6 | CESM: 010602 | | Introduction to Animal and Plant Breeding | 3L,3P |
| <p>This module contains fundamental knowledge of animal science including modes of inheritance, evolution and genetic diversity, mitoses and meiosis, chromosomes, locus and genes, Medelian inheritance, Sex chromosomes and determination of sex, linkage and crossing over, sex related inheritance, randomness of inheritance, dominance and epistasis.</p> | | | | | | <p>One examination paper of three hours. Group work assignments, class tests and semester tests.</p> |
| DTL601 | 20 | 8 | CESM: 010602 | | Fundamental Animal Breeding | |
| <p>After successful completion of this module the student will have an in-depth knowledge of the underlying principles of quantitative genetics and the application thereof in the genetic improvement of domesticated livestock and wildlife.</p> | | | | | | |
| DTL602 | 20 | 8 | CESM: 010602 | | Experimental Animal Breeding | |
| <p>After successful completion of this module the student will have a fundamental knowledge of the underlying principles and methodologies (single and multiple trait, maternal, environmental and threshold models) of how accurate genetic predictions could be made using statistical analyses and utilised as selection aids for genetic improvement of domesticated livestock. The role and application of molecular techniques in modern animal breeding will also be discussed.</p> | | | | | | |
| DTL603 | 20 | 8 | CESM: 010602 | | Applied Animal Breeding | |
| <p>After successful completion of this module the student will have a fundamental knowledge and insight of selection objectives, selection criteria, genetic parameters thereof and how to construct a comprehensive breeding plan that will result in genetic improved populations of different livestock species under South African environmental conditions.</p> | | | | | | |
| DVL334 | 16 | 7 | CESM: 010604 | BCC214 | Fundamental and Experimental Animal Nutrition | 3L,3P |
| <p>After completion the student is familiar with the concepts of feeds and nutrients (water, carbohydrates, lipids, proteins, minerals and vitamins); digestive systems (monogastric, ruminant and lower digestive tract fermenters), digestion, absorption and metabolism; nutrient deficiencies, toxicity and metabolic disturbances; digestibility of feeds and feed components; techniques for the evaluation of feeds and pastures; nutrient requirements for monogastric animals, ruminants and lower digestive tract fermenters.</p> <p>Practical work: Students perform feeding and digestion trials, and laboratory analyses.</p> | | | | | | <p>One examination paper of three hours.</p> |
| DVL344 | 16 | 7 | CESM: 010604 | | Properties of Feeds, Balancing Rations and Fodder Flow Planning | 3L,3P |
| <p>After completion the student is familiar with the classification, nutritional characteristics, processing and toxicity of feeds; feed additives and by-products; quality control, balancing of diets and feeding management.</p> <p>Practical work: The student performs linear programming, computer-assisted balancing of diets and fodder flow management. Visits are brought to farming production units.</p> | | | | | | <p>One examination paper of three hours.</p> |
| DVL434 | 16 | 8 | CESM: 010604 | | Applied Monogastric Nutrition | 3L,3P |
| <p>After completion the student is familiar with the principles of nutrition; feed type; formulation of diets; feeding systems; feeding facilities; housing and production management in poultry and pigs.</p> <p>Practical work: Visits to various production units. Formulation of pig and poultry diets.</p> | | | | | | <p>One examination paper of three hours. Mono Research.</p> |
| DVL464 | 16 | 8 | CESM: 010604 | | Applied Ruminant Nutrition | 3L,3P |
| <p>After completion the student is familiar with the nutrient requirements and nutritional management of dairy cattle, dairy calves, beef cattle, sheep and goats during different physiological stages; extensive and semi-intensive feeding systems for livestock, including drought feeding, over-wintering, stall feeding and supplementation on veld.</p> <p>Practical work: Formulation of ruminant diets. Planning and conducting applied ruminant research.</p> | | | | | | <p>One examination paper of three hours.</p> |

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| DVL601 | 20 | 8 | CESM: 010604 | Fundamental Animal Nutrition | |
| <p>Through self-study (studying literature and written seminars) the student is familiarised with the concepts of feeds and nutrients (water, carbohydrates, lipids, proteins, minerals and vitamins); digestive systems (monogastric, ruminant and lower digestive tract fermenters), digestion, absorption and metabolism; nutrient deficiencies, toxicity and metabolic disturbances; digestibility of feeds and feed components; techniques for the evaluation of feeds and pastures; protein and energy requirements for monogastric animals, ruminants and lower digestive tract fermenters. The student is provided opportunity to master through self-study specific topics and write seminars in scientific style and format.</p> | | | | | One examination paper of three hours. Mono Research. |
| DVL602 | 20 | 8 | CESM: 010604 | Experimental Animal Nutrition | |
| <p>On completion of this module the student will be well acquainted and have an in-depth knowledge regarding the quantitative aspect of nutrition e.g. the quantity of nutrients provided by the feed and secondly the nutrient requirements of various farm animals. Experimental techniques used for the quantification of nutrient utilisation and requirements are addressed in-depth.</p> | | | | | One examination paper of three hours. |
| DVL603 | 20 | 8 | CESM: 010604 | Applied Ruminant Nutrition | |
| <p>On completion of this module the student will have a valid knowledge and in-depth insight regarding feeding management of dairy cattle, dairy calves, beef cattle and sheep in different physiological stadiums to produce economical high quality animal products under specific environmental conditions.</p> | | | | | One examination paper of three hours. Oral examination. |
| DVL604 | 20 | 8 | CESM: 010604 | Applied Monogastric Nutrition | |
| <p>On completion of this module the student will be well acquainted and have an in-depth knowledge regarding feeding requirements, feed facilities, feeding systems, diet formulation and feeding management of poultry and pigs at different physiological stadiums to ensure the production of economical high quality animal products.</p> | | | | | One examination paper of three hours. Oral examination. |
| VKD214 | 16 | 6 | CESM: 010301 | Introductory Ruminant Production | 3L,3P |
| <p>After completion the student will be familiar with the general principles of beef, dairy, sheep and goat production, the role of the four industries in South Africa, different breeds, the effect of nutrition, breeding, physiology and health on the efficient production of beef, mutton (lamb meat), milk and wool. Practical work: Visits to beef, dairy, sheep and goat production and processing units will be arranged to expose students to the different aspects of the production systems commonly used in South Africa. Basic animal husbandry skills (dipping, dosing, vaccination, castration, dehorning etc.) will be demonstrated and performed. The basic principles of meat, milk and wool evaluation will be demonstrated.</p> | | | | | One examination paper of three hours. |
| VKD224 | 16 | 6 | CESM: 010399 | Introductory Monogastric, Wildlife and Aquaculture Production | 3L,3P |
| <p>After completion the student will be familiar with the general principles of pig, poultry and ostrich production, the role of the industries in South Africa, different breeds, the effect of nutrition, breeding, physiology and health on the efficient production of meat and eggs. Practical work: Visits to various production and processing units will be arranged to expose students to the different production systems commonly used in South Africa. Basic animal husbandry skills (dosing, vaccination, castration, etc.) will be demonstrated and performed. The basic principles of meat and egg evaluation will be demonstrated.</p> | | | | | One examination paper of three hours. |
| VKD314 | 16 | 7 | CESM: 010301 | Cattle Production Systems | 3L,3P |
| <p>Having successfully completed this module the student will understand the integrated management aspects related to nutrition, breeding, products, ecology, animal diseases, husbandry and economy; how nutrition, breeding, products, ecology, animal diseases, husbandry and economy can be manipulated within different production systems to increase efficiency of production in beef and dairy cattle enterprises. Practical work: Students must compile and evaluate a management system for dairy and beef enterprises.</p> | | | | | One examination paper of three hours. |
| VKD324 | 16 | 7 | CESM: 010301 | Sheep and Goat Production Systems | 3L,3P |
| <p>Having successfully completed this module the student will understand the integrated management aspects related to nutrition, breeding, products, ecology, animal diseases, husbandry and economy; how nutrition, breeding, products, ecology, animal diseases, husbandry and economy can be manipulated within different production systems to increase efficiency of production in sheep and goat enterprises. Practical work: Students must compile and evaluate a management system for sheep and goat enterprises.</p> | | | | | |
| VKD334: | 16 | 7 | CESM: 010301 | Poultry Production Systems | 3L,3P |
| <p>Having successfully completed this module the student will understand the integrated management aspects related to nutrition, breeding, products, ecology, animal diseases, husbandry and economy; how nutrition, breeding, products, ecology, animal diseases, husbandry and economy can be manipulated within different production systems to increase efficiency of production poultry enterprises. Practical work: Students must compile and evaluate a management system for poultry enterprises.</p> | | | | | |

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| VKD344 | 16 | 7 | CESM: 010301 | Pig Production Systems / | 3L,3P |
| <p>Having successfully completed this module the student will understand the integrated management aspects related to nutrition, breeding, products, ecology, animal diseases, husbandry and economy; how nutrition, breeding, products, ecology, animal diseases, husbandry and economy can be manipulated within different production systems to increase efficiency of production in pig enterprises.</p> <p>Practical work: Students must compile and evaluate a management system for pig enterprises.</p> | | | | | |
| VKD693 | 20 | 8 | | Research Project | |
| <p>A subject specific project will be completed under the guidance of a supervisor and will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of animal science experiments/research, as well as the interpretation and communication of results. It is expected of students to submit a scientific research report in the form of a publication and to prepare and orally present the results in the form required by scientific conferences. The independence and scientific insight developed in this module provides a background for further postgraduate studies.</p> | | | | | |
| VKD695 | 20 | 8 | | Literature Review | |
| <p>The student prepares a comprehensive scientific literature review on a specific subject and presented it in the form of a seminar and oral presentation on the topic. On completion of this module the student is acquainted with literature searches, organising information, the compilation of information according to a specific format, as well as in written and verbal communication skills.</p> | | | | | |
| VWW124 | 16 | 6 | CESM: 010601 | Introduction to Animal, Wildlife and Grassland Sciences | 3L,3P |
| <p>Domestication and migration routes of livestock species; importance of livestock industry; livestock breeds; handling of farm animals; concepts in livestock production; livestock and the environment; safety in livestock production; wildlife species and production systems; vegetation of South Africa and the rangeland ecosystem; career opportunities in the animal, wildlife and grassland science industries.</p> <p>Practical work: Visits to different production systems. Demonstrations of animal handling in different species. Rangeland evaluation techniques. Identification of wildlife and vegetation species.</p> | | | | | |
| VWW364 | 16 | 8 | CESM: 010601 | Applied Nutrition of Wild Herbivores and Carnivores | |
| VWW405 | 12 | 8 | CESM: 010601 | Literature Review | |
| <p>The student prepares a comprehensive scientific literature review on a specific subject and presented it in the form of a seminar and oral presentation on the topic. On completion of this module the student is acquainted with literature searches, organising information, the compilation of information according to a specific format, as well as in written and verbal communication skills.</p> | | | | | |
| VWW403 | 20 | 8 | CESM: 010601 | Research Project | |
| <p>A subject specific project will be completed under the guidance of a supervisor and will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of animal science experiments/research, as well as the interpretation and communication of results. It is expected of students to submit a scientific research report in the form of a publication and to prepare and orally present the results in the form required by scientific conferences. The independence and scientific insight developed in this module provides a background for further postgraduate studies.</p> | | | | | |

GRASSLAND SCIENCE

| WDK314 | 16 | 7 | CESM: 010801 | Applied Veld Management and Veld Evaluation | 3L,3P |
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| <p>The aims and principles of veld management with livestock and wildlife will be studied in this module. Knowledge of grazing habits of livestock and wildlife and selective grazing will be attained. Identification and analysing of veld management methods and strategies will be discussed. Determination of production and quality of veld will be studied. The student will be equipped to determine grazing capacity and stocking rate. Students will be familiar with the importance of record-keeping of veld. The student will be able to do scientific planning of a farm unit and study the methods for evaluating grasslands in respect of cover, botanical composition and veld condition. The student will bring game farm planning in proper relation to management and utilisation of game.</p> <p>Practical work: Physical and biological planning of a farming unit will be done. Students will gain practical skills in application of different techniques to establish veld condition, production, quality and grazing capacity. Practical reports must be handed in.</p> | | | | | One examination paper of three hours. |
| WDK324 | 16 | 7 | CESM: 010801 | Intensive Pasture Production | 3L,3P |
| <p>After completion of the module the student will know of the importance, extent and purpose of intensive pasture production in the RSA. The student will gather information about seed germination of fodder plants. Evaluation of factors important in veld reclamation and veld reinforcement will be discussed. Identification and evaluation of suitable crops for planting/cultivating: cultivation aspects, choice of crops, nutritive value, quality, utilisation and forage conservation will be studied. The student must integrate all the information to do fodder flow planning.</p> <p>Practical work: The student should be able to develop skills on identification of grasses and legumes for establishment and veld improvement. Study and evaluation of management practices on farms. Designing fodder flow programmes.</p> | | | | | One examination paper of three hours. |
| WDK414 | 16 | 8 | CESM: 010801 | Production and Utilisation Ecology | 3L,3P |
| <p>The grassland ecosystem (interactions, structure and functioning) and the farmer as manager will be studied in this module. The student should be able to evaluate the sustainability of the grassland ecosystem and the factors that may influence it. The student should have a higher level of knowledge on the outputs of the grassland ecosystem. Identification and analysing of ecological game farming areas and ecosystem characteristics in connection with game-species and its social behaviour and habitat preferences. Evaluation and analysing the hydrological and other cycles in the grassland ecosystem with reference to the influence of utilisation and management will be discussed. The student will be equipped with the development of models for the prediction of production and utilisation of the grassland ecosystem. After completion the student should be familiar with pollution and preservation of the grassland ecosystem.</p> <p>Practical work: Evaluation of the influence of utilisation and management on productivity of the grassland ecosystem under different veld conditions will be done. Identification and description of plant growth habitat relationships.</p> | | | | | One examination paper of three hours. |
| WDK424 | 16 | 8 | CESM: 010801 | Advanced Veld Management | 3L,3P |
| <p>Knowledge of the extent and history of the conservation idea will be studied in this module. Identification of the causes and results of veld deterioration (erosion) and measures to combat it will be done. The student should be able to identify the importance of veld management in different veld types and the critical evaluation of system/practices. Identification and analysing the grazing habits of livestock and game and selective grazing. Determination of grazing capacity and stocking rate and application of special treatments for veld will be discussed. Students will carry out veld management planning and bringing applied wildlife management in proper relation to marketing, legal aspects, economics and socio-economic aspects of game. Students will be familiar with the management of communal areas.</p> <p>Practical work: Determination of veld condition and production planning will be applied for the physical and biological planning of a veld management system on both a livestock and game farming unit. Excursions, during which practical work regarding veld condition, evaluation and practical veld management will be critically discussed, are compulsory. Practical reports on these excursions must be submitted.</p> | | | | | One examination paper of three hours. |
| WDK434 | 16 | 8 | CESM: 010801 | Defoliation Phenology and Physiology | 3L,3P |
| <p>The student will have a higher level of knowledge on physiological and phenological aspects of fodder plants. The student has to gain information about water absorption, translocation and food storage in fodder plants as applicable to grassland management. Identification of critical periods (phenological and physiological) in the seasonal growth cycle of grasses, legumes, fodder shrubs and bushes. Be adjusted to the influence of intensity, frequency and season of defoliation on net assimilation rate, root growth, growth reserves and plant growth changes of grasses, bushes and Karoo shrubs. Bringing the influence of water shortages in proper relation to the growth and development of fodder plants. Students will gain knowledge of seasonal variation in nutritional value and quality of fodder plants.</p> <p>Practical work: Analysing of the influence of intensity and frequency of defoliation on production and root growth of fodder plants will be done. Identification of the growth cycle, leaf lengths and leaf surfaces of fodder plants. Introduction to devices such as infrared gas analyser, leaf surface meter, neutron water meter and transpiration meter.</p> | | | | | One examination paper of three hours. |

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| WDK444 | 16 | 8 | CESM: 010801 | Advanced Fodder Plant Evaluation | 3L,3P |
| <p>After completion the student will have a higher level of knowledge on the classification of vegetation and identification of the variables that influence the grassland ecosystem. Planning and conducting of grassland science research will be carried out. Sampling, arrangement, statistical tests and simulation models applicable to the grassland ecosystem will be done. Student should be able to identify methods to measure variables and the productivity of the grassland ecosystem and knowledge of the practical application of the techniques. Evaluation of applied livestock and wildlife management systems will be studied. Student should be familiar with the principles, application and limitations of the most important wildlife management research methodology.</p> <p>Practical work: Practical skills will be developed in different techniques (veld work and computer), applicable to grassland science. Report and processing of data.</p> | | | | | One examination paper of three hours. |
| WDK214 | 16 | 6 | CESM: 0199 | Veld as Natural Resource for Livestock and Game | 3L,3P |
| <p>In this course students are introduced to Grassland Science and Wildlife Management and equipped with the basic principles of the ecology of veld vegetation and herbivore games species. This includes skills in identifying southern African biomes, game ranching areas and veld types in terms of their characteristics, agricultural potential, production capacity and conservation status. Must be able to describe and evaluate the causes and results of vegetation changes, Knowledgeable of ecological aspects of rangeland and rangeland ecosystems. Identification and description of South African fodder plants including grasses, Karoo shrubs and trees, as well as indicator and problem plants. Identification of herbivore game species and knowledge off their habitat requirements and diet selection</p> | | | | | Summative assessment: One examination paper of three hours. |
| WDK601 | 20 | 8 | CESM: 010801 | Rangeland Physiology and Ecology | |
| To familiarise the student with the principles of grassland science (ecology, physiology and phenology) on advanced level, on which the sustainable utilisation and management of the rangeland ecosystem are based. | | | | | |
| WDK602 | 20 | 8 | CESM: 010801 | Rangeland Management | |
| To familiarise the student with the different ways of veld utilisation to obtain sustainability, as well as the practical planning of a farming unit in a scientific way. | | | | | |
| WDK603 | 20 | 8 | CESM: 010801 | Intensive Pasture Production | |
| The application of veld intensification and the use of planted pastures to improve and supplement the natural veld in order to maintain sustainable productivity. | | | | | |
| WDK604 | 20 | 8 | CESM: 010801 | Rangeland Evaluation | |
| To equip the student with the necessary knowledge on advanced level of the various criteria and techniques that can be used to evaluate the resource, so that the productivity of the ecosystem can be identified and to determine vegetation changes | | | | | |
| WDK693 | 20 | 8 | | Research Project | |
| A subject specific project will be completed under the guidance of a supervisor and will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of grassland science experiments/research, as well as the interpretation and communication of results. It is expected of students to submit a scientific research report in the form of a publication and to prepare and orally present the results in the form required by scientific conferences. The independence and scientific insight developed in this module provides a background for further postgraduate studies. | | | | | |
| WDK695 | 20 | 8 | | Literature Review | |
| The student prepares a comprehensive scientific literature review on a specific subject and presented it in the form of a seminar and oral presentation on a grassland science topic. On completion of this module the student is acquainted with literature searches, organising information, the compilation of information according to a specific format, as well as in written and verbal communication skills. | | | | | |

12.1.3 DEPARTMENT OF SOIL, CROP AND CLIMATE SCIENCES

AGROMETEORLOGY

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| LWR214 | 16 | 6 | CESM: 0199 | GKG124 or FSK134 or FSK114 or LWL154 or concurrently | Fundamentals of Agrometeorology | 3L,3P |
| <p>A description of various climatic elements and the interaction between weather/climate and agriculture on different spatial and temporal scales. This includes the use of shelterbelts and frost protection to create more favourable plant environments at the microscale, the study of local and synoptic scale weather systems that affect southern Africa from time to time, as well as planetary scale systems such as the El Niño Southern Oscillation phenomenon that may influence weather patterns worldwide. Evapotranspiration calculations and irrigation scheduling using weather data will also be dealt with.</p> <p>Practical work: Weekly assignments focus on cloud identification; temperature calibration; the use of the psychometric diagram; synoptic chart analysis; frost and wind protection; calculating daily evapotranspiration rates and the use of weather data in irrigation scheduling.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours</p> |
| LWR224 | 16 | 6 | CESM: 0199 | GKG124 or Min (LWR214) | Agrometeorology for Farming Systems | 3L,3P |
| <p>This module focuses on climatological influences on management and planning decision-making in the agricultural environment. Climate data and forecasts will be employed in the determination of potential and production risk of crops and livestock, while climatic indices will be used to assess the impact of, among others, cold and heat stress, fire risk and droughts as well as pests and diseases on agricultural production in southern Africa. Measures that can be applied to mitigate adverse impacts will also be evaluated.</p> <p>Practical work: The module is problem-based and students are expected to identify, analyse and solve real problems in collaboration with other students by using all available resources.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| LWR314 | 16 | 7 | CESM: 0199 | LWR214 or LWR224 | Climate Data Analysis for Agrometeorological Services | 3L,3P |
| <p>This module will focus on the various communication channels and methods of technology transfer with specific emphasis on weather bulletins and advisories (for a whole range of spatial and temporal scales) for use by farmers, extension officers and policy makers. They will also learn how to conduct a participatory needs assessment survey to determine end-user needs, and how to develop new products from available forecasts and information obtained from meteorologists or climatologists.</p> <p>Practical work: Weekly assignments will enable students to apply basic statistical procedures to climate data sets; time series analysis; analysis of multivariate data sets; statistical weather forecasting for all time scales and forecast verification.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| LWR324 | 16 | 7 | CESM: 0199 | None | Climate Change and Variability | 3L,3P |
| <p>The following aspects are dealt with: global climate system; climate variability; natural and anthropogenic climate forcing; climate feedbacks; proxy data; recently observed changes; climate prediction and climate change projections; climate change impacts and adaptation strategies.</p> <p>Practical work: Students will be expected to acquire the necessary climate data to analyse and describe the past climate and its variability for a specific location and identify any trends in the climatic record if present. They will also be introduced to basic concepts of climate modelling and contemplate how the climate change projections for their home countries/areas will affect the local agricultural sector.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| LWR414/LWR614 | 16 | 8 | CESM: 0199 | LWR214 | Micrometeorology and Specialised Instrumentation | 3L,3P |
| <p>The following aspects are dealt with: radiation, temperature, humidity, wind, turbulence and profiles of momentum and mass transfer within plant communities over a diurnal and seasonal cycle; the Monin-Obukhov similarity principle; the microclimate of urban areas, forests, greenhouses and crops.</p> <p>Practical work: Practical skills will be acquired in the calibration and set-up of instruments used for observation of environmental variables within and above plant communities and soil surfaces.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| LWR424/LWR624 | 16 | 8 | CESM: 0199 | LWR214 | Simulating Biophysical Interactions | 3L,3P |
| <p>The influence of various climatic and growth factors on photosynthesis and crop growth, and how these processes are depicted by crop growth models are dealt with. The necessary background to test crop growth models by means of sensitivity analysis and statistical verification before these models can be applied in agriculture, will be provided.</p> <p>Practical work: Students will obtain practical experience with crop growth models and sensitivity analysis.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| LWR434/LWR634 | 16 | 8 | CESM: 0199 | LWR214 | Physics and Dynamics of the Atmosphere | 3L,3P |
| <p>The following aspects are dealt with: review of the atmospheric composition and structure; the various forces which are at work in the atmosphere; wind calculations; pressure, temperature and density relations; cloud formation and precipitation; thermodynamic diagrams and convective development.</p> <p>Practical work: Weekly assignments focus on the calculation of atmospheric forces and wind components as required by numerical models as well as plotting and analysing of thermodynamic diagrams in weather forecasting.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |

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| LWR444/LWR644 | 16 | 8 | CESM: 0199 | LWR214 | Weather Analysis and Forecasting | 3L,3P |
| <p>The content will focus on synoptic climatology and the large scale tropical and extra-tropical weather systems that may affect southern Africa. Various theoretical models are introduced and explained with the use of numerical models. Decoding surface observations, satellite and radar image interpretation and different weather forecasting techniques are dealt with.</p> <p>Practical work: Various forecasting techniques are used to compile a five-day weather forecast on a weekly basis. Such a forecast is based on theoretical knowledge as well as the analysis and interpretation of synoptic weather charts, meteorological observations, numerical model outputs and remotely sensed imagery.</p> | | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. |
| LWR601 | 20 | 8 | CESM: 0199 | | Agrometeorological Services for Extension | |
| <p>The student will be expected to understand the various communication channels and methods of technology transfer with specific emphasis on weather bulletins and advisories (for the whole range of temporal and spatial scales) for use by farmers, extension officers and policy makers. They will also learn how to conduct a participatory needs assessment survey to determine end-user needs, and how to develop new products from available forecasts and information obtained from meteorologists or climatologists.</p> | | | | | | Continuous evaluation, consisting of at least one semester test, practical and for tutorial evaluations and one examination paper of three hours. |
| LWR602 | 20 | 8 | CESM: 0199 | | Data Analysis for Weather and Climate Research | |
| <p>Upon completion of this module students will be able to apply basic statistical procedures to weather and climate data sets, and to do time series analysis, analysis of multivariate data sets, statistical weather forecasting for all time scales and forecast verification.</p> | | | | | | Continuous evaluation, consisting of at least one semester test, practical and for tutorial evaluations and one examination paper of three hours. |
| LWR603 | 20 | 8 | CESM: 0199 | | Specialised Instrumentation | |
| <p>After completion of this module students will be able to discuss the history, nature, operation and use of agrometeorological instruments. The goal is to provide students with the background, knowledge and analytical skills to test, calibrate and evaluate agrometeorological instruments. Students will obtain hands-on experience with instruments where possible.</p> | | | | | | Continuous evaluation, consisting of at least one semester test, practical and for tutorial evaluations and one examination paper of three hours. |
| LWR604 | 20 | 8 | CESM: 0199 | | Simulating Biophysical Interactions | |
| <p>The outcomes of this module will allow students to evaluate the influence of various weather elements and growth factors on photosynthesis and crop growth. The aim is to develop students' reasoning capacity and to provide them with the necessary background to test crop growth models by means of sensitivity analysis and statistical verification before these models can be applied in agriculture. Students will obtain practical experience with crop growth models where possible.</p> | | | | | | Continuous evaluation, consisting of at least one semester test, practical and for tutorial evaluations and one examination paper of three hours. |
| LWR605 | 20 | 8 | CESM: 0199 | | Applied Agrometeorology | |
| <p>The outcomes of this module will enable students to identify existing or anticipated problems related to the agrometeorological environment. Knowledge acquired by students will equip them to formulate objectives and methods required to tackle specific problems, given the necessary tools, such as seasonal forecasts, advisory reports, etc. Students will gain practical experience by writing a scientific article through acquisition and analysis of data as well as interpretation of results and drawing conclusions. This provides preparation to enter the workplace, equipping them to solve agrometeorological problems and apply this knowledge to real-life situations.</p> | | | | | | Continuous evaluation, consisting of at least one semester test, practical and for tutorial evaluations and one examination paper of three hours. |
| LWR606 | 20 | | CESM: 0199 | | Programming Principles in Climatology | |
| <p>Upon completion of this module the student will be able to manipulate large climate datasets within a Linux environment. After familiarising themselves with the different elements of a programming language, data description statements, control structures, data-processing statements as well as in- and output statements will be incorporated in programmes that aim to automate data manipulation. Students will obtain practical experience in programming and be able to apply these skills in certain aspects of their research.</p> | | | | | | Continuous evaluation, consisting of at least one semester test, practical and for tutorial evaluations and one examination paper of three hours. |
| LWR693 | 20 | | CESM: 0199 | | Research Project | |
| <p>The student will gain knowledge on sound research methodology by locating and evaluating relevant literature to write a research proposal. A research project must also be completed by a student through analysis and interpretation of results that are compiled into a report.</p> | | | | | | Submit and present a research report. |
| LWR695 | 20 | | CESM: 0199 | | Literature Review | |
| <p>The student will gain knowledge on scientific writing for publication and receive guidance in preparing and presenting a literature review paper on an approved topic in agrometeorology. This seminar must preferably be presented at a discipline-related conference.</p> | | | | | | Submit and present a literature review. |

AGRONOMY

| AGR214 | 16 | 6 | CESM: 010802 | GKG124 | Concepts in Crop Production | 3L, 3P |
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| <p>During this module students will gain greater knowledge about the basic agronomic production practices such as soil tillage, fertilisation/plant nutrition, irrigation and pest control. Practical work: Students will obtain sufficient practical knowledge, skills and experience to understand the functioning of implements, and be able to evaluate soil tillage operations. They will also gain a basic understanding on the use of fertilisers, irrigation systems and herbicides.</p> | | | | | | |
| AGR224 | 16 | 6 | CESM: 010802 | AGR214 or concurrently | Winter Grain, Industrial and Diverse Crops | 3L, 3P |
| <p>Cultivation practices of the most important winter grain, industrial and diverse crops of South Africa. The students will also be able to apply the theoretical and practical aspects of soil tillage, seedbed preparation, planting techniques, plant nutrition and pest control, harvesting and grading as it relates to these crops on a higher level. Practical work: During practical sessions the student will study the morphology of these crops in detail and skills concerning practical aspects of crop cultivation will be developed and practised by the students.</p> | | | | | | |
| AGR314 | 16 | 7 | CESM: 010802 | AGR214 or concurrently | Summer Grain, Oil and Protein-Rich Crops | 3L, 3P |
| <p>Cultivation practices of the most important summer grain, oil and protein-rich crops of South Africa. Students will also be able to apply the theoretical and practical aspects of soil tillage, seedbed preparation, planting techniques, plant nutrition and pest control, harvesting and grading as it relates to these crops on a higher level. Practical work: During practical sessions the student will study the morphology of these crops in detail and skills concerning the practical aspects of crop cultivation will be developed and practised by the students.</p> | | | | | | |
| AGR324 | 16 | 7 | CESM: 010802 | AGR214 or concurrently | Vegetable Crops | 3L,3 P |
| <p>Cultivation and use of the most important vegetable crops in South Africa. Aspects such as classification, morphology, cultivation and establishment of seedlings, soil and climatic requirements, fertilisation, irrigation, crop rotation, pest control, harvesting, handling and storage, as well as the principles involved in the cultivation of vegetables under protection will be dealt with. Practical work: The production, acclimatisation and establishment of seedlings, together with other cultivation techniques will be practised in both glasshouse and field.</p> | | | | | | |
| AGR414/AGR614 | 16 | 8 | CESM: 010802 | AGR214 | Crop Physiology | 3L,3 P |
| <p>World food security and the place of crop physiology in crop production. Physiology and biochemistry of plants will be dealt with, including membrane, enzyme and energy systems, together with regulatory mechanisms and signalling. The reactions of the primary and secondary metabolic pathways will be dealt with, as well as their regulation under normal and abnormal environmental conditions. Plant physiology and biochemistry will be placed into perspective for agricultural production, with emphasis on the potential of external manipulation to increase yields. Practical work: Practicals are presented on a weekly basis in order to a) develop skills of students to apply standard methodology and techniques as well as to obtain data and b) develop the ability to present data in graphic or table format and interpret data in a scientifically correct manner.</p> | | | | | | |
| AGR424/AGR624 | 16 | 8 | CESM: 010802 | AGR214 | Crop Development | 3L, 3P |
| <p>Patterns of plant growth and development using soya bean and maize case studies. The role of external factors on the growth and development of plants will also be dealt with, as well as the role of plant hormones and the responses of crop plants to environmental stresses. Practical work: A specific research project on the response of a crop to a normal and abnormal environmental condition (e.g. drought stress) will be followed. Standard experimental techniques will be applied and the chosen treatments applied in order to attain growth, yield, physiological and biochemical data that might shed light on the response of the crop to these treatments. Students will be expected to present data scientifically, discuss the response of the crop and to explain possible action mechanisms that might be involved in the crop response.</p> | | | | | | |
| AGR434/AGR634 | 16 | 8 | CESM: 010802 | AGR224 or AGR314 or AGR324 | Crop Nutrition and Water Relations | 3L, 3P |
| <p>Advanced knowledge and insight of selected plant nutrients regarding their supply, uptake and physiological functions in crop manipulation. Aspects of plant analysis, crop requirements, interpretation of plant and soil analysis, nutrient application and organic fertilisation as part of the holistic approach to crop nutrition will also be studied. Students will integrate current knowledge on water movement across the soil-plant-atmosphere continuum for agricultural crops. On completion of this module students should have acquired sound knowledge of root growth and water uptake, the water balance of the plant, water use by crops, measurements of soil water and plant water status, plant response to water deficit and the need, concerns and problems of irrigation. Practical work: During tutorials students will learn to interpret soil and plant analyses reports, and how to compile crop nutrition programmes from these analysis reports. Case studies will be used to teach students sustainable water management practices.</p> | | | | | | |

| AGR444/AGR644 | 16 | 8 | CESM: 010802 | AGR214 and AGR414 or concurrently | Weed Control | 3L,3 P |
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| <p>The laws which govern weed control in South Africa, as well as how the biology of weeds affects control strategies. The concepts of herbicide selectivity, absorption, translocation, mode of action and residual activity will be dealt with at an advanced level. Various classification systems used for herbicides, and the safe use of these products will also be dealt with. Students will also learn about the occurrence, prevention and management of weed resistance to herbicides, as well as the use of genetically engineered herbicide resistant plants and their consequences for weed management. The registration process followed for new herbicides will be addressed, and the procedure to be followed to diagnose of herbicide problems.</p> <p>Practical work: Students will learn to identify the most common agricultural weeds, how to calibrate sprayers and conduct a research project into an aspect of chemical weed control. Students will be expected to follow standard scientific procedures in both the conduct and reporting of the research project.</p> | | | | | | <p>Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| AGR615 | 20 | 8 | CESM: 010802 | | Crop and Stress Physiology | |
| <p>On completion of this module students will have developed their critical reading skills, and will be able to relate stress symptoms in crops with physiological and biochemical mechanisms. In the crop physiology section students will develop a high level of understanding of the physiological principles of dry land crop production, as well as the possibilities of manipulating the physiological and biochemical processes to improve yields. The stress physiology part of the module will enable students to understand the effects of climate change on food production, and gain a deeper understanding of how plants react to various stresses imposed by the environment and production practices.</p> | | | | | | <p>Continuous evaluation, consisting of two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours.</p> |
| AGR625 | 20 | 8 | CESM: 010802 | | Plant Nutrition | |
| <p>In this module the student is familiarised with classification systems of plant nutrients. The student will acquire knowledge and insight of selected plant nutrients on their supply, uptake and physiological functions in crop manipulation. Nutrient requirements of crops, value and interpretation of plant and soil analyses, application of nutrients through inorganic and organic fertilisation is part of the holistic approach to plant nutrition. On completion of this module the student will be able to successfully compile and evaluate a crop fertiliser programme.</p> | | | | | | <p>Continuous evaluation, consisting of tutorial evaluations, and one examination paper of three hours.</p> |
| AGR635 | 20 | 8 | CESM: 010802 | | Plant-Water Relations | |
| <p>On completion of this module students will have acquired sound knowledge of the soil-plant-atmosphere continuum, root growth and water uptake, the movement of water in plants, measurements of the plant water status, and plant response to water deficit and water logged conditions. Each student is required to prepare and present an assignment on the water requirements of a selected crop by using relevant literature.</p> | | | | | | <p>Continuous evaluation, consisting of tutorial evaluations, and one examination paper of three hours.</p> |
| AGR645 | 20 | 8 | CESM: 010802 | | Weed Control | |
| <p>After completion of this module students will have advanced knowledge of various aspects of weed control, including different herbicides and their modes of action, application methods, allelopathy and its use in weed control, the development of herbicide resistance in weeds and how to prevent it, the registration process to be followed for new herbicides, as well as how to diagnose herbicide problems and conduct experiments to confirm the diagnosis. This module expands the student's knowledge of weed control, mainly through self-study. It is expected that the student identify any shortcomings in his or her knowledge base and rectify these.</p> | | | | | | <p>Continuous evaluation, consisting of tutorial evaluations, and one examination paper of three hours.</p> |
| AGR693 | 20 | 8 | CESM: 010802 | | Research Project | |
| <p>Students will conduct a research project on an aspect of agronomy under the guidance of a supervisor. At the end of the second semester students will be required to submit the results of this research in the form of a scientific paper, and will be expected to prepare and present the results in the form required by scientific conferences. During this project skills in problem identification, hypothesis formulation, planning, conducting and analysis of agronomic experiments, as well as the interpretation and communication of results in both written and oral form will be developed by the students.</p> | | | | | | <p>Submit and present a research report.</p> |
| AGR693 | 20 | 8 | CESM: 010802 | | Literature Review | |
| <p>Students develop skills and knowledge on scientific writing for publication through the preparation of a comprehensive literature review linked to their research project. This study will be written up and presented in the form of a seminar at the end of the first semester. Students should become familiar with the scientific style of writing, as well as being well acquainted with the resources available and skills required for literature searches, as well as being able to combine relevant sources in a meaningful manner. Valuable experience will also be gained in public presentation.</p> | | | | | | <p>Submit and present a literature review.</p> |

SOIL SCIENCE

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| GKG124 | 16 | 6 | CESM: 010901 | National Senior Certificate with at least Mathematics performance on level 3 | Introduction to Soil, Crop and Climate Sciences | 3L, 3P |
| This module will build on a number of fundamental and applied sciences to introduce the complex and integrated nature of soil, crop and climate ecosystems. Practical work: Students will be introduced to the soil profile and its morphological, physical and chemical properties; climate classification and crop-climate matching; crop morphology and crop production practices. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD214 | 16 | 6 | CESM: 010901 | GKG124 | Soil Classification, Evaluation, and Land Use Planning | 3L,3 P |
| Classification of South African soils; the behaviour and function of these soils under natural, agricultural and urban ecosystems; soil survey and application in land-use change. Practical work: Skills training in classification of South African soils in the laboratory and in the field. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD224 | 16 | 6 | CESM: 010901 | GKG124 | Sustainable Soil and Water Management | 3L,3 P |
| Natural resources soil and water; physical aspects such as soil compaction; erosion; soil water; soil water potential; gas content and composition; soil temperature; tillage methods and approaches; irrigation scheduling; salinity management. Practical work: Field visit, an essay on the sustainable use of natural resources and tutorials. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD314 | 16 | 7 | CESM: 010901 | GKG124 | Soil Fertility and Fertilisation | 3L,3 P |
| Soil-plant relationships, soil acidity and liming, functions of all essential nutrients in plants, including consequences of insufficient and excessive supply; nature, dynamics and availability of all essential plant nutrients in soils; methods used for evaluation of soil fertility status; plant nutrient management, including precision agriculture. Practical work: Tutorials on the interpretation of soil analyses and the compiling of liming and fertilisation programmes. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD324 | 16 | 7 | CESM: 010901 | GKG124 | Soil Contaminants and Management | 3L,3 P |
| Source and nature of major contaminants added to soils through agricultural, municipal, industrial, nuclear and other wastes; reactions of inorganic (e.g. heavy metals) and organic (e.g. pesticides) contaminants with soils and soil components; factors affecting the mobility and degradation of contaminants in soils; effects of contaminants on soil, water and atmosphere; management and amelioration of contaminated soils. Practical work: Tutorials on soil contamination and amelioration of contaminated soils based on case studies. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD414/GKD614 | 16 | 8 | CESM: 010901 | GKD314 or GKD324 | Soil Chemical Principles and Applications | 3L,3 P |
| Soil solution chemistry, colloidal chemistry, adsorption phenomena, ion exchange reactions, nutrient precipitation, soil reaction, redox equilibria, and the environmental significance thereof. Practical work: Laboratory determination of chemical properties, reactions and processes in soils. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours | |
| GKD424/GKD624 | 16 | 8 | CESM: 010901 | GKD224 | Soil Physical Principles and Applications | 3L,3 P |
| Water flow in saturated and unsaturated soil conditions. Movement and exchange of air, heat and solutes in soils. Theory, measurement, and application of the soil water balance, viz. runoff, drainage, evaporation, and transpiration. Practical work: Field and laboratory investigations in soils of different physical, hydraulic and mechanic properties. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD434/GKD634 | 16 | 8 | CESM: 010901 | GKD214 | Soil Classification Principles and Applications | 3L,3 P |
| Principles in soil classification; relationships between soil properties, processes and expected behaviour. Global soil classification systems. Practical work: Skills training in the collection of soil systems (i.e. soil survey, soil profile, soilscape) data and analysis of data from soil systems. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKD444/GKD644 | 16 | 8 | CESM: 010901 | GKD314 or GKD324 | Soil Biological Principles and Applications | 3L,3 P |
| Activity and role of macro- and micro-organisms in soil. Interaction between plant roots and micro-organisms in soil. Chemical changes of biological residues in soil. Composition of humus and the fractionation thereof. Properties of humus and the effect thereof on the biological, chemical and physical properties of soils. Maintenance and improvement of biological soil quality. Practical work: Isolation of bacteria, fungi, algae, actinomycetes, and nematodes from soil. Extraction of humus from soil and its fractionation. A practical report must be handed in at the end of the module. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |
| GKG414/GKG614 | 16 | 8 | CESM: 010901 | WTW134 | Research Methodology | 3L,3 P |
| During this module the value of research will be highlighted while students will gain experience in planning and conducting experiments, data collection and processing, and interpretation of data from experiments. The use of regression, correlation and co-variance analysis will also be dealt with. Practical work: During tutorials students will analyse various data sets to illustrate the different techniques learned. | | | | | Continuous evaluation, consisting of at least two semester tests, practical and/or tutorial evaluation(s), and one examination paper of three hours. | |

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| GKG424/GKG624 | 16 | 8 | CESM: 010901 | Any third year module in AGR, GKD or LWR | Literature Review | 3L,3 P |
| <p>The acquisition of data from various literature sources and the capturing thereof in a scientific writing style. During the preparation, writing and presentation of a seminar on an approved subject-related topic, students will develop the necessary evaluation and communication skills required to succeed as a research scientist.</p> <p>Practical work: Weekly assignments lead students through the process of data collection, analysis and presentation as they write up results, discussions and conclusions in the form and style of a scientific article.</p> | | | | | | Continuous evaluation of assignments, literature reviews and presentations. |
| GKD615 | 20 | 8 | CESM: 010901 | | Soil Chemical Principles and Applications | |
| <p>The following aspects are dealt with on an advanced level: nature and practical significance of soil colloids; carbon balance of soil and the role of organic matter therein; dynamics and availability of nitrogen, phosphorus and potassium in soils; acid soils and the management thereof; salt-affected soils and the management thereof; and heavy metals in soil and the environmental significance thereof.</p> | | | | | | Continuous evaluation consisting of tutorial evaluations and one examination paper of three hours. |
| GKD625 | 20 | 8 | CESM: 010901 | | Soil Genesis and Evaluation | |
| <p>The following aspects are dealt with on an advanced level: concepts of soil, soil properties and soil genesis; philosophy, similarities and differences of selected international soil classification systems; design of soil surveys for specific uses; principles of land evaluation; compilation of land use requirements, interpretation of land characteristics, and matching thereof with land use requirements; properties and behaviour of primary and secondary minerals.</p> | | | | | | Continuous evaluation consisting of tutorial evaluations and one examination paper of three hours. |
| GKD635 | 20 | 8 | CESM: 010901 | | Soil Physical Principles and Applications | |
| <p>The following aspects are dealt with on an advanced level: the description and application of processes related to the soil water balance, namely infiltration, runoff, evaporation from soil and plant surfaces and drainage; soil physical factors influencing root growth; irrigation scheduling and leaching management.</p> | | | | | | Continuous evaluation consisting of tutorial evaluations and one examination paper of three hours. |
| GDK645 | 20 | 8 | CESM: 010901 | | Soil Fertility and Fertilisation | |
| <p>The following aspects are dealt with on an advanced level: functions of all essential nutrients in plants, including consequences of insufficient and excessive supply; nature, dynamics and availability of all essential nutrients in soils; methods used for evaluation of soil fertility status; fundamental biophysical and economic principles of fertilisation.</p> | | | | | | Continuous evaluation consisting of tutorial evaluations and one examination paper of three hours. |
| GK693 | 20 | 8 | CESM: 010901 | | Research Project | |
| <p>Every student will conduct under guidance a small research project on a soil science topic. In the process a student will gain experience in the compilation of a research protocol, selection of appropriate methodology, conducting of trials, processing of data, interpretation of results and reaching of conclusions. A student must write a report on the project for evaluation according to an approved procedure.</p> | | | | | | Submit and present a research report. |
| GKD695 | 20 | 8 | CESM: 010901 | | Literature Review | |
| <p>Every student will conduct literature reviews on soil science topics under guidance. In this process a student will gain experience in the unlocking and synthesis of information as well as the written and oral presentation thereof according to approved procedures.</p> | | | | | | Submit and present a literature review. |

WILDLIFE MANAGEMENT

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| NLB601 | 24 | | | | Veld and Game Ecology | |
| <p>The identification and analysis of ecological game farming areas and familiarity with ecosystem characteristics. The student must be adjusted to physiological, phenological and ecological principles of the management of the grassland ecosystem. Population dynamics of game, including aspects such as knowledge of game species, social behaviour, reproduction, habitat preferences, diet selection and grazing habits.</p> | | | | | | |
| NLB602 | 24 | | | | Applied Habitat Evaluation | |
| <p>The student must have knowledge of the principles, applications and limitations with regard to important wildlife management and research techniques. Practical skills on techniques to determine primary production, veld condition and grazing capacity of the grass and tree layer. The student must be familiar with techniques to determine fodder intake and feeding preferences of game species.</p> | | | | | | |
| NLB603 | 24 | | | | Applied Wildlife Management | |
| <p>The student must have knowledge of the physical planning of a game farm, including fencing requirements, handling facilities, minimum farm sizes and legal aspects. The student must also be familiar with game capture, immobilisation, transport and handling of stress, game diseases and parasitology. The evaluation and analysing of game utilisation, including all aspects of hunting and life sales, as well as processing of game products</p> | | | | | | |

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| NLB693 | 24 | | | | Short Research Essay | |
| Integrated planning of a game farm/reserve where various aspects of wildlife management will be applied practically. Its objective is to solve management problems and to ensure the sustainable utilisation of the natural resources. | | | | | | |
| NLB700 | 180 | 10 | | | Dissertation | |
| MOB707 | 48 | 9 | CESM: | | Resources and Processes | |
| Basic principles and concepts of the natural environment, as well as planning and management aspects. | | | | | | A minimum of 50% in each module is required. Formal examinations one per semester will contribute 40% of the combined mark, and the semester mark (and oral where applicable) 60%. This mark counts 20% towards final mark. |

12.1.4 DIMTEC

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| DIM601 | 15 | 8 | CESM :0199 | | Research Methodology | |
| Development of knowledge and skills of candidates to conduct qualitative and quantitative research. Planning, design and management of practical research. Understanding participatory action research (PAR). Construct and present a project proposal for mini-dissertation. | | | | | | <i>There will be a compulsory practical exercise in DIM 601 Research Methodology. On completion of participation in this exercise students will receive a 10% mark which is part of the final mark.</i> |
| DIM602 | 15 | 8 | CESM :0199 | | Hazards and Disaster Management | |
| Understand disaster hazards and how they pose disaster threats. Categories and characteristics of disaster threats. Learning about environmental and other hazards; identification, description and management of all potential hazards that may occur in the area of responsibility. | | | | | | |
| DIM603 | 15 | 8 | CESM :0199 | | Strategic Disaster Management | |
| Understanding the application of the principles and procedures of strategic management in the domain of disaster management. Strategic management principles, methods and tools. Develop strategic thinking in the field of disaster management. Improving the quality of humanitarian environmental assessment, planning, organising, leadership and monitoring and evaluation of all role-players in disaster management. | | | | | | |
| DIM604 | 15 | 8 | CESM :0199 | | Disaster Management Principles and Practices | |
| Consider most important factors that need attention for the implementation of Disaster Management. National and International Disaster Management Legislation, key factors, principles and ethics consideration for effective planning, controlling, co-ordinating, monitoring and implementing Disaster Management. | | | | | | |
| DIM605 | 15 | 8 | CESM :0199 | | Disaster Risk Management | |
| Execution of a qualitative and quantitative risk and vulnerability assessment. Integrated risk and resources assessment. Hazard mapping. Determining. of potential disaster losses. Establish levels of acceptable risk. Utilising GIS as a means to manage risk and vulnerability assessment. | | | | | | |
| DIM606 | 15 | 8 | CESM :0199 | | Information Technology in Disaster Management | |
| Understanding the link between decision making and information. Understanding and classify information systems that can have an impact on the dynamic disaster environment. Demonstrate the process of the development of a Management Information System. Understand the concept of simulation in decision-making for disaster management. Demonstrate how different information technologies could be used in disaster management. | | | | | | |
| DIM607 | 15 | 8 | CESM :0199 | | Public Health | |
| Understanding concepts related to public health with regard to biological, community health and psycho-social and certain mental health implications of disasters. Biological warfare, veterinary risks; epidemiology: community assessment, infection control and prevention disease. Handling and management of health risks during disasters and/or conflict. Psycho-social aspect of HIV/Aids and mental health burn-out. | | | | | | |

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| DIM608 | 15 | 8 | CESM :0199 | Management of Natural and Human-Made Disasters |
| Understanding the critical common factors in responding to disasters. Demonstrate the management principles of at least four natural and four human-made disasters. Assessing of hazards and risk. Vulnerability analysis. Determining the potential impacts of disasters. Social-, economics and environmental impact. Formulating of hazard and risk reduction strategies. Formulating prevention and mitigation strategies. | | | | |
| DIM701 | 16 | | CESM :0199 | Trauma Management |
| The management of crisis intervention and trauma management to support victims of traumatic incidents. Post-traumatic stress and burn-out resulting from long-term exposure to traumatic incidents and the emotional distress of victims of trauma. Action strategies for crisis workers. Coping strategies and management principles of natural disasters, human made disasters, family and sexual violence and injury, chronic and life-threatening illness. | | | | |
| DIM702 | 16 | | CESM :0199 | Political Strategic Planning |
| The main aim of this module is the development of sophisticated techniques within the context of political environmental analysis with specific emphasis on forecasting. Specific attention will be given to scenario development as a technique for predicting the future. | | | | |
| DIM703 | 16 | | CESM :0199 | Information Management |
| This module pays pertinent attention to information needed within the organisational context. The importance of information to the manager, how he/she applies it, how the information is retrieved and from what type of sources are only a few of the issues which will be discussed. Applications of information in the industry, information systems and their management, as well as the integrity thereof will be explored. | | | | |
| DIM704 | 16 | | CESM :0199 | Ethnic and cultural conduct |
| The nature and development of human settlement. The nature of settlement in Africa. Indigenous settlement patterns. Formal and informal urbanisation. Anthropology of poverty. Ethnography of urbanisation. The ethnic and cultural influences on human settlements in multi-cultural urban environments. Problems created by the present tendencies in urban settlement from an anthropological perspective. | | | | |
| DIM705 | 16 | | CESM :0199 | Management of Media Relations |
| Understanding the influence of old-fashioned charity approach and the rights-based approach to the provision of humanitarian assistance has on public participation. Role of communities in all phases of disaster management if public participation programme is planned and coordinated effectively. Risk communication. Releasing information to the community. | | | | |
| DIM706 | 16 | | CESM :0199 | Environmental Risk and Impact Assessment |
| Environmental damage assessment: damage risk assessments on humans lives, farm and range lands, water and aquatic lives and air, vegetation and stratosphere. Post damage assessments. Pre- and post-damage remedies. Social dimensions of environmental degradation; drought risks and impacts on food production and supply, disease epidemics, political conflicts, refugees and pollutant emissions. Economic impacts of disasters; economic risk assessment, valuing of disaster damage (cost-benefit analysis and environmental impact assessment) and forecasting of disaster risks. Biological and biophysical aspects of environmental degradation; pests and diseases attack, microorganisms as polluting agents of food and drinks, microorganisms roles in biodegradation. Policy dimensions to environmental disasters. | | | | |
| DIM707 | 16 | | CESM: 0199 | Disaster Vulnerability and Risk Assessment |
| Quantitative method to determine vulnerability and risks. Case studies to determine the vulnerability of communities and communities at risk. Actuary probability theory. Determining the probable disaster loss. Using vulnerability and risk assessment to formulate prevention and mitigation strategies. | | | | |
| DIM708 | 16 | | CESM: 0199 | Water-Related Disaster Risk Management |
| The subject will offer the students the opportunity to acquire skills and knowledge in an intra- and multidisciplinary course to understand and manage disasters and their consequences. This subject entails seven modules about water related disasters. the modules are as follows: weather and climate, waterborne diseases, early warning and information systems, droughts and water scarcity, floods, water pollution and legal or institutional. | | | | |
| DIM791 | 90 | | CESM: 0199 | Extended Research Essay |
| *Subject to approval by the programme committee | | | | |

12.1.5 SUSTAINABLE AGRICULTURE, RURAL DEVELOPMENT AND EXTENSION

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| ADS116 | 24 | 7 | CESM: 010303 | Students with a related diploma or qualification, both at NQF Level 6 | Foundational Theories in Plant Production | 3B 18 months |
| <p>Within the area of sustainable plant production practices, students will be able to: Develop water harvesting techniques; demonstrate different cultivation practices; choose correct cultivars for specific areas; integrate weed control programmes; establish an integrated pest management approach; improve biological and economical crop production practices; conserve soil structures; and enhance crop produces for own consumption and marketing. The contact sessions are largely devoted to case studies, practicals and applications. Group work is done to develop team skills and independent studies are undertaken to develop research skills.</p> | | | | | <p>Formative assessment: four practical and/or work-related assignments. Practical evaluations are done in the community where the student operates. Summative assessment: two-hour examination.</p> | |
| ADS126 | 24 | 7 | CESM: 0199 | Students with a related diploma or qualification, both at NQF Level 6 | Fundamentals of Rural Development | 3B 18 months |
| <p>Within the area of managing rural structures and dynamics, be able to: apply acquired skills and know-how to deal with the challenges of rural life; resolve gender issues; explain the important role of agriculture in communities; contrast poverty vs. self-sufficiency; introduce programmes to alleviate hunger and ensure food security; initiate improved support structures in all spheres of rural life; facilitate improved living environments; and create capacity towards self-sufficiency. The contact sessions are largely devoted to case studies, practicals and applications. Group work is done to develop team skills and independent studies are undertaken to develop research skills</p> | | | | | <p>Formative assessment: four practical and/or work-related assignments. Practical evaluations are done in the community where the student operates. Summative assessment: two-hour examination.</p> | |
| ADS136 | 24 | 7 | CESM: 010301 | Students with a related diploma or qualification, both at NQF Level 6 | Foundational Theories in Animal Production | 3B 18 months |
| <p>Within the area of sustainable animal production practices, be able to: design practical rotational grazing systems to avoid over grazing; develop and apply sound animal husbandry practices; identify nutritional needs of free ranging animals; implement correct breeding practices; introduce sound animal health procedures; devise sound marketing practices; improve biological and economical livestock production practices; curb high mortality and low fertility rates; improve genetic material for herd progress; implement sound feeding regimes to avoid excessive mass losses in dry seasons; The contact sessions are largely devoted to case studies, practicals and applications. Group work is done to develop team skills and independent studies are undertaken to develop research skills</p> | | | | | <p>Formative assessment: four practical and/or work-related assignments. Practical evaluations are done in the community where the student operates. Summative assessment: two-hour examination.</p> | |
| ADS146 | 24 | 7 | CESM: 010102 | Students with a related diploma or qualification, both at NQF Level 6 | Fundamentals of Agriculture Economics | 3B 18 months |
| <p>Within the area of production, marketing and adding value, be able to: teach methods for processing and preserving perishable foodstuffs; develop alternative marketing strategies; introduce support systems to implement new marketing strategies; improve the financial stability of the members of the communities; and advance improved competitiveness in the markets. The contact sessions are largely devoted to case studies, practicals and applications. Group work is done to develop team skills and independent studies are undertaken to develop research skills</p> | | | | | <p>Formative assessment: four practical and/or work-related assignments. Practical evaluations are done in the community where the student operates. Summative assessment: two-hour examination.</p> | |
| ADS226 | 24 | 7 | CESM: 0199 | Students with a related Diploma or qualification, both at NQF Level 6 | Basic Communication Skill for Sustainable Agriculture | 3B 18 months |
| <p>Within the area of written, communication and presentation skills, be able to: advance overall effectiveness due to better communication and understanding of the spoken and written words; facilitate effective interpersonal discussions; improve harmony in diverse communities; enhance writing, oral, communication and presenting skills; develop skills to formulate needs in an understandable context; and apply transferred knowledge. The contact sessions are largely devoted to case studies, practicals and applications. Group work is done to develop team skills and independent studies are undertaken to develop research skills</p> | | | | | <p>Formative assessment: four practical and/or work-related assignments. Practical evaluations are done in the community where the student operates. Summative assessment: two-hour examination.</p> | |
| BSB693 | 20 | | | | Research Project | |
| <p>After completion of this module a student will have experience in the integrated planning of irrigation farming. This planning will be conducted under guidance. The soil, climate, agronomy, economy and engineering aspects must be taken into account. A report covering all aspects of the planning is required.</p> | | | | | | |

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| BSB695 | 20 | | | | Literature Review | |
| After completion of this module students will have the skill to conduct successful literature reviews. Every student will conduct literature reviews on irrigation science topics under guidance. In this process a student will gain experience in the unlocking and synthesis of information as well as the written and oral presentation thereof according to an approved procedure. | | | | | | |
| BSB601 | 24 | | | | Evaluation of Soil and Water for Irrigation Suitability | |
| Knowledge on the influence of the climate on the selection of irrigated crops. Management of the soil water balance. The student must be familiar with the soil-plant-atmosphere continuum under irrigation and the effect of irrigation on the environment. | | | | | | |
| BSB602 | 24 | | | | | |
| Knowledge on the maintenance of soil fertility, integrated pest control and rotation of crops under irrigation. Quantification of water requirements and usage of irrigated crops and the identification of methods for irrigation scheduling. | | | | | | |
| BSB603 | 24 | | | | | |
| The student must be familiar with making choices, design, installation, evaluation and management of irrigation systems. Analysis and evaluation of electrical motors and electrical usage of irrigation systems. | | | | | | |
| BSB693 | 24 | | | | Research | |
| Integrated planning of irrigation farming, and taking into account the soil, climate, agronomy, economy and engineering aspects. | | | | | | |
| HRT625 | 20 | | | | Plant Propagation | |
| On completion of this module students will be familiar with the sexual and asexual propagation of horticultural crops: The following aspects are dealt with at an advanced level: seedling propagation, theoretical aspects of vegetative propagation by budding, grafting, cuttings, layering and specialised plant structures, rootstock and scion relationships and principles of tissue culture for micro propagation. | | | | | | |
| HRT645 | 20 | | | | Vegetable Production | |
| On completion of this module students will be familiar with vegetable production. The following aspects are dealt with at an advanced level: establishment, induction of flowering, environmental influences on development, growth and yield, correlative growth and the production aspects of the major leaf, bulb, root and fruit vegetable crops. | | | | | | |
| HRT665 | 20 | | | | Fruit Production | |
| This module consists mainly of self-study of scientific review articles on specific advanced topics in fruit production. After completion of this module, students will have acquired an in-depth knowledge of important concepts in fruit production, including flowering and dormancy, fruit development, and fruit tree manipulation. Experience in evaluating scientific literature and extracting relevant information from such sources will also be gained. | | | | | | |
| HRT693 | 20 | | | | Research Project | |
| The research project extends over a whole year. A subject specific project will be completed under supervision. They will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of horticultural experiments, as well as the interpretation and communication of results. Students will be required to submit a scientific research report and make an oral presentation on the project results by the end of the second semester. After completion of this module, skills of scientific insight and procedure, as well as written and oral presentation skills of scientific information will have been developed. | | | | | | |
| HRT695 | 20 | | | | Literature Review | |
| Students will prepare a comprehensive, scientific literature review linked to their research project and present this seminar by the end of the first semester. On successful completion of this module students should have an understanding of the importance of a comprehensive literature survey in research, and be completely familiar with the scientific style of writing. Students should be well acquainted with the resources available and skills of literature searches, and the combination of relevant sources into a meaningful union. Students will also gain valuable experience in presentation of scientific matter in front of an audience. | | | | | | |
| MOB741 | 48 | 9 | CESM: | | Water, Pollution and Rehabilitation Management | |
| A two-week block period of class attendance is compulsory during each semester, or two to three weeks in the case of the second semester of the first year, during which lectures, practicals, tutorials and discussions will take place. For the rest of the semester the candidate will be required to prepare assignments through self-study and submit them or present them orally. | | | | | | A minimum of 50% in each module is required. Formal examinations one per semester will contribute 40% of the combined mark, and the semester mark (and oral where applicable) 60%. This mark counts 20% towards final mark. |

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| MOB743 | 48 | 9 | CESM: | Biodiversity and Conservation Management | A minimum of 50% in each module is required. Formal examinations one per semester will contribute 40% of the combined mark, and the semester mark (and oral where applicable) 60%. This mark counts 20% towards final mark. |
| MOB745 | 48 | 9 | CESM: | Wetland Management | A minimum of 50% in each module is required. Formal examinations one per semester will contribute 40% of the combined mark, and the semester mark (and oral where applicable) 60%. This mark counts 20% towards final mark. |
| LBB702 | 180 | 9 | CESM: | Production Management | After the successful completion of this module the student will understand the theoretical concepts of production economics, which include, amongst others, input/output, input/input, and output/output relationships, economic optimal input and output levels, and economies of scale. The student will be able to compile comprehensive enterprise budgets for cash and perennial crops, pastures and livestock enterprises with special reference to the consideration of the availability, and the quality of available natural resources. With the aid of actual case studies, the student will understand how theoretical concepts are applied in practice when making management decisions to choose between different production alternatives, production processes, and the adoption of new production technology. The student will be able to assess the financial impact of management decisions within a case study of his/her choice. |

12.2 BUILDING SCIENCES

12.2.1 DEPARTMENT OF ARCHITECTURE

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| BOW106, BOW204/206, BOW304/306, BOW608, BOW708 – Building Science | | | | | |
| The course duration is five years, of which the modules BOW106/206/306 constitute a part of the BArchStud programme, BOW608 constitutes part of the BArchStud (Hons) degree and BOW708 constitutes part of the MArch(Prof) degree. The module consists of theoretical and practical instruction, combined with visits to sites, manufacturers and trade shows. | | | | | |
| This module comprises a Design Dissertation, the theme of which has been approved by the department. The Design Dissertation must lead to a design project and deliver proof that the student has mastered construction techniques and architectural theory at a high level. This module involves the investigative research and critical judgement of all aspects (historical, theoretical, contextual, etc.) pertaining to the chosen design subject and project, and is set out in an academically rigorous document. It further involves the development of the chosen design project with reference to concept development, development and setting out of programme (list of accommodation and spatial parameters), the integration of all aspects involved (precedent studies, historical and theoretical premises, contextual and environmental/urban determinants, development of structure and technical issues, services, etc.) in an appropriate design solution and the presentation thereof in a document with the necessary illustrations, sketches, drawings and model(s). | | | | | Internal and external examination of the final Design Dissertation document and an oral defence of the final realised design project. External assessment. |
| TAR704 | 16 | 9 | CESM: | Selection for MArch(Prof) | Theory of Architecture 2L |
| The development of a meaningful theoretical framework to underpin the design. For their dissertations students are advised to select a design topic in which they wish to enhance their knowledge. A critical investigation of the theoretical aspects of the specific design subject and project derived from the Design Dissertation (SKR791). Critical analyses of relevant contemporary theoretical premises, as well as applicable theoretical issues pertaining to the specific design subject and project form an important part of this investigation and are set out in an academically rigorous treatise. | | | | | Internal and external examination the final theoretical chapter in the Design Dissertation document (SKR791) and an oral defence. |
| BOW106, BOW204/206, BOW304/306, BOW608, BOW708 – Building Science | | | | | |
| The course duration is five years, of which the modules BOW106/206/306 constitute a part of the BArchStud programme, BOW608 constitutes part of the BArchStud(Hons) degree and BOW708 constitutes part of the MArch(Prof) degree. The module consists of theoretical and practical instruction, combined with visits to sites, manufacturers and trade shows. | | | | | |

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| BOW106 | 24 | 6 | CESM: 020301 | Selection for BArchStud | Building Science | 2L, 3P |
| <p>Theory: The complete construction process of the single storey structure viz: site analysis and preparation, shallow foundations, loadbearing masonry walls, arches and framed openings, pitched roof, rainwater management, and services, introduction to, and application of laws and regulations in the built environment. Introduction to construction materials: masonry units, mass concrete, glass, ferrous metals, timber.</p> <p>Working drawings (application of theory) of a single-storey structure.</p> <p>Site visits: Illustration of theory.</p> | | | | | | Continuous evaluation by means of tests, assignments, precedent and case studies, seminars and visual and oral presentation of portfolio. External assessment. |
| BOW206 | 24 | 6 | CESM: 020301 | BOW106, OGT106, ONW100 | Building Science | 2L, 3P |
| <p>Theory: the complete construction process of the double-storey structure viz: Site analysis and preparation, sub structures, waterproofing systems, superstructures, building- and site services, introduction to elements of framed structures, regulations in the built environment relating to year themes, including the principles of empirical and rational building design.</p> <p>Working drawings (application of theory) of a double-storey structure.</p> <p>Site visits: A complete building project.</p> | | | | | | Continuous evaluation by means of tests, assignments, precedent and case studies, seminars and visual and oral presentation of portfolio. External assessment. |
| BOW306 | 24 | 7 | CESM:020301 | BOW206, OGT206, ONW200, TAR204 | Building Science | 2L, 3P |
| <p>Theory: the complete construction process of the multi-storey structures viz: site analysis, regulations within the built environment (National Building Regulations, SANS 10400), safety considerations and regulations, framed structural systems, sub structure systems, superstructure systems, vertical circulation systems, the practical and economic implications of construction decisions, and an independent module on earth construction presented by the "Earth Unit" of the department.</p> <p>Working drawings (application of theory) of a multi-storey structure with a basement. A set of drawings enabling the candidate to be employable.</p> <p>Site visits: A complete building project.</p> | | | | | | Continuous evaluation by means of tests, assignments, precedent and case studies, seminars and visual and oral presentation of portfolio. External assessment. |
| BOW204 | 16 | 6 | CESM: 020301 | | Building Science | 1L, |
| <p>These modules presented to the candidates of the Department of Quantity Surveying and Construction Management.</p> <p>Theory: the introduction to the construction process of a single and double-storey structure viz: Site analysis and preparation, sub structures, waterproofing systems, superstructures, building and site services, introduction to elements of framed structures, regulations in the built environment relating to year themes, including the principles of empirical and rational building design.</p> | | | | | | Continuous evaluation by means of tests, assignments, precedent and case studies |
| BOW304 | 16 | 7 | CESM: 020301 | BOW204 | Building Science | 1L, |
| <p>These modules presented to the candidates of the Department of Quantity Surveying and Construction Management.</p> <p>Theory: the introduction to the construction process of the multi-storey structures viz: site analysis, regulations within the built environment (National Building Regulations, SANS 10400), safety considerations and regulations, framed structural systems, sub structure systems, superstructure systems, vertical circulation systems, the practical and economic implications of construction decisions.</p> | | | | | | Continuous evaluation by means of tests, assignments, precedent and case studies |
| BOW608 | 32 | 8 | CESM: 020301 | Selection for BArchStudHons | Building Science | 2L, 3P |
| <p>Theory: Contemporary issues in architecture are explored through case studies presented as formal lectures or seminars. Critical discussion and evaluation of the following core principles form part of lectures and seminars: Construction methods at an appropriate level of complexity, building processes – construction logistics and implementation, materials – properties and fixing methods and restrictions (rules, regulations, legislation, title restrictions, and zoning).</p> <p>Working drawings: Guided individual research on project-specific requirements, technical resolution of design projects, technical documentation of design projects to a sophisticated level of detail resolution, formal and self-organised site visits to expand on the student's understanding of the management of architectural construction programmes and methods.</p> <p>Site visits: Site visits focus on critical evaluation of the theoretical components.</p> | | | | | | Continuous evaluation by means of tests, assignments, precedent and case studies, seminars and visual and oral presentation of portfolio. External assessment. |
| GRT104 | 16 | 5 | CESM: | Selection for BArchStud | Presentation Techniques | 3P |
| <p>The introduction of graphic representation techniques, form studies and the utilisation of different media.</p> | | | | | | Continuous evaluation by means of assignments and presentations. External assessment. |
| GRT204 | 16 | 6 | CESM: | BOW106, GRT112 | Computer Drafting | |
| <p>The theory and practice of computer-assisted graphic methods and the use of various Cad software.</p> | | | | | | Continuous evaluation by means of tests and assignments. External assessment. |

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| GRT112 | 8 | 5 | CESM: | | Trigonometrical Drawing | 3P |
| Orthographical projection, scale, isometry, axonometry, sections through solid bodies, development, horizontal projection. Theoretical instruction coupled with practical exercises. | | | | | | Continuous evaluation by means of assignments and presentations. External assessment. |
| GRT122 | 8 | 5 | CESM: | GRT112 | Photography | 2P |
| Types of cameras, lenses, adjustment, light measurement, types of photographs, enlargements, duplicating, model photography, building photography, prints and enlargements. | | | | | | Continuous evaluation by means of assignments and presentations. External assessment. |
| NMA622 | 8 | 8 | CESM:020101 | Selection for BArchStudHons | Research Methods in Architecture | 3L |
| Academic writing, selected methods and techniques applicable to research in Architecture and the design of a research proposal. Literature review, annotated bibliography, research methods and techniques in architecture, academic writing, and sources and resources in the field of Architecture. | | | | | | Continuous evaluation by means of coursework assignments and oral defence. External assessment. |
| OGT106(4)/OGT206/OGT304/OGT606 | | | | | | |
| The course duration is four years, of which the modules OGT106/206/304 constitute a part of the BArchStud programme and OGT606 constitutes part of the BArchStud(Hons) degree. In broad terms it comprises an overview of the history of the built environment throughout the principal historic divisions of architecture from the pre-historic period until today. | | | | | | |
| OGT106(4), | 16 | 6 | CESM:020701 | Selection for BArchStud | History of the Environment | 2L |
| The introduction to the history and theory of architecture, human settlements and architecture in the context of a coherent part within the greater whole of man's existential environment. The interaction between these three components and their occurrence internationally, in an African context and locally is investigated. An introduction to vernacular and indigenous architecture, the historical evolution of architecture from ancient Egypt, classical Greece and Rome, to the early Christian, Byzantine, medieval and Gothic periods. | | | | | | Continuous evaluation by means of tests, assignments, class work, class tests and discussions. External assessment. |
| OGT206(4), | 16 | 6 | CESM:020701 | BOW106, OGT106, ONW100 | History of the Environment | 2L |
| This historical evolution and generative basis of architecture from the Renaissance to the early 20 th Century and the South African counterparts. Internationally the module observes architectural history from the 15 th Century Renaissance to the beginning of the early 20 th Century Modern Movement. The theoretical and philosophical ideas of the various periods and their influence on architecture are considered. The South African component focuses on the influence of the European settlers from 1652 to 1910. | | | | | | Continuous evaluation by means of tests, assignments, class work, class tests and discussions. External assessment. |
| OGT304 | 16 | 7 | CESM:020701 | BOW206, OGT206, ONW200, TAR204 | History of the Environment | 2L |
| The reception of modernism in South Africa and the development of contemporary architectural culture through the work and lives of South African architects. The international and local pioneers of Modernism as well as mutations / revisions / hybrids that occurred within the Modern tradition are discussed. This investigation constructs a context for the development of Modernism locally. The theme: "Modernism from a SA point of view" investigates architecture at the turn of the century and current practice of architecture in South Africa. | | | | | | Continuous evaluation by means of written tests, assignments, class tests, essays, reports, seminars, discussions and oral assessment. External assessment. |
| OGT606 | 24 | 8 | CESM:020701 | Selection for BArchStudHons | History of the Environment | 2L |
| The study of the built form of human settlements in history, internationally and in South Africa, with an emphasis on town planning, urban design, housing, conservation and sustainable development. Student seminars investigate South African urban areas and focus on components within the afore mentioned broad topics. Students undertake a critical investigation of the historical aspects of the specific design theme and project (integrated with ONW600). | | | | | | Continuous evaluation by means of written tests, assignments, class tests, essays, reports, seminars, discussions and oral assessment. External assessment. |
| OMA612 | 8 | 8 | CESM:020101 | Selection for BArchStudHons | Design Methodology | 3L |
| Introduction to a wide range of factors influencing design and design methods, as well as the application thereof on the design of buildings. The course duration is four years, of which the modules ONW100/200/300 constitute a part of the BArchStud programme and ONW600 constitutes part of the BArchStud(Hons) degree. The modules develop the ability to identify and creatively solve problems concerning humans' interaction with their physical environment. Through prescribed projects in the studio the design process is discovered. The design process involves the creation of spaces and artefacts (landscapes, cities, buildings, utility objects), to address the social, environmental, cultural and historical ecologies of man in an identifiable and functional way. Aspects such as functional planning, structural integrity and meaningful shaping is emphasised during this course, where the spectrum of design theories, a wide variety of project types and architectural history is utilised in varying combinations in order to integrate all the fields of study into the curriculum. During the three years of study all the above-mentioned aspects of design, taking into consideration the variety of courses presented in each year, are addressed in an even more complex form. Compulsory excursions will form part of the Design courses of each year, | | | | | | Continuous evaluation by means of coursework assignments and in-class student presentations of data collection. External assessment. |

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| ONW100 | 48 | 6 | CESM:020101 | Selection for BArchStud | Design | 2L |
| Theme: The place of the individual (<i>my</i> building/structure) in the natural landscape. The projects address <i>inter alia</i> the concepts: <i>Genius Loci</i> (sense of place), enclosure and threshold, typology, geometry, ergonomics, order and space, and meaning and architecture. | | | | | | Continuous evaluation by means of assignments, precedent and case studies, seminars, design projects and visual and oral presentation of portfolio. External assessment. |
| ONW200 | 48 | 6 | CESM:020101 | BOW106, OGT106, ONW100 | Design | 1L, 8P |
| Theme: the place of the individual group within the built environment (<i>our</i> building/structure within the human settlement, i.e. towns, cities etc.).The projects address <i>inter alia</i> the concepts of topology, typology and morphology. | | | | | | Continuous evaluation by means of assignments, precedent and case studies, seminars, design projects and visual and oral presentation of portfolio. External assessment. |
| ONW300 | 48 | 7 | CESM:020101 | BOW206, OGT206, ONW200, TAR204 | Design | 1L, 8P |
| Theme: The place of the community (<i>their and our</i> building/structure, especially more complex multi-functional buildings) and the contextual relationship with the human ecological landscape specifically the urban environment. The projects address <i>inter alia</i> the concepts: Body, place, method, metaphors, tectonics, urban theory, and critical regionalism. | | | | | | Continuous evaluation by means of assignments, precedent and case studies, seminars, design projects and visual and oral presentation of portfolio. External assessment. |
| ONW600 | 48 | 8 | CESM:020101 | Selection for BArchStudHons | | 1L, 8P |
| Four themes, one per quarter, are critically researched and exploited through a specific design project as identified by each candidate individually. The four themes address <i>inter alia</i> the concepts: urban design, sustainability (environmental impact, earth construction/alternative technologies, etc.), conservation, contemporary theoretical philosophical issues, housing and landscape. Group research precedes the critical investigation of each theme, which then extends to individual reports and design projects. Building Science, Environmental History and Theory of Architecture are thus meaningfully integrated with reference to each theme in every specific design project. | | | | | | Continuous evaluation by means of assignments, precedent and case studies, seminars, design projects and visual and oral presentation of portfolio. External assessment. |

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| TAR22(0)4/TAR304/TAR604 | | | | | | |
| The course duration is three years, of which the modules TAR204/304 constitute a part of the BArchStud programme and TAR604 constitutes part of the BArchStud(Hons) degree. In broad terms it comprises the reading and interpretation of the chronological development of Architectural Theory from classical times to the 21 st Century. The course entails an in-depth study of contemporary architectural and philosophical thought, its reaction on and interaction with human ecology and architectural design. | | | | | | |
| TAR22(0)4 | 16 | 6 | CESM:020101 | BOW106, OGT106, ONW100 | Theory of Architecture | 2L |
| The introduction to and overview of the history of Architectural Theory. The influences on architecture from classical times to the beginning of the enlightenment era. The ideas behind historical architectural form-giving, addressing <i>inter alia</i> the influences of concepts of enclosure, threshold, geometry, ergonomics, order, space, place, meaning, topology, typology and morphology. | | | | | | Continuous evaluation by means of tests, assignments, class tests, essays, reports, seminars and discussions. External assessment. |
| TAR304 | 16 | 7 | CESM:020101 | BOW206, OGT206, ONW200, TAR204 | Theory of Architecture | 2L |
| The intellectual, theoretical and philosophical principles of rational and post-rational architecture and the application thereof internationally and in South Africa. The architectural theory over the last century is explored within specific human ecological landscapes, addressing <i>inter alia</i> the themes: Body, place, method, metaphor, tectonics, urbanism, critical regionalism and sustainability. Students communicate through a report with a theoretical approach to architectural solutions within a specific human ecological landscape and design project (ONW300). | | | | | | Continuous evaluation by means of tests, assignments, class tests, essays, reports, seminars and discussions. External assessment. |
| TAR604 | 16 | 8 | CESM:020101 | Selection for BArchStudHons | Theory of Architecture | 2L |
| The in-depth study of the post-modern critique of contemporary architecture, addressing <i>inter alia</i> the concepts: urban design, sustainability, conservation, contemporary theoretical philosophical issues, housing and landscape. Students undertake a critical investigation and analyses of relevant contemporary premises, as well as applicable theoretical aspects of a specific design theme and project (integrated with ONW600) set out in an academically rigorous report. | | | | | | Continuous evaluation by means of tests, assignments, class tests, essays, reports, seminars and discussions. External assessment. |

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| BOW708 | 32 | 9 | CESM:020101 | Selection for MArch(Prof) | Building Science (Construction) | 3D |
| <p>This module takes place parallel to the Design Dissertation (SKR791), it is examined separately. The module comprises the theoretical and technical investigation (considering: materials, structural system and construction methods) of the proposed design scheme. Detailed design and technical development of the proposed scheme. The above is presented as a technical report with fully set out documentation.</p> | | | | | | <p>Internal and external examination of the final Technical Report chapter in the Design Dissertation document (SKR791) and an oral defence of technical documentation of the design proposal. External assessment.</p> |
| PAK70(1)4 | 16 | 9 | CESM:020101 | Selection for MArch(Prof) | | 2P |
| <p>This module involves aspects pertaining to the professional running of an architect's practice. It includes aspects of office administration and finances, professional service to clients, communication, presentation of projects, marketing, liaison with consultants, etc.</p> | | | | | | <p>Continuous evaluation by means of class discussions, mini-assignments, seminars and a test. External assessment.</p> |
| SKR791 | 100 | 9 | CESM:020101 | Selection for MArch(Prof) | Extended Research Essay | 12P, 2D |
| <p>This module comprises a Design Dissertation, the theme of which has been approved by the department. The Design Dissertation must lead to a design project and deliver proof that the student has mastered construction techniques and architectural theory on a high level. This module involves the investigative research and critical judgement of all aspects (historical, theoretical, contextual, etc.) pertaining to the chosen design subject and project, and is set out in an academically rigorous document. It further involves the development of the chosen design project with reference to concept development, development and setting out of programme (list of accommodation and spatial parameters), the integration of all aspects involved (precedent studies, historical and theoretical premises, contextual and environmental/urban determinants, development of structure and technical issues, services, etc.) in an appropriate design solution and the presentation thereof in a document with the necessary illustrations, sketches, drawings and model(s).</p> | | | | | | <p>Internal and external examination of the final Design Dissertation document and an oral defence of the final realised design project. External assessment.</p> |
| TAR70(1)4 | 16 | 9 | CESM:020101 | Selection for MArch(Prof) | Theory of Architecture | 2L |
| <p>The development of a meaningful theoretical framework to underpin the design. For their dissertations students are advised to select a design topic in which they wish to enhance their knowledge. A critical investigation of the theoretical aspects of the specific design subject and project derived from the Design Dissertation (SKR791). Critical analyses of relevant contemporary theoretical premises, as well as applicable theoretical issues pertaining to the specific design subject and project form an important part of this investigation and are set out in an academically rigorous treatise.</p> | | | | | | <p>Internal and external examination the final Theoretical chapter in the Design Dissertation document (SKR791) and an oral defence.</p> |

12.2.2 DEPARTMENT OF QUANTITY SURVEYING AND CONSTRUCTION MANAGEMENT

| University of the Free State | | UNISA |
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| HRG204 | Commercial Law | CLA1501/CLA1502/CLA1503 |
| EACC61406 OR EAAC62406 | Accounting OR Accounting | FAC1501&FAC1502 OR FAC1601 |
| EBUS74407 | Entrepreneurship | MNE3701 |
| EBUS51305 | Business Functions | MNB1601 |
| EECF61306 | Introduction to economics and micro economics | ECS1501 |
| ABR224 | Labour Law | MRL3702 |
| EBUS62406 | General Management | MNG2016 |
| EBUS61406 | Core business activities | MNF2023 |
| STK124 | Introduction to Statistics II | STA1610 |
| EBE112 | Business English | ENN1504 |
| EBE122 | Business English | ENN103F |
| ENG104 | English Skills | ENH101J |
| STK114 | Introduction to Statistics | STA1510 |
| EECF62306 | Introduction to Macro Economics | ECS1601 |

The distance learning modules (marked with *) are presented during three block sessions per year with 2 hour sessions each.

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| ARG204/ARG 204* | 16 | 6 | CESM:020701 | Architecture | 1L |
| <p>Part 1 The history of architecture in respect of the art of building from antique civilisation until the 21st century. Philosophy of Architecture, a survey able view, the connection between the historical art of building, culture environment and philosophy. The economy's impact on architecture.</p> <p>Part 2 Aspects of architecture theory and philosophy which affect modern man and development. Built-up areas, city planning and design fundamentals. Housing design and construction, the approach to creating salubrious environments for communities. The design and documentation of a home/dwelling in practice. Continuous assessment by means of two assignments , two two-hour tests and one final test of three hours</p> | | | | | |
| BKF104/DQF104* | 16 | 5 | CESM:020901 | Descriptive Quantification | 2L |
| <p>Small, medium and complex constructions: Dissecting, specification, quantification and composition of process items in terms of elemental level- and Introductory perspective: Introduction to the building and construction industry, structure, functioning, services, interest. Orientation within the real estate industry. Professional consultants, contractor and investor. Professional orientation and inter-professional liaison. Introduction to documentation procurement: Types, purpose, compilation and methodology. Introduction to financial service. Introduction to construction management. Documentation procedures: Introduction to documentation procedure and method for inviting or preparing tenders, elements, arrangement and compilation. Construction drawings: Interpretation of construction drawings. Three-dimensional insight and perspective. Descriptive quantification: Introduction to descriptive quantification, style, explanation, reference and arrangement. Dissecting of small, medium and complex building structures in terms of sections, subsections, elements and components, specification and quantification thereof, processing and compiling of lists. Computerised quantification systems: Introductory synopsis of computerised quantification systems, taking off, working up and list production. Introductory synopsis of computerised drawing systems, three-dimensional insight, procedure and working up. Integration of measuring and drawing systems, general conceptual approach and documentation component level item definition with regards to foundation work, lower structures for framed and load-bearing constructions, simple concrete floors, frameworks and steps, walls, waterproofing of flat roofs, flat and pitched roof constructions, windows and doors, finishes, ceilings and systems, fittings and services. Processing of quantities, abstracting in elements and components and compiling of lists.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, three two-hour tests and one final test of three hours. These assessment tasks will focus on applications within quantity surveying.</p> |
| BKF204/DQF204* | 16 | 6 | CESM:020901 | Descriptive Quantification | 2L |
| <p>Simple constructions: Dissecting, specification, quantification and composition of process items in terms of trade item definition with regard to foundation work, lower structures, wall constructions, roof constructions and finishes, finishes, windows, doors. Working up of quantities, abstracting in trades, compiling of draft trade lists of integrated examples. Complex constructions: Dissecting, specification and quantification and composition of process items in terms of trade item definition with regards to wooden floors, special windows and doors. Working up of quantities, abstracting in trades, compiling of draft trade lists of integrated examples.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, three two-hour tests and one final test of three hours. These assessment tasks will focus on applications within quantity surveying.</p> |
| BKF304/DQF304* | 16 | 7 | CESM:020901 | Descriptive Quantification | 2L |
| <p>Simple constructions: Dissecting, specification and quantification of process items in terms of trade item definition with regard to: Foundation work, lower structures, concrete frames, intermediate floors and steps, wall constructions, roof constructions and finishing, finishing, windows, doors, fittings and sanitary services. Processing of quantities, abstracting in trades, draft lists and integrated examples. Complex constructions: Dissecting, specification and quantification of process items in terms of trade item definition with regard to: Foundation work on sloping sites, concrete floor slabs, complex masonry constructions, such as haunches, fins, arches, domes, special bonding, etc. and structures, long-span roofs, patent roof trusses, steel structures, special patents and non-patent fittings, sanitary fittings and complex pipe systems, etc. Processing of quantities, abstracting in trades, draft lists and integrated examples.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests and tasks, three three-hour tests and one final test of four hours.</p> |
| BKF404/DQF404* | 16 | 8 | CESM: 020901 | Descriptive Quantification | 2L |
| <p>Complex items: Dissecting, specification and quantification of process items in terms of trade item definition regarding: Alterations, piling, ground anchoring, special foundation constructions, false ground floor constructions of wood and concrete, complex basement constructions, underpinning and shoring, compound short and long-span structures of in situ concrete, troughed, ribbed and hollow block slabs, pre-cast concrete, steel, wood, etc., concrete shell, arched, dome and circular constructions, special long-span, arched and dome-roofed constructions, stress structures, stonework, waterproofing and basement construction, curtain walling and special cladding, special ceilings, finishes, doors, windows and fittings, electrical work, mechanical work, site work and site services. Practice systems: Theoretical basis, compiling and utilisation of quantification systems for small and large constructions. Guidelines for interpreting their use, with some examples as illustration. Theoretical frame of reference for system management. Documentation: Theory of documentation regarding taking off systems, abstracting and billing under the different taking off systems. Preliminaries, specifications and integrated documentation procurement. Computer-supported documentation, abstracting, billing, item data banks, taking off procedures, three-dimensional perspective and computerised taking off procedures. Drawing documentation, computer systems, functioning and standardised data bases. Integrated documentation networks, file and data base systems. Integrated documentation by means of computerised systems. Architectural documentation. Engineering documentation and quantity surveying systems. Future documentation perspective.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests and tasks, three three-hour tests and one final test of four hours.</p> |

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| BKI404/MCI404* | 16 | 8 | CESM: 020901 | Management of Information and Communication Systems | 1L |
| <p>Research methodology: Field of research, role and place of research, types of research, research methodology, sources and reports. The compilation of a research report on an approved topic of the learner's own choice.</p> <p>Information management: Information, data and data communication. Database theory, independence of data, models of data. Physical aspects of a database. Operating systems, hardware, software and micro-codes. Principles of processes, asynchronous, concurrent processes and programming. Organisation of virtual memory, task and processing scheduling. File and database systems. The database administrator and functions, the utilisation of database systems, repair, distributed systems and security. Integrated networks, computer communication and information management. Future trends, development and possibilities. Fourth generation languages, artificial intelligence and business expert systems. Computer graphics and abilities. Future computer development and user perspective.</p> <p>Communication: Theory and principles of communication. Verbal communication. Written communication and documentation. Electronic communication and communication satellites. Negotiating techniques. Industrial communication, visual communication, integrated network systems and information management in the construction and property industries. Future trends, development and possibilities.</p> | | | | | Thesis and article. |
| BKR306/CCM306* | 24 | 7 | CESM: 020901, 120403 | Building Contracts Law | 1L, 1P |
| <p>Introduction to building law: Foundations of contracts law and commercial law in the construction industry: Building contracts, leases, purchase-deeds, agencies, contracts of service.</p> <p>Building contracts: Parties to the building contract, types of building contracts, structure and forms, sureties, interpretation of building contracts, general conditions of building contracts in use and deeper study of standard clauses, terms and conditions in building contracts, the interpretation and implication thereof. Utilisation of standard building contracts.</p> | | | | | Continuous assessment by means of one assignment, three two-hour tests and one final test of three hours. |
| BKS304/DQS304* | 16 | 7 | CESM:020901 | Descriptive Quantification (Project) | 2L |
| <p>During the year, on instruction by the departmental head, each learner must do an Integrated Project. Year-end evaluation is handled and applied in an integrated manner.</p> | | | | | Comprehensive assignment. |
| BOE104/COE104* | 16 | 5 | CESM:020901 | Building Economics | 1L, 1P |
| <p>Part 1 The architect and architecture: Historical perspective, man and his immediate surroundings, natural environment, urban environment. Review of architectural philosophy. Fundamentals of design: Three-dimensional concepts of spatial planning, conceptual understanding of structure, integration of structural techniques in the design process, form construction, management of environmental factors, graphic Construction: Historical perspective, natural building materials, building construction, structural elements, finishing, doors and windows, services. Construction plans: Types of drawings and series, number and reference systems, titles, headings, scale, specification notes, detail and captions. Drawing techniques: media, style, lettering, lines and diagrams. Lay-out of drawings: site plans methods of representation, form studies and the use of different media, such as free-hand drawings, theory and application of principles of perspective in architectural presentations, water-colour, pasting methods, photography. Design process: The analysis of consumer needs, spatial planning, form and perspective, draft plans, scheme plans, detail planning and documentation drawings, the influence on building costs.</p> <p>Part 2 The principals of building cost and prices. The theory of cost planning, cost comparisons and competitiveness. Contracts and building economical basis.</p> | | | | | Continuous assessment by means of two assignments, two two-hour tests and one final test of three hours. |
| BOE204/COE204* | 16 | 6 | CESM:020901 | Building Economics | 1L |
| <p>Introduction to Building Economics: The extent and development of building economics as discipline, the structure and functioning of the building industry. The effect on and composition of building costs and factors which have an influence on it, the theory of cost planning and cost control, inter-professional liaison and the designing process with special reference to the optimal application of financial resources.</p> <p>Building Price Economics: General concept of building prices and their composition. Calculation of running expenses. The calculation of labour and material expenses of construction items, components and elements. The concept of profit, productivity, utilisation of material and equipment and the unit cost. The concept "market price" and implication. The usage of unit price in construction. Computerised data banks and application. Quotations, sources and their use. Practical work.</p> | | | | | Continuous assessment by means of two assignments, two two-hour tests and one final test of three hours. |

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| BOE304/COE304* | 16 | 7 | CESM:020901 | Building Economics | 1L |
| <p>The development, methodology and application of historical and current cost estimating methods as applied to different phases of a project. The practical application of cost data sources and computerised data as required for cost estimating purposes. The financial implications and use of different contract price adjustment provisions and their indices. Contract management, payment procedures and certification. The composition of final accounts. The development, methodology and implementation of historical and modern cost planning methods used during the different phases of project implementation. The practical utilisation of price schedules and computerised data bank statements, which are necessary for cost planning.</p> | | | | | <p>Continuous assessment by means of three assignments, two two-hour tests and one final test of four hours.</p> |
| BOE404/COE404* | 16 | 8 | CESM:020901 | Building Economics | 1L |
| <p>Cost studies and normative planning: Cost studies of building morphology, elemental cost studies and the cost behaviour of the major building elements. Factors which influence the economic design planning. Building cost analysis and the cost-spread between building elements and components. Normative planning and the implementation of the principles of economical design planning to keep inside space- and cost norms. Life cycle costs and building-cost indexes: The execution of comparing cost studies of design alternatives through life cycle cost analysis. The factors which determine accuracy of analyses. Improvement of the dependability of live cycle cost results through sensitivity analyses. The characteristic of and aspects to take into consideration while composing different building cost indexes. The different applications of indexes in the analysis of time sequences and escalation of planning till contract completion. The use of electronic index data bases. Risk management: The analysis, planning, management and monetary value of risks. Monte Carlo simulations and other sensitivity analyses which enable project managers to determine the mathematical probability of success with regard to the proposed decisions liability towards uncertainty and risks. Factors which lead to the most favourable and profitable outcomes. Decision making analyses and the use of computer programmes for risk management.</p> | | | | | <p>Continuous assessment by means of two assignments, three two-hour tests and one final test of three hours.</p> |
| BPK304/DCP304 | 16 | 7 | CESM: 20302 | Descriptive Construction Project | 2L |
| <p>Aims: After completion of the project the student must be able to investigate, research and develop a workable system for works procurement Outcomes: To produce a document containing the procedures of estimation procurement control and finalisation of a construction project Syllabus: Own development.</p> | | | | | |
| BPK404/PPR404* | 16 | 8 | CESM:020901 | Professional Practice | 1L |
| <p>Law of procedure and procedures: Introduction to law of procedure, law of criminal procedure, civil procedure and law of evidence. The SA courts of law: magistrate's court, supreme court and small claims court. Court procedures and representation. Law of evidence in the magistrate's court and supreme court. General principles of civil procedure in the small claims court, magistrate's court and supreme court. Practical work with regard to court procedure. Mediation and arbitration: Mediation as legal process. Alternative procedures for settling disputes. Arbitration: Principles and law applicable to arbitration, parties, trial, awards, publication and cost. Practical work with regard to arbitration and mediation. Documentation: The standard building contract and tender documentation. Integration of different documents and relationship. Special documents and clauses. Signing of contracts. Methodology associated with amendments and additions to clauses. Procedures for the composition of special types and conditions of contracts. Practical work. Special types of building contracts for specific uses. Case studies. Practice: The organisation of the practice, legislation, statutory councils and powers, professional societies and composition. Code of conduct, remuneration, restrictive practices, entering the profession and forms of enterprise. Future orientation. Problems. Office administration: Extent of office administration and functions in practice. General management functions, leadership and style of management. Practice production, cost, income and administrative procedures. Control and regulatory functions. Office facilities. Liaison, marketing of services and service contracts. Professional accountability and insurance. Case studies. Future orientation and integration of services. The architect in practice. Management and administration in the architect's works and projects. Documentation and principles.</p> | | | | | <p>Continuous assessment by means of one assignment, three two-hour tests and one final test of three hours. Oral examination.</p> |
| BPK514 | 16 | 8 | CESM:020901 | Professional Practice | 2L |
| <p>Communication: Theory and principles of communication. Verbal communication. Written communication and documentation. Electronic communication and communication satellites. Negotiating techniques. Industrial communication, visual communication, integrated network systems and information management in the construction and property industries. Future trends, development and possibilities.</p> | | | | | <p>Continuous assessment by means of one assignment, one two-hour test and one final test of three hours. Oral examination.</p> |

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| BSC204 | 16 | 6 | CESM:020901 | ONLY DISTANCE LEARNING | Building Science | 3L per year |
| <p>The complete construction of a single or multi-storey building: Foundations and sub-structures for a load bearing and skeleton/framed structures, basic concrete frames, walls, flat and pitched roofs, floors, waterproofing of floors, steps, window ranges, door types, uses of locks, patented fittings and metalwork, service design for single and multi-storey structures.</p> <p>Principles for climate oriented design.</p> <p>Working drawings: Double storey buildings with basements.</p> <p>Complex building projects, tall buildings, long-span structures, complex façade designs i.e. curtain walls, upkeep and life cycles, design and construction of internal partitioning, considerations, structural implications and problems, special roofing constructions and roofing finishes, materials, waterproofing, patents and non-patent fixtures, material choices, special uses, etc.</p> <p>Advanced building science: Advanced construction problems, integration of different systems, restoration and general construction problems.</p> | | | | | | Continuous assessment by means of two assignments, class tests, and one final test of three hours. |
| BSC304 | 16 | 7 | CESM:020901 | ONLY DISTANCE LEARNING | Building Science | 3L per year |
| <p>Multi-story structures, shoring, sub-structure building and basement constructions, structural steel work, joined structures.</p> <p>Material science: wood, cement, glass, metals, plastic, petro-chemicals and paints, building components, e.g. roof lights, retaining walls, low cost housing.</p> <p>Working drawings: multi-storey structures.</p> | | | | | | Continuous assessment by means of two assignments, class tests, and one final test of three hours. |
| DQF116 | 24 | 5 | CESM:020901 | ONLY DISTANCE LEARNING | Introduction to Construction Science | 3L per year |
| <p>Introduction to construction science, aimed at the following broad subject areas:</p> <p>Construction Science: General principles of materials and construction of simple buildings.</p> <p>Quantity Surveying: The theory and principles of descriptive quantification and contract documentation.</p> <p>Terrain management: General theory and principles of terrain administration and management. Labour, equipment and material handling.</p> <p>Building contracts and procedures: Basic principles of building contracts and procedures.</p> <p>Building and construction economy: Basic principles of planning, prices and certification.</p> <p>Introduction: Introduction to property development.</p> | | | | | | Continuous assessment by means of one assignment, three two-hour tests, and one final test of three hours. |
| EFB404/PFM404* | 16 | 8 | CESM:020901, 20302 | | Property Facilities Management | 1L |
| <p>Extent, function, techniques, procedures. Financial previews and budgets. Leases, lessee composition, valuations and market evaluation. Re-developments, capital application and trusts, risks, valuations and trusts, risks, valuations and evaluation.</p> | | | | | | Continuous assessment by means of two assignments, class tests, two two-hour tests, and one final test of three hours. |
| END104/PDE104* | 16 | 5 | CESM:020901 | | Property Development Economics | 1L |
| <p>Introduction perspective on project development and management: The functions and elements of management within the project environment and scope.</p> <p>Introduction perspective: Defining property, fixed property, land, land-ownership, development and the development process. The science of property development economics. The property market, composition, functioning and occupational orientation. Property development management, career opportunities, subject view and curriculum planning, study and learning methods.</p> <p>Historic development perspective: Development concepts and fixed property. Historic perspective of the development process. Man and development, physical, technological, social, economic and government development.</p> <p>History of development of Africa and South Africa: Prehistoric and early civilisations, colonial era, liberation era. Cultural heritage, development standard and fixed property.</p> <p>Fixed property and development: Role and place of fixed property in the development history, prehistoric and antique civilizations, early Christian and Medieval period, the Renaissance to the 20th Century. Architectural art, construction materials, methods and development systems.</p> <p>Property development economy. Professional scientific perspective. Role of fixed property in development and economy. Subject branching.</p> | | | | | | Continuous assessment by means of two assignments, class tests, two two-hour tests, and one final test of three hours. |

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| END204/PDE204* | 16 | 6 | CESM:020901 | Property Development Economics | 1L |
| <p>Land development economics: Introductory perspective: Property economics as discipline. Introductory synopsis of property, the process of property development, land ownership and administration. National developmental perspective: Introduction to the theory of settlement, the origin and growth of towns, cities and regions, development problems, political theory and development, government control of the development process, land ownership and administration, regional and community development. International perspective. Problems. Local developmental perspective: Urban morphology, lay-out, structure, structural changes, growth paths, informal structures, development problems and local government control. National trends. Regional governments, local governments, urbanisation and township establishment. First-world, third-world and African cities. Future development trends, problems, control and planning. Property economics: Property values, the value concept, theory of emblements, property production and the economic cycle. Property ownership, types of ownership rights and establishment thereof. The property market, structure, functioning, the price mechanism, market cycles, market prices and values. Property financing, financing of sources, form and markets. Introduction to property investment, financial mathematics and the process of investment. The role of property production in the national economy, patterns of market behaviour, construction markets and industry, development of land and government control. Macro-property development perspective. Synopsis of critical field analysis and scheduling.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, two two-hour tests, and one final test of three hours.</p> |
| END304/PDE304* | 16 | 7 | CESM:020901 | Property Development Economics | 1L |
| <p>Investment economics: Introduction to the theory of investment, investment markets, investment in stock, fundamental and technical analyses. Investment in real estate, Investment options, characteristics and behaviour. Financial mathematics, techniques for measuring investment return and applications. Capital, income, expenditure and the composition of simple and complex financial feasibility studies. Quantification and evaluation of returns. The concept market value, types of valuations and valuation techniques. Valuation problems complexities. Investment evaluation, risk and risk evaluation. Utilisation and application of computerised databanks and user software for investment evaluation of and decision-making. Case studies.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, three two-hour tests, and one final test of three hours.</p> |
| END404/PDE404* | 16 | 8 | CESM: CESM:020901 | Property Development Economics | 1L |
| <p>Development economics: Introductory perspective: Scope of development economics. Macro-development, micro-development and the property package. Viability studies: Purpose, types, methodology and application. Methodology of market research, procedures, financial studies, residual land valuations, theory of emblements, scale of development and evaluation of viability. Development budgets. Project planning: Planning studies, stages and procedures. Economic and value studies. Financial design criteria and cost economy. Project management: Scope, organisation, functions and techniques. Case studies. Management of computerised software. Problems. Development: Development characteristics, procedures, techniques, risks and case studies in respect of commercial, non-commercial and large-scale developments. Town planning and development. Third world developments. International tendencies and case studies. Problematic and market tendencies. Computerised data banks and programme handling. Development economic perspective: Micro-development, macro-development, authorities, political systems, international tendencies and -markets. Problems. African studies. Future tendencies and challenges. Integrated computer systems, -graphics and decision-making.</p> | | | | | <p>Continuous assessment by means of one assignment, class tests, two two-hour tests, and one final test of three hours.</p> |
| EWP404/PVP404* | 16 | 8 | CESM:20399 | Property Valuation Practice | 1L |
| <p>Types of valuations and how they can be applied in practice. Method of compiling each type valuation, law towards registration, methods of properties, share titles, time sharing, share block development and housing developments. The theory of valuations, valuation practices and techniques. The principles of property valuations and techniques, valuation systems, data and information services.</p> | | | | | <p>Continuous assessment by means of two assignments, two two-hour tests, and one final test of three hours.</p> |
| EOK404 | 16 | 8 | CESM:20302 | Property Economics | 1L |
| <p>Introduction to the process of property development, the extent and historical development of construction economics as discipline, the composition of building costs, building cost estimates, cost data and indices, planning and control of costs during all stages of a building project, design economics, cost modelling and quantity surveying practice. Introduction to property investment, the property market, proprietary rights and sectional title rights, property financing, markets and financial mathematics, financial feasibility studies, project viability studies, budgets, planning and management, project planning and control techniques, planning efficiency and development characteristics of the major property sub-markets. The role and place of real estate in the national economy.</p> | | | | | <p>Continuous assessment by means of two assignments, two two-hour tests, and one final test of three hours.</p> |
| GIP404/INP404* | 16 | 8 | CESM:20302 | Integrated Project | 2L |
| <p>An Integrated Project should be done during the year by the student on the instruction of the departmental head. End-of-year evaluation is handled on a integrated manner.</p> | | | | | <p>Comprehensive assignment.</p> |

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| GPB402/APM402* | 8 | 8 | CESM:20302 | Advanced Project Management | 1L |
| Project management functions and principles. Management of time, time scheduling and programming, time management techniques and time controlling systems. Management of project costs, cost report rendering and cost planning and control. Auditing of cost results. Interpretation of finances and financial reports and data. The planning and organising of scope decision making and design norm determination. The management of design planning and specification. The representation of quality norms, quality management and handling quality as a product, communication and communication techniques in respect of advanced project management and project administration. | | | | | Continuous assessment by means of one assignment, class tests, two two-hour tests, and one final test of three hours. |
| IGW104/EGS104* | 16 | 5 | CESM:80703 | Engineering Science | 1L |
| Part 1 Historical review and perspective of structures: The creation of engineering solutions such as dams, bridges, canals, silos, railway lines, roads and buildings from the earliest historical times till the 21 st Century, to fulfil the necessities of man in his/her natural environment. After successful completion of this module, a student should be able to: comprehend historical engineering and thereby have developed a perspective which will enable him/her to speak with insight to engineers. | | | | | Continuous assessment by means of two assignments, class tests, two two-hour tests, and one final test of three hours. |
| Part 2 The explanation of basic structural principles as applied in the solving of complex structural problems with respect to historical cases. The use of services in buildings and other structures e.g. electricity, air conditioners and personal and goods movement with regard to historical cases. | | | | | |
| KOF304/CFN304* | 16 | 7 | CESM:20302 | Construction Finance | 1L |
| Aims After completion the student must be able to: <ul style="list-style-type: none"> Understand how project cost control is used on site to achieve cost goals. Develop systems for small works projects for control purposes and invoicing. Outcomes <ul style="list-style-type: none"> After completion of this model a student will be able to produce cost reports for labour, material, plant and overhead costs. Be able to set up his own small works enterprise and introduce the required control programmes to manage the works Syllabus <ul style="list-style-type: none"> The concept of cost control programmes to manage the works. The concept of cost control and cost planning pertaining to construction sites. Develop on site databases for pricing procurement of future work. | | | | | |
| KOF404/CFN404* | 16 | 8 | CESM:20302 | Construction Finance | 1L |
| Cost control systems: Cost control systems, general and specific cost control, standard cost and control systems. Cost allocation, accounting and accounting cycle. The concept of standard cost, cost planning and control of labour, material, equipment, subcontractors, diverse direct and indirect costs at activity and process level. Income and cash control: Preparation of income claims, contract price adjustment clauses, certification and income control statements. Final accounts and contractual claims. Cash flow, progress and planning. Integrated cost and budget control: Cost statements and project costs, income and cost reconciliation, cost and cash budgets and control. Debtors, creditors and cost control. Accounting dates and responsible cost management. Reporting: preparation, interpretation and decision-making. | | | | | Continuous assessment by means of two assignments, two two-hour tests, and one final test of three hours. |
| KWE204/CSC204* | 8 | 6 | CESM:083101,082601,080703 | Construction Science (Part I) | 1L, 1P |
| Land surveying Introduction to land surveying: The Land Survey Act, the land surveyor and the Surveyor-General. Mapping and map series: Mapping procedures and map series: international, national, regions an local areas. Trigonometry, beacons and references. Storing, deeds and registration of land. Stands: References, maps, stakes, building lines and servitudes. Surveying: Planimetry and principles, measuring-tape measurements, levelling, plumb levels and contours. Theodolite: Directional distances and co-ordination. Traverses: Calculations and junctions. Tachymetric surveys, sizes and volumes. Plotting of construction: Site plans, points of reference, boundary distances, floor-plans, vertical measurements, control systems. The land surveyor: Functions, application, modern equipment, technology and computerised data banks. | | | | | Continuous assessment by means of one assignment, two two-hour tests, and one final test of three hours, and one practical examination of three hours. |

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| KWE212 | 8 | 6 | CESM:083101,082601, 080703 | Construction Science (Part I) | 1L, 1P |
| <p>Land surveying Introduction to land surveying: The Land Survey Act, the land surveyor and the Surveyor-General. Mapping and map series: Mapping procedures and map series: international, national, regions and local areas. Trigonometry, beacons and references. Storing, deeds and registration of land. Stands: References, maps, stakes, building lines and servitudes. Surveying: Planimetry and principles, measuring-tape measurements, levelling, plumb levels and contours. Theodolite: Directional distances and co-ordination. Traverses: Calculations and junctions. Tachymetric surveys, sizes and volumes. Plotting of construction: Site plans, points of reference, boundary distances, floor-plans, vertical measurements, control systems. The land surveyor: Functions, application, modern equipment, technology and computerised data banks.</p> | | | | | <p>Continuous assessment by means of one assignment, two two-hour tests, and one final test of three hours, and one practical examination of three hours.</p> |
| KWE204/ CSC204* | 8 | 6 | CESM:083101,082601, 080703 | Construction Science (Part II) | 2L, 1P |
| <p>Study of Structure: Introductory study of structure: Purpose and function of structures, principles of design, approach to design, materials, study of materials and behaviour. Structural behaviour: Stresses, tensions, shearing forces, bending moments, centres of gravity, moments of inertia and resistance. Objectives of design, approach, principles, structural failure. Specialised materials: In situ concrete, reinforced concrete, pre- and post-stressed concrete, steel, wood, plastic, metal and alloys. Structural types, parts and utilisation of materials: Application of construction material, principles of design, empirical rules for determining the sizes of parts and economical boundaries of application. Design procedures: Approach, guide-line design, detailed design, design codes, safety and quality control. Design examples of specific structural elements. The structural engineer and his services.</p> | | | | | <p>Continuous assessmentAssessment by means of one assignment, two two-hour tests, and one final test of three hours.</p> |
| KWE304/CSC304* | 8 | 7 | CESM:80705 | (Part I) Construction Science – For Quantity Surveying and Construction Management and Architecture Students | 2L, 1P |
| <p>Sanitation Serviceability of buildings: Role of local governments with regard to plot serviceability, supply services, drainage services and functional planning. Sanitary fittings: Types, quality, placement, norms and design codes for determining type and quantity. Water supply: Types of pipes, piping systems, components of pipes, route-planning for hot and cold-water systems, empirical rules for determination pipe sizes, design norms and codes. Sanitary drainage: Types of pipes, piping systems, components of pipes, route-planning, empirical rules for determination pipe sizes, design norms and codes. Fire service: Fittings, pipes, lay-out, routes, design norms and codes. Site services: Reticulation and lay-out, pipes, types of pipes, fittings, design norms and codes, connections and determining connection fees with regard to water drainage, sanitation and water supply. Integration of water drainage systems: rainwater, storm water and road canals. Local government systems: Storm-water systems, water-supply systems, sewage systems and purification. First and third-world planning systems. The sanitary engineer and his services.</p> | | | | | <p>Continuous assessment by means of one assignment, two two-hour tests.</p> |

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| KWE304/CSC304* | | | | | | | 2L, 1P |
| <p>Electrical and mechanical services Electrical services: Power and lighting as user service. Lighting: planning of buildings, orientation, intensity of light and light fittings. Types of light fittings, placement and intensity requirements. Wiring, design codes, principles and procedures of design. Power supply: Supply requirements for specific uses, wiring, design codes, principles and procedures. Circuits: Internal distribution networks, conductors and conduits, distribution boards, fittings, empirical rules for determining supply requirements, conductor sizes, norms and codes of design, quality standards, safety and design procedures. Telecommunication: Communication system, fittings, placement, wiring, norms and codes of design. Consumption of power: Empirical rules for determining consumption, measures for conservation of energy. Utilisation of solar energy and solar heating systems. Drawings: Lay-out, symbols, integration with architectural drawings, interpretation and specifications. The electrical engineer and his services.</p> <p>Mechanical services Natural ventilation, forced ventilation and climate control: General requirements, codes and procedures of design. Types of ventilation and air purification systems, placement, routes, central control equipment, allotment of space, empirical rules for determining air volumes, shaft sizes and propulsion systems. Evaluation of different systems with regard to capacity, cost, energy consumption and installation. Heating systems: Types of systems, equipment, central propulsion, pipe routes and systems. Transport: Lifts, elevators, conveyor belts, etc. Types of systems, capacity, energy consumption, design procedures and empirical rules for determining units, size, capacity, placement and energy consumption. Refrigeration: Refrigeration and freezing-rooms, construction, capacity, utilisation, requirements and norms of design, empirical rules for determining requirements. Other: Utilisation, construction, principles and norms of design with regard to kitchen and other specialised fittings. Drawings: Lay-out, symbols, integration with architectural drawings, interpretation and specifications. The mechanical engineer and his services.</p> | | | | | | | <p>Continuous assessment by means of one assignment, two two-hour tests, and one final four-hour test.</p> |
| KWE404/CSC404* | 16 | 8 | CESM:080701, 080901,081501 | | Construction Science | | 2L, 1P |
| <p>Heavy engineering constructions and procedures: General principles of construction, design procedures, applied-materials science, drawings, general principles regarding itemisation and quantification as applicable to the disciplines below:</p> <ul style="list-style-type: none"> • Civil: Roads and bridges, railway lines, dams, harbour walls, tunnel and shaft constructions, sewage and water plants, treatment of industrial waste, construction works at mines, energy-generating installations and other engineering structures. • Mechanical: Pipe-plants, shaft-work and supporting structures, installations for handling materials, installations for heating, refrigeration and ventilation, isolations, process-engineering equipment, fire-fighting systems, oil and gas-plant platforms, related building and construction works. • Electrical: Power-generators, high- medium- and low-tension distributions and connections, lighting and power-supply installations, instrumentation, fire-detection, communication and heating systems, associated building and construction works. <p>Engineering practice: Introduction to engineering practice. The interpretation of engineering drawings, specifications and contracts. Engineering design procedures, codes, cost evaluation and standards of quality. Procedures and conveying of documentation, tender procedures, project administration, management, supervision and control. Inter-professional liaison.</p> | | | | | | | <p>Continuous assessment by means of two assignments, two two-hour tests, and one final four-hour test.</p> |
| PFM106 | 24 | | CESM:020399 020901 | ONLY DISTANCE LEARNING | Facilities Management | | 3L per year |
| <p>Introduction to facilities management and practice: An introduction and overview of the practice of facilities management, how its development takes place and how it fits into the knowledge areas of asset management, property development and property management Management fundamentals: Contextualisation of facilities management, general management, project management and strategic management in pursuit of facilities management as a profession. Managerial imperatives for facilities management: Management tasks to be fulfilled by the facilities manager regarding human resources, law, contractual arrangements, finance, total quality management, service level agreements and information technology.</p> | | | | | | | <p>Continuous assessment by means of two assignments, class tests, one final three-hour test.</p> |
| PFM206 | 24 | | CESM: 020302, 020901 | ONLY DISTANCE LEARNING | Facilities Management | | 3L per year |
| <p>Maintenance management: An introduction to maintenance management and the categorization of building maintenance. Operational maintenance management: Planning, programming and execution of maintenance management and pest control. Operational maintenance finance: Financial management of maintenance work. Construction works: Technical principles regarding construction, renovation and maintenance work.</p> | | | | | | | <p>Continuous assessment by means of two assignments, class tests, one final three-hour test.</p> |

| PFM306 | 24 | CESM:020302, 020901 | ONLY DISTANCE LEARNING | Facilities Management | 3L per year |
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| <p>Structure of facilities management enterprises: Creation of organisational structures to serve different types of facilities management organisations, procurement and outsourcing imperatives. Client and/or user needs: Evaluation client/user needs, space management and general services. Capital planning and life cycle costing: Planning of capital expenses, application of life cycle costing thereto. Risk management, post occupancy evaluation and benchmarking: Development and application of the necessary tools and techniques. Occupational Health and Safety Act and Regulations/ Application of National Building Regulations: The contents, implications and application of the relevant regulations.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, one final three-hour test.</p> |
| PFM494 | 16 | CESM:020302, 020901 | ONLY DISTANCE LEARNING | Facilities Management | 3L per year |
| <p>An Integrated Project should be done during the year by the learner on the instruction of the departmental head. End of year evaluation is handled on a integrated manner.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, one final three-hour test.</p> |
| SBE104 | 16 | CESM:020302, 020901 | ONLY DISTANCE LEARNING | Structure of the Built Environment | 3L per year |
| <p>A General overview: An overview of the built environment, statistical data, production process, contracts and the procurement process. Employers, contractors and subcontractors: The structure of the relationships between the parties and their functioning in the built environment. Professional consultants and others: Description of statutory and non-statutory bodies. The services offered and the duties of the various professions and others in support of the professions, that serve the built environment. Organisations in the built environment: The most prominent of the numerous organisations that represent role players, suppliers, trade organisations, employers and employees in the construction industry.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, one final three-hour test.</p> |
| POB104/PQM104* | 16 | 5 | CESM:20301 | Production and Operational Management | 2L |
| <p>Small, medium and complex constructions: Dissecting, specification, quantification and composition of process items in terms of elemental level- and Introductory perspective: Introduction to the building and construction industry, structure, functioning, services, interest. Orientation within the real estate industry. Professional consultants, contractor and investor. Professional orientation and inter-professional liaison. Introduction to documentation procurement: Types, purpose, compilation and methodology. Introduction to financial service. Introduction to construction management. Documentation procedures: Introduction to documentation procedure and method for inviting or preparing tenders, elements, arrangement and compilation. Construction drawings: Interpretation of construction drawings. Three-dimensional insight and perspective. Descriptive quantification: Introduction to descriptive quantification, style, explanation, reference and arrangement. Dissecting of small, medium and complex building structures in terms of sections, subsections, elements and components, specification and quantification thereof, processing and compiling of lists. Computerised quantification systems: Introductory synopsis of computerised quantification systems, taking off, working up and list production. Introductory synopsis of computerised drawing systems, three-dimensional insight, procedure and working up. Integration of measuring- and drawing systems, general conceptual approach and documentation component level item definition with regards to foundation work, lower structures for framed and load-bearing constructions, simple concrete floors, -frameworks and -steps, walls, waterproofing of flat roofs, flat and pitched roof constructions, windows and doors, finishes, ceilings and -systems, fittings and services. Processing of quantities, abstracting in elements and components and compiling of lists.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, three two-hour tests and one final three-hour test. These assessment tasks will focus on applications within construction management.</p> |
| POB204/PQM204* | 16 | 6 | CESM: 20301 | Production and Operational Management | 2L |
| <p>Simple constructions: Dissecting, specification, quantification and composition of process items in terms of trade item definition with regard to foundation work, lower structures, wall constructions, roof constructions and finishes, finishes, windows, doors. Working up of quantities, abstracting in trades, compiling of draft trade lists of integrated examples. Complex constructions: Dissecting, specification and quantification and composition of process items in terms of trade item definition with regards to wooden floors, special windows and doors. Working up of quantities, abstracting in trades, compiling of draft trade lists of integrated examples.</p> | | | | | <p>Continuous assessment by means of two assignments, class tests, three two-hour tests and one final three-hour test. These assessment tasks will focus on applications within quantity surveying.</p> |
| POB306/PQM306* | 24 | 7 | CESM:20301 | Production and Operational Management | 2L |
| <p>Site Management: Introduction to construction management. General management functions regarding construction projects. Site management and organisation. Planning supervision and control techniques regarding building projects. Manpower application on the building site. Scheduling, controlling, cost and productivity compensation, maintenance communication and by-laws. Application of material. Time-scheduling, site applications, management, control and administration, management, control and administration quality control and measurement of material strengths selection, application and safety requirements of equipment. Computer. Computer and aided building management. Builders quantities. Measurement of complexed steel/concrete- and floor structures. Foundation, services and site works.</p> | | | | | <p>Continuous assessment by means of one assignment, two two-hour tests, and one final three-hour test.</p> |

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| POB404/PQM404* | 16 | 8 | CESM:20302 | Production and Operational Management | 1L |
| Corporate management. Organisation of the construction industry, employer organisation, restrictive and stimulating practices organisation of the construction enterprise, forms of structure, task distribution, line and staff functions, responsibilities of top, middle and executive management. Project selection and market evaluation. The planning and control of production portfolios including labour application and scheduling. Purchase and control of material and equipment. Personnel management and administration within a contractors enterprise. The formulation of policies strategies and tactical planning on corporate and middle management level. Development and orientation due to changing, technological economic and political changes. The position and role of the contractor within the organised building environment. Computer-aided building management. | | | | | Continuous assessment by means of three assignments, one two-hour test, one final three-hour test, and one practical three-hour examination. |
| SIB712 | 16 | | CESM: | Civil Engineering for Planners | |
| (See information under Urban and Rural Planning) | | | | | |

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| BEH704 | 16 | | CESM:2020 | Housing | 3 W per year |
| Addressing basic concepts, models, policies, market influences and implementation frameworks. Housing history. World trends and the South African housing need. The relationship between types of housing and land values, as well as the influence of location factors on housing. Types of housing schemes: site and service, in situ upgrading and enablement approaches. | | | | | Continuous assessment by means of three assignments, and one test . |
| BGR704 | 8 | | CESM:2020 | Planning Management | 3 W per year |
| Elements of legislation regarding physical planning, on national, provincial and local level with emphasis on the compiling, implementation and management of different plans and legal documents. | | | | | Continuous assessment by means of four assignments, and one test. |
| BOE704 | 16 | | CESM:20901 | Building Economics | 3 W per year |
| Advances in building and construction economics cost design and cost planning of physical developmental projects, cost control interim valuations and certification. Estimating techniques and quantification of elements of structures and projects. | | | | | Continuous assessment by means of two assignments, one examination . |
| BSP702 | 8 | | CESM:2020 | Basic Urban Planning Practice | 3 W per year |
| Block classes as determined by programme for M.L.P.M. (MProp) No examination, only continuous evaluation. Land use surveys, cadastral information – related studio - and fieldwork. Computer use. Practical projects and fieldwork (land use and zoning) related to the theory of urban planning. Coupled to GSP722. | | | | | Continuous assessment by means of three assignments, and one test |
| BTR704 | 16 | | CESM:2020 | Basic Town Planning Theory | 3 W per year |
| Introduction to the nature of town planning theory. The role of values and norms in the theory of town planning as well as the change in theoretical thinking from product to process to normative thought. The influence of theory on the development of the city and environment. | | | | | Continuous assessment by means of three assignments, and two tests. |
| CCP702 | 8 | | CESM:20901, 120403 | Construction contracts, procedures and procurement | 3 W per year |
| Property investment, acquisition and establishment of property rights, ownership, tenure, possession, expropriation, insolvencies and contracts. The law of property valuation, case studies on the role of the property valuers. | | | | | Continuous assessment by means of one assignment, one examination. |
| CIN702 | 8 | | CESM:083101, 082601, 080703 | Construction and Agricultural Engineering | 3 W per year |
| Project procurement and development in civil, mechanical, electrical and agricultural projects. Cost planning and financing. Documentation and advanced cost contracts and project management. Advanced conceptual development i.r.o. the role, design, construction methods, management and procurement of civil, structural, mechanical and electrical services i.r.o. building projects and agricultural services. | | | | | Continuous assessment by means of three assignments, one examination. |
| CIN793 | 8 | | CESM:083101, 082601, 080703 | Construction and Agricultural Engineering | |
| Project procurement and development in civil, mechanical, electrical and agricultural projects. Cost planning and financing. Documentation and advanced cost contracts and project management. | | | | | |
| DPR702 | 8 | | CESM:20901, 120403 | Dispute Resolution | 3 W per year |
| Clauses that handle breach of contract and are aimed at dispute resolution as object. Different dispute-settlement methods, courts, arbitration, mediation, peace-making, communication and management of disputes. | | | | | Continuous assessment by means of two assignments, one examination. |

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| END704 | 16 | CESM:20901 | Property Development | 3 W per year |
| Advanced property development economics. The theory of property development, property development as science, property value, property valuation as element of property development and selection the property development process. The theory of property valuation, property law and property economics. | | | Continuous assessment by means of two assignments, one examination | |
| END793 | 16 | CESM:20901 | Property development | 3 W per year |
| Property development economics, financing, marketing and physical development of projects. Project selection, viability and feasibility studies. Advanced property development calculations, arithmetic and financial mathematics. | | | Continuous assessment by means of two assignments, one examination | |
| END792 | 32 | CESM:20901 | Research Essay: Property Development | 3 W per year |
| An integrate research and practical project including an article of the student choice based on compulsory modules. | | | Thesis | |
| ENW793 | 16 | CESM:20399 | Property Valuation and Management | 3 W per year |
| Specialised valuation applied in practice. Legal aspects in respect of registration methods in the property science. The theory and principles of advanced valuation, data, data-banks, information services, etc. | | | Continuous assessment by means of two assignments, one examination | |
| GKD708 | 32 | CESM:10999 | Land Evaluation | 3 W per year |
| Soil and climate plays a role in the environment. The quality, pollution and classification of soil and climate. Climatic regions and indices (including ENSO). Impact of urban activities on the quality of the soil and atmosphere. Urban agriculture. Evaluation of the environment (soil and climate). Data bases (maps, reports and memoirs). | | | Continuous assessment by means of six assignments, two examinations. | |
| GSP702 | 8 | CESM:2020 | Advanced Urban Planning Practice | 3 W per year |
| Types of plans and the drawing up of urban planning proposals. Plan evaluation and submission of development applications. Coupled to BSP712. | | | Continuous assessment by means of two assignments, two tests. | |
| ISR702 | 8 | CESM:2020 | Introduction Studies in Regional Planning | 3 W per year |
| Introduction regional planning. History of regional planning, internationally as applicable in South Africa. | | | Continuous assessment by means of two assignments, two tests | |
| LEK720 | 8 | CESM:010102 040407 | Environmental Economics | 3 W per year |
| Aspects addressed in the course include: Property rights, externalities and environmental problems, market and government failures and optimal use/management of natural resources and the environment. | | | Continuous assessment by means of one assignment, one examination | |
| LEK793 | 8 | CESM:010102 040407 | Land Valuation and Business Plans | 3 W per year |
| Factors influencing land prices and the reasons will be discussed. Different types of land value and reasons for the differences will also be addressed. Learners will obtain knowledge in the compilation of business plans for development projects. | | | Continuous assessment by means of one assignment, one examination. | |
| LSF793 | 8 | CESM:20302 | Life Cycle Cost, Facility Evaluation and Management | 3 W per year |
| The theory of life cycle costing. Calculation in respect of life cycle costing, evaluation and analysis of cost- and price determinants. The management of the effect of operating cost and financing cost on the life cycle of a property project. Facility evaluation, planning, management and control in respect of all property facilities. The influence of maintenance, labour, material and resources. | | | Continuous assessment by means of two assignments, one examination. | |
| NLE793 | 16 | CESM:10103, 010806 | Applied Game Farm Planning | 3 W per year |
| Basic ecological, physiological and phenological knowledge of the vegetation, knowledge of game species, their social behaviour, habitat and feeding preferences. Techniques to evaluate the resource (habitat). Identification of management units and the determination of grazing capacity. Requirements regarding fencing and infrastructure. | | | Continuous assessment by means of two assignments, one examination. | |
| PPY702 | 8 | CESM:20901 | Professional Practice | 3 W per year |
| Professional service as a business. Law and regulations that affect the profession. Ethics and codes of conduct, communication between professionals, the client and the society. Advanced project procurement methods and procurement management. Alternative procedures and processes in respect of contract documentation. The qualification, compilation and management of documentation. Different contract types and contract forms. Construction contract analysis. | | | Continuous assessment by means of two assignments, one examination. | |

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| RBT702 | 8 | | CESM: | Tourism and Development | 3 W per year |
| Introduction to the definitions, components and impact of tourism. New forms of tourism (sustainable, alternative, soft, green and eco-tourism). General tourism development and policy. General tourism management, planning and development concepts and instruments. | | | | | Continuous assessment by means of two assignments, one examination. |
| TRB304/ ABS304* | 7 | 16 | CESM: 20301 | Applied Building Science | 1L |
| Aims <ul style="list-style-type: none"> After completion of the model the student must: Have been exposed to the SANS building regulations and the application Have been exposed to regulations pertaining to the NHBRC Have undergone training for the application of H & S regulations on site Have been exposed to all statutory and local authority requirements relating to the construction industry Have been exposed to trade specific factors on a building site Outcomes <ul style="list-style-type: none"> Set up a construction site considering all the above aim Set out the works Manage and supervise all trades for the execution of the works Develop safety plans, construction programmes and procurement procedures Manager labour issues Manage control over material Syllabus <ul style="list-style-type: none"> Studies of all statutory requirements of national and local authorities Studies relating to SANS & NHBRC requirements and Health and Safety Planning of the works Specific trade applications on site Close-out procedures | | | | | |
| TRB704 | 16 | | CESM:20302 | Applied Project Management | 3 W per year |
| Identify the project. Different development methods for instance "RIBA plan of work". The element of project management. The management of scope, cost, price, time, communication and quality. Contract procurement and management. Reports and audits. | | | | | Continuous Assessment by means of two assignments, one examination |
| VVB702 | 8 | | CESM:2020 | Transportation | 3 W per year |
| The study of the application of transport impact studies. The role of trip generation and land use on traffic patterns. Focus on transport policy, automobile travel, pedestrians, public transport and transport applications. | | | | | Continuous Assessment by means of two assignments, |

12.2.3 DEPARTMENT URBAN AND REGIONAL PLANNING

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| URBP6806 | 24 | 8 | CESM:20201 | Basic Practice in Urban and Regional Planning | |
| Site analysis, site planning, layout planning and township establishment, zoning, floor area, coverage, height, building restriction area, title deeds and general plans, informal settlement upgrading, infrastructure planning process. | | | | | As per study guide |
| URCS6812/6822 | 8 | 9 | CESM:20201 | Capita Selecta in Planning | |
| Further research in any Spatial Planning (Hons) subject already taken, or complementary work. | | | | | Extended assignment or essay. |
| URCS6814/6824 | 16 | 9 | CESM:20201 | Capita Selecta in Planning | |
| Further research in any Spatial Planning (Hons) subject already taken, or complementary work. | | | | | Extended assignment or essay. |
| URCS7912/7922 | 8 | 9 | CESM:20201 | Capita Selecta in Planning | |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | | Extended assignment or essay. |
| URCS7913/7923 | 12 | 9 | CESM:20201 | Capita Selecta in Planning | |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | | Extended assignment or essay. |
| URCS7914/7924 | 16 | 9 | CESM:20201 | Capita Selecta in Planning | |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | | Extended assignment or essay. |

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| URCS7916/7926 | 24 | 9 | CESM:20201 | Capita Selecta in Planning | |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | | Extended assignment or essay. |
| URDP7922 | 8 | 9 | CESM:20201 | Dissertation Proposal in Urban and Regional Planning | |
| After completion of the module: Research methodologies. Research proposal. | | | | | As per study guide |
| UREP6824 /6814 | 16 | 8 | CESM:202018 | Research in Environmental Planning | |
| Environmental awareness, Sustainable development, Planning with the environment, Sustainable planning, Environmental impact assessment, disaster risk management, environmental management plans. | | | | | As per study guide |
| URGI7904 | 16 | 9 | CESM:20201 | Geographic Information Systems for Planners | |
| Basic theory, methods and techniques regarding the use of GIS in planning, preparation of plans, spatial analysis. | | | | | As per study guide |
| URHS7913/7923 | 12 | 9 | CESM:20201 | Housing for Planners | |
| Role of housing, planning for housing, legal framework. | | | | | As per study guide |
| URLM6814/6824 | 16 | 8 | CESM:20201 | Land Use Management | |
| What is land use management, planning legislation, zoning schemes, development applications, land development. | | | | | As per study guide |
| URMD7900 | 88 | 9 | CESM:20201 | Extended Research Essay | |
| Dissertation. | | | | | |
| URPP7914/7924 | 16 | 9 | CESM:20201 | Professional Practice in Urban and Regional Planning | |
| Project management, planning office management (budgeting, personnel management, leadership), tender processes, stakeholder management. | | | | | As per study guide |
| URPT6804 | 16 | 8 | CESM:20201 | Research in Theory of Planning | |
| Values, ethics for planners, planning processes and techniques, strategic planning, systems thinking development of planning thought, public participation/ actor collaboration and the right to the city. | | | | | As per study guide |
| URRE6814/6824 | 16 | 8 | CESM:20201 | Research in Economics for Planners | |
| Research with a urban and regional planning focus in topics such as economic theory, economics, contemporary economic realities, entrepreneurship, informal economy, subsistence economy, globalisation, developmental economics, rethinking economic development, local economic development and sustainable livelihoods. | | | | | As per study guide. |
| URRM7914/7924 | 16 | 9 | CESM:20201 | Research Methodologies for Planners | |
| Introduction to research, research designs, quantitative methods, qualitative methods, basic statistics. | | | | | As per study guide. |
| URRP7906 | 24 | 9 | CESM:20201 | Applied Regional Planning Project | |
| Regional Planning processes and IDP, legal framework, applied regional development project. | | | | | As per study guide. |
| URRT6805 | 20 | 8 | CESM:20201 | Research in Regional Planning Theory | |
| Research with a regional planning focus in topics such as regional context, classical regional planning theories, regional planning policy and legislation timeline, rural realities and rural development, small towns, rural-urban linkage, city regions, mega-city regions, polycentric regions, regional blocks, Regionalism, New Regionalism, globalisation, industrial spaces, competitiveness and innovation, innovative spaces, regional planning process, regional development plans, systems thinking in regional planning, regional scenario planning, regional project management, rural resilience and rural self sufficiency. | | | | | As per study guide. |
| URSC6814/6824 | 16 | 8 | CESM:20201 | Research In Socio-Cultural Aspects in Planning | |
| Research with a urban and regional planning focus in topics such as cultures and traditions, social factors influencing planning, e.g. migration, demography, culture of poverty, indigenous knowledge, gender, housing as a verb, social context, contemporary society, impact of HIV/AIDS and disease. | | | | | As per study guide. |
| URUP7906 | 24 | 9 | CESM:20201 | Urban Research Project | |
| Spatial planning processes and legal framework, spatial analysis, planning techniques, public participation, applied urban development project. | | | | | As per study guide. |
| URUT6804 | 16 | 8 | CESM:20201 | Research in Urban Development Theory | |
| Research with an urban planning focus in topics such as the urban context, the ideal city, urban functionality, urban form, urban transportation, urban economy, urban sustainability and self sufficiency, urban resilience, safe and healthy cities, Western urban realities, African urban realities, urban management and governance and Right to the City. | | | | | As per study guide. |

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| ATS691 | 24 | 8 | CESM:20201 | | |
| Purpose of regional planning, classic theories of regional development, development paradigms and the implications for regional planning, urban- rural relationships, globalisation and connectivity, competitiveness and high technology, regional development strategies, sustainable development, regional systems, trans-national planning, regional spatial planning. After completion of the module: Knowledge and application of regional development theory, Understand the relationship between regional, national and global development and to evaluate how philosophical and theoretical values influence it, Creative problem-solving individually and in a group, ability to conduct research on regional development concepts and strategies, effective communication of concepts and proposals using a diverse range of media. | | | | | A minimum of 16 hours contact time in lectures and discussions, seminars, simulations and field trips, Continuous evaluation: Assignments, essays and tests. |
| ATS624 | 16 | 8 | CESM:20201 | | Advanced Theory of Regional Planning (for recognition purposes only) |
| Theoretical analyses of development paradigms worldwide that influences the planning of regions. The role of globalization and information technology on regions. Applications of theoretical viewpoints on local or other region. | | | | | Oral examination. |
| BTR605 | 20 | | CESM:20201 | | Basic Theory of Urban Planning |
| Continuous evaluation: Assignments, essays and tests. Values in planning, ethics and planning, development of planning thought, community participation in planning, who benefits from planning?, systems thinking, value of planning theory. After completion of the module: Identify and debate the role of values and norms in planning, know the main moral theories and concepts applicable to urban and regional planning, appreciate the types of ethical dilemmas facing planners and the profession, apply the guidelines for ethical behaviour and planning practice , assess the changing approach towards urban and regional planning in practice and thought, assess the implications of various paradigms on planning theory, evaluate approaches and apply planning theory in practice, Be able to critically examine planning theory literature and communicate the analysis in various forms. | | | | | A minimum of 16 hours contact time in lectures and discussions. Continuous evaluation: Assignments, essays and tests. |
| EVB614 | 16 | 8 | CESM:20201 | | Economics and Entrepreneurship (for recognition purposes only) |
| Introduction to economics in general, macroeconomics, micro economics, development economics and public policy. Different economic systems and concepts, as well as global economic status quo, patterns and processes that is of consideration in urban and regional planning. Sustainable development in South Africa. | | | | | Oral examination if the student does not promote the module. |
| GCP604 | 16 | 8 | CESM:20201 | | Computer Use for Planners |
| General lectures, seminars, practicals, field work. Tests, assignments and exams. Practical use of ArchiCAD. After completion of the module: Practical use of CAD, Virtual design of township layouts. | | | | | Tests, assignments and exams. |
| GCP622 | 8 | 8 | CESM:20201 | | Advanced Computer Use for Planners (for recognition purposes only) |
| Advanced use of the computer (CAD) in township layout and establishment, rezoning, subdivision and consolidation. Coupled to BCP712. | | | | | Practical and oral examination. |
| GSP604 | 16 | 8 | CESM:20201 | | Practice of Urban Planning |
| Land use surveys, cadastral information, site evaluation and design, layout planning , preparation and evaluation of applications, practical projects and fieldwork (land use and zoning) related to the theory of urban planning. After completion of the module: Understand and apply urban planning principles, standards and techniques, Undertake site evaluation and do site design, and layouts, prepare and evaluate land development applications. | | | | | Lectures and practical classes. Practical and oral examination. Introduction to planning practice. |
| GSP622 | 8 | 8 | CESM:20201 | | Advanced Urban Planning Practice (for recognition purposes only) |
| Types of plans and the drawing up of urban planning proposals. Plan evaluation and submission of development applications. Coupled to BSP712. | | | | | Practical and oral examination |
| UDT604 | 16 | 8 | CESM:20201 | | Urban development theory |
| The structure of the modern city, Residential component of the city, the productive city (retail, office and manufacturing), the connected city, the African City – past and present. After completion of the module: Understand the function of urban areas, ability to evaluate the impact of policy decisions on the structure and function of the city, ability to plan for urban development at various scales. | | | | | Assignments, tests and an examination. |
| ATB612 | 8 | 8 | CESM:20201 | | Anthropology for Planners |
| Different worldviews, cultures and traditions, indigenous knowledge, different priorities and customs. | | | | | Assignments and a test. |
| BEH612 | 8 | 8 | CESM:20201 | | Housing for Planners |
| Course overview, Housing legislation, Housing theory, housing programmes and practice, the implementation of housing projects. | | | | | Assignments, tests and a written exam. |
| BGO614 | 16 | 8 | CESM:202018 | | Environmental Planning |
| Environmental awareness, Sustainable development, planning with the environment, sustainable planning, environmental impact assessment. | | | | | Assignments, tests and a written exam. |
| BOB614 | 16 | 8 | CESM:20201 | | Civilisation Development |
| The history of urban development from the dawn of civilisations to modern cities, how the culture and values of civilizations influences the location and form of settlements. | | | | | 12 x 1 hour. Continuous evaluation. |

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| GAD104 | 16 | 8 | CESM:20201 | Land Administration | |
| Map-work, Understanding the earth environment, Sustainable settlements, SA developmental , Principles and processes of property development, Site evaluation. | | | | | 16 x 1 hour. Continuous evaluation. |
| GAD204 | 16 | 8 | CESM:20201 | Land Administration | |
| History of national planning, National development legislation, SA land tenure and property registration, Principles of sustainable development. | | | | | 16 x 1 hour. Continuous evaluation. |
| GAD504 | 16 | 8 | CESM:20201 | Land Administration | |
| The rise of urban settlements, Visions of utopia – past and future. | | | | | 6 x 2 hour. Continuous evaluation. Worldviews and how they influence city building |
| GAD604 | 16 | 8 | CESM:20201 | Land Administration | |
| Introduction to systems, Engaging with systems Complex adaptive systems and planning. | | | | | 6 x 2 hour. Continuous evaluation. |
| KIB614 | 16 | 8 | CESM:20201 | Introduction to Creative Innovation | |
| Introduction to creativity, How to generate new ideas, Using multiple viewpoints to reach new perspectives on issues, application of the techniques to problem solving. | | | | | 12 x 1 hour. Continuous evaluation. |
| TVB614 | 16 | 8 | CESM:20201 | Introduction to Futurology | |
| Future thinking, scenario building. After completion of the module: Understand the factors that influence future planning. Creatively explore possible futures. Develop scenarios for the future based on current trends and possible events and technologies. | | | | | 12 x 1 hour. Continuous evaluation. |
| VBM614 | 16 | 8 | CESM:20201 | Urbanisation | |
| Theory relating to urbanisation, Policy and implementation of projects, Case studies. After completion of the module: Be able to understand strategic planning in urbanisationurbanisation projects, Be able to have an understanding of the collaboration between the physical urban environment and the functions of the city. | | | | | Workshops, lectures, presentation. Continuous evaluation, tests, assignments, presentation. |
| CSB614/624 | 16 | 8 | CESM:20201 | Capita Selecta in Planning (for recognition purposes only) | |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | | |
| BRT614 | 16 | 8 | CESM:20201 | Basic Theory of Regional Planning (for recognition purposes only) | |
| What is regional Planning? Where does Regional planning come from and what is its purpose? Different theoretical approaches to regional planning. Techniques of Regional Planning. The Urban/rural relationship. Policy and strategy from national to regional level. | | | | | |
| BET614 | 16 | 8 | CESM:20201 | Planning Ethics (for recognition purposes only) | |
| General philosophical theories and the ethics involved in Urban and Regional planning are explained. The implications of planners' decisions for the profession as well as for planning in the country are pointed out to students. The need for planners to uphold an unimpeachable ethical code is stressed. | | | | | Oral examination if the module is not promoted. |
| BMK793 | 16 | 8 | CESM:20201 | Planning Methodology | |
| | | | | | Continuous evaluation. |
| BNA712 | 8 | 8 | CESM:20201 | Planning Research | |
| After completion of the module: Research methodologies. | | | | | At least 8 hours of lectures. Continuous evaluation. |
| GIB704 | 16 | 8 | CESM:20201 | Geographic Information Systems for Planners | |
| After completion of the module: The application of Geographical Information Systems (GIS) technologies in preparing maps and plans, undertaking spatial analysis. | | | | | Continuous evaluation. |
| GTR793 | 16 | 8 | CESM:20201 | Advanced Research in Urban Planning | |
| Theory of planning, Modernist and post-modernist perspectives. Students are expected to evaluate advanced theoretical and philosophical approaches and hold seminars. | | | | | Seminars and oral examination. |
| SBF793 | 8 | 8 | CESM:20201 | Strategic Spatial Planning and Financial Management | |
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| SSS793 | 64 | 8 | CESM:20201 | Research Essay or Scientific Article | |

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| SSS791 | 88 | 8 | CESM:20201 | Extended Research Essay or Publishable Article |
| Independent research on planning. | | | | |
| TSP792 | 24 | 8 | CESM:20201 | Applied Regional Planning Project |
| Regional development research. | | | | |
| TSP793 | 24 | 8 | CESM:20201 | Applied Regional Planning Programme |
| Regional development theory and policy, Regional development research. | | | | |
| BEH614/712/752 | 8 | 8 | CESM:20201 | Housing |
| The role of housing in development, Housing policy, the influence of housing types on land uses as well as density and zoning. Types of housing schemes: site and service, <i>in situ</i> upgrading and enablement approaches. | | | | |
| BGM712/752 | 8 | 8 | CESM:20201 | |
| The patterns of urbanisation as well as its advantages and disadvantages. Urbanisation as it is taking place in Southern Africa, with special reference to future problems and possible solutions. Socio-economical and cultural factors. What metropolitan planning means. Size, character and function of the metropolis. | | | | |
| BGR712/752 | 8 | 8 | CESM:20201 | Planning Management |
| Lectures and practical as determined by the chairperson of the department to coincide with research of the department. Elements of legislation regarding physical planning, on national, provincial and local level with emphasis on the compiling, implementation and management of different plans and legal documents. | | | | |
| BVG712/752 | 8 | 8 | CESM:20201 | Planning for Sustainable Communities |
| What do sustainable communities mean? The influence of the aim of sustainability on the practice, theory and ideological thinking of people. Sustainability that starts at family and home level up to communities in an urban complex. | | | | |
| CSB702/762 | 8 | 8 | CESM:20201 | Capita Selecta in Planning |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | |
| CSB704 | 16 | | CESM:20201 | Capita Selecta in Planning |
| Further research in any M.U.R.P. subject already taken, or complementary work. | | | | |
| DGP752 | 8 | 8 | CESM:20201 | Demography for Planning |
| Test if not promoted. | | | | |
| ENB712/722/752/762 | 8 | 8 | CESM:20201 | Property Development and Valuation |
| Introduction to the nature of property development. The relationship between planning, zoning and property value. Property market and the factors influence it, as well as the price of the property or the probability of a planned development. The role of valuations and the property and development market. | | | | |
| GBE712/752 | 8 | 8 | CESM:20201 | Geography for Planners |
| Urban Geography: Physiographic stand factors, functional user occupations, the Central Business District, urban service areas, problems of urban pollution and climatic factors. Mapping and surveying techniques important to planners. Case studies. | | | | |
| GND752 | 8 | 8 | CESM:20201 | Gender in Planning |
| Lectures and seminar classes as determined by the head of the department. | | | | |

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| GOB712/752 | 8 | 8 | CESM:20201 | | |
| The principles of the Integrated Development Planning (IDP) process, strategic planning processes, development paradigms and implications for planning. | | | | | |
| IHB752 | 8 | 8 | CESM:20201 | | Indigenous Knowledge for Planners |
| How to generate new ideas, Using multiple viewpoints to reach new perspectives on issues, application of the techniques to problem solving. Be able to use various techniques to generate innovative ideas, apply multiple perspectives to solving a problem, explore unusual solutions and approaches to problems. | | | | | Introduction to creativity, |
| KIB752 | 8 | 8 | CESM:20201 | | Creative Innovation for Planning |
| Description of rural area. Planning without loss of character. Conservation and development of rural areas. After completion of the module: To understand rural development theory and apply it in rural areas. To develop a rural development strategy, ability to critically evaluate the rural development policy. | | | | | |
| LGB712/752 | 8 | 8 | CESM:20201 | | Planning of Rural Areas |
| Professional rendering of service as business law and regulations that affect the profession. Ethics and code of conduct, communicate between professionals, the client and the society. | | | | | |
| PPB712/752 | 8 | 8 | CESM:20201 | | Professional Practice and Project Management |
| RBT712/752 | 8 | 8 | CESM:20201 | | Planning for tourism |
| Introduction to the definitions, components and impact of tourism. New forms of tourism (sustainable, alternative, soft, green and eco-tourism). General tourism development and policy. General tourism planning concepts and instruments. National, regional and local tourism planning on national, regional and local level. | | | | | Oral examination for students who are not promoted. |
| RPB712/752 | 8 | 8 | CESM:20201 | | Management of the Spatial Plan |
| A Key component of Integrated Development Planning is the preparation of a Spatial Development Framework together with a Land Use Management system. | | | | | |
| SOB712/752 | 8 | 8 | CESM:20201 | | Sociology for Planners |
| Introduction to exposition of basic concepts with regard to Sociology and Planning. Analysis of relevant variables with regard to the South African society. Some theoretical frameworks in Sociology and the application thereof in planning. Group dynamic principles, social research and surveys important to planners. | | | | | Oral examination for students who are not promoted. |
| STO712/752 | 8 | 8 | CESM:20201 | | Urban Design |
| Understanding of basic design elements that influences urban form. Introduction to Urban design. The interaction between architecture and town planning as well as the nature of public spaces. Three dimensional thinking and practical projects. | | | | | Oral examination for students who are not promoted. |
| TVB712/752 | 8 | 8 | CESM: | | Futurology for Planning |
| A theoretical approach as to what the future is and how planners must handle the uncertainty, the quantitative and the qualitative aspects of spatial ordering in a world of different future scenario's and the application on South Africa. | | | | | Oral examination for students who are not promoted. |
| VBW712/752 | 8 | 8 | CESM:20201 | | Transportation |
| Understanding of the application of transport impact studies, the role of trip generation and land use on traffic patterns. Focus on transport policy, automobile travel, pedestrians, public transport and transport applications. | | | | | Oral examination for students who are not promoted. |
| BCP712 | 8 | 8 | CESM:20201 | | Basic Computer Use for Planners (for recognition purposes) |
| Advanced use of the computer (CAD) in township layout and establishment, rezoning, subdivision and consolidation. Coupled to BCP712. | | | | | Practical and oral examination. |
| GCP722 | 8 | 8 | CESM:20201 | | Advanced Computer Use for Planners (for recognition purposes only) |
| | | | | | Practical and oral examination. |
| GSP722 | 8 | 8 | CESM:20201 | | Advanced Urban Planning Practice (for recognition purposes only) |
| Types of plans and the drawing up of urban planning proposals. Plan evaluation and submission of development applications. Coupled to BSP712. | | | | | Practical and oral examination. |

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| BTR714 | 16 | 8 | CESM:20201 | Basic Theory of Regional Planning (for recognition purposes only) |
| What is regional Planning? Where does Regional planning come from and what is its purpose? Different theoretical approaches to regional planning. Techniques of Regional Planning. The Urban/rural relationship. Policy and strategy from national to regional level. | | | | Oral examination. |
| ATS724 | 16 | 8 | CESM:20201 | Advanced Theory of Regional Planning (for recognition purposes only) |
| Theoretical analyses of development paradigms worldwide that influences the planning of regions. The role of globalisation and information technology on regions. Applications of theoretical viewpoints on local or other region. | | | | Oral examination. |
| ISR712 | 8 | 8 | CESM:20201 | Introductory Studies In Regional Planning (for recognition purposes only) |
| History of regional planning, internationally as applicable in South Africa. Metropolitan planning as a bridge between urban and regional planning. Coupled to TSP726. | | | | Oral examination. |
| BET714 | 16 | 8 | CESM:20201 | Planning Ethics (for recognition purposes only) |
| General philosophical theories and the ethics involved in Urban and Regional planning are explained. The implications of planners' decisions for the profession as well as for planning in the country are pointed out to students. The need for planners to uphold an unimpeachable ethical code is stressed. | | | | Oral examination for students who are not promoted. |
| BGO714 | 16 | 8 | CESM:20201 | Environmental Planning (for recognition purposes only) |
| The role of human society in nature. Influence of development on nature. | | | | Oral examination for students who are not promoted. |
| EVB714 | 16 | 8 | CESM:20201 | Economics and Entrepreneurship (for recognition purposes only) |
| Introduction to economics in general, macroeconomics, micro economics, development economics and public policy. Different economic systems and concepts, as well as global economic status quo, patterns and processes that is of consideration in urban and regional planning. Sustainable development in South Africa. | | | | Oral examination for students who are not promoted. |
| OEB712/752 | 8 | 8 | CESM:20201 | Development Economics (for recognition purposes only) |
| Study of the problems of developing communities and the different development methods as applied worldwide. Application of the above-mentioned methods in the unique South African context. Case studies. | | | | The chairperson of the department can promote a student with a semester mark of 65% and above. |
| OGG704 | 16 | 8 | CESM:20201 | Development Planning (for recognition purposes only) |
| Study of the problems of developing communities and the different development methods as applied worldwide. Application of the above-mentioned methods in the unique South African context. Case studies with community participation. | | | | |
| OGG712/752 | 8 | 8 | CESM:20201 | Development Planning (for recognition purposes only) |
| Study of the problems of developing communities and the different development methods as applied worldwide. Application of the above-mentioned methods in the unique South African context. Case studies. | | | | Oral examination for students who are not promoted. |
| PDF712/752 | 8 | 8 | CESM:20201 | Public Participation and Facilitation (for recognition purposes only) |
| History of public participation and facilitation. Models, theories, practices and legislation of public participation and facilitation in urban and regional planning. | | | | Oral examination for students who are not promoted. |

12.3 NATURAL SCIENCES

12.3.1 DEPARTMENT OF GENETICS

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| BLGY1623 | 12 | 6 | CESM: 130701 | Introductory Genetics | 2L, 1.5P | |
| This module covers the basic principles of inheritance and starts with a study of meiosis, since a good understanding of the fundamental genetic mechanisms of reproduction is necessary to understand the principles of heredity. The work of Gregor Mendel, the father of Genetics, will also be studied. We will also investigate both the chromosomal and molecular foundations of inheritance. The way in which genes are expressed will become clearer when we look at protein synthesis. Finally, we will investigate the fast growing field of Biotechnology, a very practical application of the science of Genetics. | | | | | One three-hour examination paper. | |
| GEN216 | 24 | 6 | CESM: 130701 | BLGY1513, BLGY1623 | Cytenogenics | 3L,5P |
| Multiple alleles, pedigrees, sex-linked inheritance, cytoplasmic inheritance, polygenic inheritance, mitosis, meiosis, cross over, 3-point gene mapping, deletion mapping, chromosome abnormalities, modern mapping methods. | | | | | One three-hour examination paper. | |
| GEN246 | 24 | 6 | CESM: 130702 | blgy1513, blgy1623 | Molecular Genetics | 3L,5P |
| the module introduces DNA as the blueprint of life. the central dogma of molecular biology will be studied, which includes the transcription of DNA to RNA, followed by the translation of RNA to proteins, DNA replication and organization into chromosomes, DNA mutations and mechanisms for repairing mutations, the basis of gene regulation and expression in prokaryotes and eukaryotes. the advent of recombinant DNA technology will be discussed by considering various DNA cloning tools and the importance of genome sequencing and analysis. The possibility of improving life through the production of genetically modified organisms (gmos) will also be studied. | | | | | One three-hour examination paper. | |
| GEN324 | 16 | 7 | CESM: 130705 | GEN216, GEN246 | Evolutionary Genetics | 2L,3P |
| The main aim of this module is to study how organisms may differ on chromosomal and DNA level and to determine the influence of these differences on evolution, speciation, genetic variation and phylogeny. | | | | | One three-hour examination paper. | |
| GEN314 | 16 | 7 | CESM: 130702 | GEN216, GEN246 | Phylogenomics | 2L,3P |
| This module will introduce the student to evolution, speciation, genetic variation, phylogeny and bioinformatics in genetics. Basic concepts of phylogeny, cladistics and methods to determine and analyse phylogenetic relationships are examined. | | | | | One three-hour examination paper. | |
| GEN344 | 16 | 7 | CESM: 130704 | GEN216, GEN246 | Population and Conservation Genetics | 2L,3P |
| Genetics and conservation, Phenotypic variation, Measuring genetic variation, Genetic diversity and the Hardy-Weinberg principle, Genetic drift, Natural selection, Population subdivision and migration, Mutation, Inbreeding and Wildlife Forensics. | | | | | One three-hour examination paper. | |
| GEN354 | 16 | 7 | CESM: 130706 | GEN216, GEN246 | Behavioural Genetics | 2L,3P |
| Chromosomal and sex linked disorders, patterns of inheritance and pedigree analysis, single gene and multifactorial disorders, molecular and cytogenetic laboratory techniques, prenatal diagnosis, the potential contribution of genotype and/or environment on behavioural studies, quantitative studies, twin and adoption studies, identifying genes contributing to human behaviour, deeper study of human behaviour, including cognitive disabilities, psychopathology, mood and anxiety disorders, as well as the influence of neurotransmitter pathways on behaviour. | | | | | One three-hour examination paper. | |
| GDF214 | 16 | 6 | CESM: 140101 | BLGY1513, BLGY1623, FSK144, (CEM114 + CEM124 = 60%) | Introductory Forensic Science | 2L, 3P |
| The module introduces Forensic Science as an applied science that covers an array of disciplines. The aim of the module is to recognise, identify and evaluate physical evidence by applying all the different fields of science, including entomology, pathology and anthropology. The application of all these fields of Forensic Science in South Africa will also be discussed. | | | | | One three-hour examination paper. | |
| GDF224 | 16 | 6 | CESM: 140101 | BLGY1513, BLGY1623, FSK144, (CEM114 + CEM124 = 60%) | Forensic Science and the Law | 2L, 3P |
| The main aim of this module is to study the interaction between crime scene investigation, the criminal law and the science involved. Various investigating and presumptive testing techniques applied in CSI will be demonstrated and procedures to ensure the quality of results and the impact it could have in the court system in South Africa will be addressed. | | | | | One three-hour examination paper. | |
| GDF314 | 16 | 7 | CESM: 140101 | GDF214, GDF224 | DNA Forensics | 2L, 3P |

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| The main aim of this module is to study how STR markers and other molecular techniques are applied in the field of forensic genetics. The interpretation of DNA profiles is demonstrated and the practical application of DNA profiles in the identification and parentage analysis process are explained. The accreditation and certification of DNA forensic laboratories are discussed. The topic of wildlife forensics is also addressed. | | | | | One three-hour examination paper. | |
| GDF324 | 16 | 7 | CESM: 140101 | GDF214, GDF224 | Forensic Crime Scene Management | 2L, 3P |
| The discipline of forensic ballistics will encompass the study of firearms, their manufacture, operation and performance. This module will also focus on the analysis of ammunition and its by-products as well as the individualizing characteristics that are transferred from firearms to bullets and cartridge cases. Analysis of tool mark evidence will also be studied in order to establish whether a certain tool was used in the commission of a crime. | | | | | One three-hour examination paper. | |
| GDF334 | 16 | 7 | CESM: 140101 | GDF214, GDF224 | Forensic Entomology | 2L, 3P |
| Introduction to entomology, morphology of body wall, head, thorax and abdomen, mouth parts, appendages, internal anatomy of organ systems, growth and metamorphosis, ecological preferences and life cycles, characteristics used to differentiate between insect orders, identification of forensic important insects and their role in forensic medicine. | | | | | One three-hour examination paper. | |
| GDF344 | 16 | 7 | CESM: 140101 | GDF214, GDF224 | Investigation Techniques and Physical Evidence | 2L, 3P |
| The main aim of this module is to describe the principles and analysis of crime scene materials using a range of forensic instrumentation/equipment, including comparison and polarising microscopy, chromatography, spectroscopy and chemical instrumentation/techniques. Students will develop the knowledge and skills to identify and process a number of examples of chemical materials evidence found at the crime scene. The science of dactyloscopy (fingerprinting) and blood spatter analysis will also be addressed. | | | | | One three-hour examination paper. | |
| GDF686/GEN686/ GGS686 | 24 | 8 | CESM: 130799 | | Research Techniques | Formal contact time of 240 hours. |
| Logic, scientific writing, scientific presentations (conferences - oral and poster, press releases, TV/radio interviews), Job interviews, statistics. Theory behind techniques such as extraction, quantification, PCR and analysis. Students should be familiar with all laboratory equipment (centrifuges, heating blocks, water baths, pipettes, autoclave, vortexes, PCR machines, pH-meter, magnetic stirrers and the NanoDrop) and save laboratory practices. Students should be able to prepare chemicals and to perform techniques such as DNA extraction, gel electrophoresis and PCR reactions. | | | | | Continuous evaluation. | |
| GDF692/ GEN692/ GGS692 | 32 | 8 | CESM: 130799 | The practical component GDF686 / GEN686 / GGS686 | Research Essay | Formal contact time of 320 hours. |
| This course stretches over the whole year and involves a research project under the guidance of a lecturer. The project is selected in consultation with departmental chair. The results of the project must be submitted in the form of a typed scientific paper for examination. An oral presentation of 15 minutes with 5 minutes for questions on the research project is required. The practical components of GDF686/GEN686/GGS686 has to be passed before continuing with this module. On completion of this module the student is acquainted with: Problem identification, hypothesis formulation, planning and conducting of experiments, analysis and interpretation of results, discussion of results, compiling the information according to a specified structure, technical aspects of scientific writing, practical presentation skills. | | | | | Continuous evaluation. | |
| GDF693 / GEN693 / GGS693 | 16 | 8 | CESM: 130799 | | Research: Literature Study | Formal contact time of 240 hours. |
| The review includes searching and accessing literature on a particular topic, organising and integrating the information, drawing conclusions from the available body of literature, compiling the information according to a specified format, technical aspects of scientific writing and practical presentation skills. The subject of the dissertation should differ from that of the research project and is selected in consultation with the division head. On completion of this module the student is acquainted with: Searching and accessing literature on a particular topic, organising and integrating the information, Drawing conclusions from the available body of literature, Compiling the information according to a specified format, Technical aspects of scientific writing, Practical presentation skills. | | | | | A review paper is written and presented orally on a date determined by the departmental chair. | |
| GEN614 | 16 | 8 | CESM: 130705 | | Advanced Cytogenetics | Formal contact time of 80 hours. |
| Chromosome evolution, cytotaxonomy, speciation. On completion of this module the student is acquainted with: planning and executing a cytotaxonomic study, analysing and reporting the results. | | | | | Continuous evaluation. | |

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| GEN624 | 16 | 8 | CESM: 130702 | Recombinant DNA Technology | Formal contact time of 80 hours. |
| <p>Recombinant DNA technology provides a powerful platform that enables the study of any gene isolated from virtually any organism. Central to this technology is the cloning of nucleic acid fragments (for example, DNA) into cloning vectors, a process simplified by the Polymerase Chain Reaction (PCR) technique. Subsequently, recombinant vectors are used to transform competent bacterial cells and the sequence information of the cloned gene can be determined by DNA sequencing. This course aims to introduce basic tools and techniques that are utilised in recombinant DNA technology. After successful completion of the module the student will be able to:</p> <ul style="list-style-type: none"> • Apply various laboratory procedures to isolate DNA and RNA from cellular and/or eukaryotic tissues. • Plan and perform experiments on complementary DNA (cDNA) synthesis. • Design, implement and evaluate experiments based on the Polymerase Chain Reaction (PCR) technique. • Create recombinant DNA molecules by cloning DNA fragments into cloning vectors. • Use laboratory protocols to transform recombinant cloning vectors into bacteria. • Analyse and compare cloned DNA fragments using sequencing and various computer-based sequence analysis programmes. | | | | | Continuous evaluation. |
| GEN634/GGS634 | 16 | 8 | CESM: 130706 | Behavioural Genetics | Formal contact time of 80 hours. |
| <p>Determination of the inheritance of behaviour, monogenic vs. polygenic inheritance, allelism, Pleiotropy, epistasis, quantitative studies and analysis, experimental design.</p> <p>After successful completion of the module, the student is acquainted with:</p> <ul style="list-style-type: none"> • Planning and executing a behavioural genetic study. • Identification and judgment of factors influencing behaviour. • Apply basic statistical analysis to behavioural genetic quantitative data. | | | | | Continuous evaluation. |
| GEN644 | 16 | 8 | CESM: 130799 | Advanced Molecular Systematics | Formal contact time of 80 hours. |
| <p>Genomes, nucleotide sequencing, mutation rates, cladistics, the use of molecular and other data for determining phylogenetic relationships and parenthood, species identification, computer programmes used in molecular analyses. After successful completion of this module the student is expected to: Plan and execute molecular studies and analyse the results.</p> | | | | | Continuous evaluation. |
| GEN654 | 16 | 8 | CESM: 130799 | Applied conservation genetics | Formal contact time of 80 hours. |
| <p>This course aims to describe genetic processes in wild and captive populations, at a very practical level. The emphasis is on the use of molecular markers and appropriate statistical coefficients to determine levels of diversity, detect historic bottlenecks, measure drift and differentiation, describe population structure, detect hybridisation and to apply assignment methods. These outcomes are reached using appropriate software such as Arlequin, GeneClass and MSToolkit.</p> | | | | | Continuous evaluation. |
| GEN674 | 16 | 8 | CESM: 130799 | Capita Selecta Genetics | Formal contact time of 80 hours. |
| <p><i>Capita Selecta</i> from advanced aspects of genetics with a view to the expansion of knowledge of the subject in the educational situation. Assignments from an integral part of the module, both for the theory and the practical work.</p> | | | | | Continuous evaluation. |
| GGS614 | 16 | 8 | CESM: 130706 | Chromosomal and Genetic Abnormalities | Formal contact time of 80 hours. |
| <p>Chromosomal and sex linked disorders, patterns of inheritance, single gene and multifactorial disorders, epigenetics, mapping and identifying genes, molecular and cytogenetic laboratory techniques, cancer genetics, hematological malignancies, prenatal diagnosis, treatment of genetic diseases and ethical issues concerning genetic testing.</p> | | | | | Continuous evaluation. |

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| GDF614 | 16 | 8 | CESM: 130799 | Crime Scene Investigation | Formal contact time of 80 hours |
| Crime scene analysis: Presumptive test done at the crime scene including (blood, saliva, semen samples), Chain of custody of evidence samples, Collecting reference samples, Chain of custody in the forensic laboratories, Compiling a DNA evidence report for court, Presenting DNA evidence in court. | | | | | Continuous evaluation. |
| GDF624 | 16 | 8 | CESM: 130799 | Forensic DNA Typing and Quality Assurance | Formal contact time of 80 hours |
| Quality control, quality assurance and accreditation of Forensic Laboratories. | | | | | Continuous evaluation. |
| GDF644 | 16 | 8 | CESM: 130799 | Capita Selecta in Forensic Science | Formal contact time of 80 hours |
| <i>Capita Selecta</i> of advanced aspects of Forensic Genetics, with the purpose of broadening the knowledge of the object presented in this module. Assignments form an important part of this module for both the theory and practical work. | | | | | Continuous evaluation. |

12.3.2 DEPARTMENT OF MICROBIAL, BIOCHEMICAL AND FOOD BIOTECHNOLOGY

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| BLGY1513 | 12 | 5 | CESM: 130101 | NCS Life Sciences performance Level 5 | Introduction to Biology | 2L, 3T |
| Introduction to Biology, presented on NQF Level 5, aim to prepare students for the next Biology related modules in the second semester which will be presented on an NQF Level 6. This module covers and serves as a preparation module for the other sub-disciplines of Biology such as Genetics, Plant Sciences, Zoology and Entomology, Microbiology and Biochemistry. The following topics will be dealt with on a basic an introductory level: Basic chemistry and biochemistry, Prokaryotic and Eukaryotic cells: Form and function, Classification and phylogeny, Biology and time, Darwin's evolution, Introduction to plant form and function, Introduction to animal form and function. | | | | | Assignments, class tests, two module tests and an examination paper of three hours. Basic concepts and principles will be assessed throughout. | |
| BLGY1623 | 12 | 6 | CESM: 130701 | BLGY1513 | Introduction to Genetics | 2L, 3P every second week |
| This module covers the basic principles of inheritance and how these give rise to diverse biological types through the process of evolution. The mechanisms of inheritance and the roles of genes and chromosomes in this are addressed. Diversification into populations and species is explained on the basis of natural selection and genetic variation. The following themes will be covered: Introduction to Genetics, Mitoses and meiosis, Mendel's principles of heredity, Extension of Mendel's laws, Chromosomal theory of inheritance, Chi-square test. Variation and selection in populations. Introduction to applied genetics. | | | | | Assignments, class tests, two module tests and an examination paper of three hours. Basic concepts and principles will be assessed throughout. | |
| BLGY1643 | 12 | 6 | CESM: 130301 | BLGY1513 | Introduction to Plant Sciences: the Interdependence of Plants and Life on Earth | 2L, 3T |
| This module will focus on the important role plants played during the development of life on earth. Included will be the following: The transition from single-celled water living algae to terrestrial plants with roots, stems and leaves. The subsequent adaptation of photosynthesis with the resultant enrichment of the atmosphere with oxygen. The influence of plants on the climate, development of habitats on land and the diversification of plants as one of the major driving forces in the diversification of animals and the evolution of humans. The adaptations of plants to different ecological niches that allowed the colonization of the whole planet. The important role of plants in daily life would be emphasised in terms of the carbon footprint, human nutrition and restoration of disturbed areas. The module will conclude with two direct applications of plants in terms of plant breeding and plant pathology. | | | | | Assessment: assignments, class tests, two module tests and an examination paper of three hours. Basic concepts and principles will be assessed throughout. | |
| BLGY1663 | 12 | 6 | CESM: 130601 | BLGY1513 | Introduction to Zoology and Entomology | 2L, 3P |
| This course deals with the form and function of plants and animals as well as the environment in which they live. The various components presented in this course are: Animal form and function: Basic principles of animal form and function, animal nutrition, Circulation and gas exchange, the immune system, Osmoregulation and excretion, Hormones and endocrine system, animal reproduction. Animal development: Neurons, synapses and signalling: Nervous systems: Sensory and motor mechanisms: Animal behaviour. Ecology: An introduction to ecology and the biosphere: Population ecology: Community ecology: Ecosystems: Conservation biology and restoration ecology. | | | | | Assignments, class tests, two module tests and an examination paper of three hours. Basic concepts and principles will be assessed throughout. | |

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| BLGY1683 | 12 | 6 | CESM: 130201, 130501 | BLGY1513 | Introduction to Microbiology and Biochemistry | 2L, 3P |
| <p>Introductory to chemical principles of life, water as biological solvent, physical and chemical characteristics of water, pH, water quality. Carbon as the backbone of living chemistry: Diversity of chemical bonds in organic molecules, functional groups and biological function, aTP as energy currency in the cell. Macromolecules, Synthesis and breakdown, structure and diversity of polymeric compounds, carbohydrates, lipids, proteins, nucleic acids as sources of information. The cell: methods of studying cells, pro- and eukaryotic cells, structure and function of organelles, the cytoskeleton, cell walls, extra-cellular matrix. Membrane structure and function, membrane protein and carbohydrates, transport systems in membranes. Introduction to metabolism: Metabolic pathways, and different forms of energy, Enzymes as biological catalysts, regulation of enzyme activity. Respiration as an energy pathway to harvest energy. Introduction to Microbiology: Viruses, Bacteria and Fungi. After the successful completion of this module, students should be able to know and understand the following themes: Water and life, Carbon and the molecular diversity of life, structure and function of large biological molecules, a tour of the cell, Membrane structure and function, Introduction to metabolism, Cellular respiration and fermentation, Viruses, Bacteria, Arachaea, Fungi.</p> | | | | | | <p>Assignments, class tests, two module tests and an examination paper of three hours. Basic concepts and principles will be assessed throughout.</p> |
| FFG216 | 24 | 6 | CESM: 130803 | BLGY1513 & CEM114 & CEM124 OR CEM144 OR CHE112+CHE132+CHE122+CHE142+CHE151+CHE161 | Cellular Physiology and Fundamentals of Homeostasis | 3L, four hours P |
| <p>Introduction to Physiology: Functional organisation of the human body and control of the internal environment. The cell and its function. Genetic control of protein synthesis, cell function, and cell reproduction. Membrane Physiology, Nerve, and Muscle: Histophysiology. Transport of ions and molecules through the cell membrane. Membrane potentials and action potentials. Excitation and contraction of skeletal muscle. Excitation and contraction of smooth muscle. Control of nervous and muscular functions. Autonomic nervous system.</p> | | | | | | <p>One three-hour examination paper.</p> |
| FFG226 | 24 | 6 | CESM: 130801, 130804,130808 | FFG216 | Homeostasis of Food and Energy | 3L |
| <p>Nutrition and Metabolism: Metabolism of carbohydrates, lipids, and proteins. Functions of the liver. Diet and regulation of feeding. Energy metabolism. Body temperature. Gastro-intestinal Physiology: General principles of gastro-intestinal function. Histophysiology. Digestion and absorption. Secretory functions of the alimentary tract. Endocrine Physiology: Introduction to endocrine physiology. Mechanisms of hormonal action. Endocrine control of water-, electrolyte, and energy homeostasis. Male and female reproductive physiology – hormonal control, conception, pregnancy.</p> | | | | | | <p>One three-hour examination paper.</p> |
| FFG316 | 24 | | CESM: 130801, 130803 | FFG216+FFG226 | Homeostasis of Fluids and Gases | 3L |
| <p>The heart and circulation: Circulatory body fluids. The physiology of blood. The heart – structure and function. Dynamics of blood and lymph flow. Cardiovascular regulatory mechanisms. The kidney and body fluids: Fluid compartments. Histophysiology. Glomerular filtration. Tubular reabsorption and secretion. The role of the kidney in the regulation of blood and extracellular fluid volume, as well as pH and electrolyte homeostasis. Respiration: Principles of pulmonary ventilation, perfusion (circulation) and diffusion – histophysiology. Transport of oxygen and carbon dioxide in blood and body fluids. The role of the lung in pH homeostasis. Regulation of breathing.</p> | | | | | | <p>One three-hour examination paper.</p> |
| FFG326 | 24 | | CESM: 130805 | FFG216+FFG226+FFG332 | Man in His Environment – Physiological Adjustments | 3L |
| <p>Homeostatic adjustments: Foetal development and on being born –alterations in the immediate postpartum period, and the neonatal period. Physiological adaptations in hot and cold environments. Life at varying oxygen pressures. On being lost on mountains, in deserts, and at sea. Circadian rhythms. Body defences – immunity and infections. On nutrition – modern tendencies and views.</p> | | | | | | <p>One three-hour examination paper.</p> |
| FFG332 | 8 | | CESM: 130806 | | Basic Neuroscience | 2L |
| <p>The central nervous system: Structure and organisation. Embryological development. Cerebral cortex, sub cortical structures, cerebellum, brainstem, spinal cord. Higher functions of the brain – intellect, learning and memory, behaviour and motivation, sleep, epilepsy, psychosis. The peripheral nervous system: Afferent division – receptor physiology, pain senses. Histo-physiology. Efferent division – somatic nervous system. Neuromuscular junction. Autonomic nervous system: Physiological anatomy, characteristics, reflexes effects of stimulation and drugs. Sympathetic nervous system. Parasympathetic nervous system.</p> | | | | | | <p>One three-hour examination paper.</p> |
| FFG342 | 8 | | CESM: 130808 | | Basic and Applied Exercise Physiology | 2L |
| <p>Exercise Physiology: Functional changes in human systems – immediate response, long-term adaptations, fitness. Mechanisms responsible for changes. Nutrition and muscle metabolism – aerobic, anaerobic. Muscle fibres – types and genetic potential. Work capacity and monitor of exercise. Drugs and the athlete.</p> | | | | | | <p>One three-hour examination paper.</p> |

BIOCHEMISTRY

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| BCC 214 | 16 | 6 | CESM: 130201 | NONE | Biochemistry for Agriculture and Health Sciences | 3L |
| The role of water and salts in the cell, survey of the chemistry of carbohydrates, lipids, proteins and nucleic acids, the flow of information. Survey of the flow of energy and material through the cell, catabolic pathways, anaerobic and aerobic metabolism, anabolic pathways, integration of metabolic pathways, metabolic diseases. | | | | | | Semester tests and class tests. One three-hour examination paper. |
| BOC 216 | 24 | 6 | CESM: 130201 | BLGY1513 & BLGY1843 and (CEM124 OR 60% pass in CEM144 or CHE132+CHE122+CHE161) | Biochemistry of Biological Compounds | 3L, 4P |
| An introduction to the most important principles governing biochemistry. The module is designed to expand on the foundation that the student has acquired in chemistry and biology modules and to provide a biochemical framework that allows understanding of new phenomena. | | | | | | Semester tests and class tests. One three-hour examination paper. |
| BOC 226 | 24 | 6 | CESM: 130201 | BOC216 | Enzymology and Introductory Metabolism | 3L, 4P |
| An introduction to the most important principles controlling enzyme action and the flow of energy through living systems. The module is designed to make students aware of the principles of Michaelis-Menten kinetics of single substrate reactions, inhibitors and activators, the regulation of allosteric enzymes, coenzymes, the theory of catalysis, enthalpy, entropy and free energy, the living cell as open thermodynamic system, coupled reactions, redox reactions, the role of ATP, introduction to metabolism, glycolysis and fermentation, gluconeogenesis, glycogen metabolism, the pentose phosphate pathway, the Krebs cycle, electron transfer and oxidative phosphorylation, glyoxylate cycle and fatty acid oxidation, fatty acid biosynthesis, the metabolism of cholesterol and phospholipids, an overview of amino acid biosynthesis and catabolism including the urea cycle, photosynthesis. | | | | | | Semester tests and class tests. One three-hour examination paper. |
| BOC314 | 16 | 7 | CESM: 130203 | BOC216 | Molecular Biology | 2L, 3P |
| Advanced discussion of the "Central Dogma:" DNA replication, transcription and translation, topics in DNA/RNA structure-function, genomics, DNA repair, epigenetics and regulation of gene expression with emphasis on eukaryotes, Recombinant DNA technology and molecular cloning: using a variety of different molecular cloning techniques, expression vectors, molecular manipulation of genes and database mining will also be studied | | | | | | Semester tests class test and assignment. One three-hour examination paper. |
| BOC324 | 16 | 7 | CESM: 130204 | BOC314 | Protein and Proteome Analysis | 2L, 3P |
| In this module the student will be trained in proteomics, the high throughput analysis of the entire protein content of a cell, tissue or an organism. Students will gain knowledge of protein properties that allow separation by liquid chromatography, expression proteome analysis by 2D gel electrophoresis, protein identification and post-translational modification analysis by mass spectrometry, X-ray crystallography and nuclear magnetic resonance, interaction proteomics including immunoprecipitation and yeast two-hybrid analysis, functional proteomics, and applications of proteomics in disease diagnosis, drug development and biotechnology. | | | | | | Semester tests class test and assignment. One three-hour examination paper. |
| BOC334 | 16 | 7 | CESM: 130204 | BOC226 | Advanced Enzyme Kinetics and Metabolism | 2L, 3P |
| In this module the student undertakes an advanced study of mono and bisubstrate enzyme reactions, the mechanisms used to regulate enzymes, principles of the regulation of metabolic pathways and principles of metabolic flow analysis. | | | | | | Semester tests class test and assignment. One three-hour examination paper. |
| BOC344 | 16 | 7 | CESM: 130204 | BOC216 | Cell Membranes, Signal Transduction and Immunology | 2L, 3P |
| In this module the student is exposed to advanced aspects of membrane structure, compounds associated with membranes such as glycoproteins, membrane lipids, glycolipids, membrane proteins, membrane transport systems, receptors, various signal transduction systems (with emphasis on the senses and the immune system), in pro and eukaryotic cells and their role in metabolic regulation, synthesis of proteins in membranes and techniques used to study membranes and the characterisation of membrane components. | | | | | | Semester tests class test and assignment. One three-hour examination paper. |
| BOC614 | 16 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | General Analytical and Chromatographic Techniques in Biochemistry (first quarter) | |
| Research techniques in biochemistry: Serological techniques, chromatographic, spectroscopic and other analytical techniques for the analysis of biomolecules and products. | | | | | | Semester tests. One three-hour examination paper. |
| BOC634 | 16 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | Protein structure and catalysis (third quarter) | |
| Enzyme structure and the theory of catalysis: Thermodynamic and kinetic principles, mechanisms applied in catalysis. Enzyme reaction mechanisms, ligand binding and design. Enzyme structure determination and prediction. Enzyme applications in organic chemistry. | | | | | | Semester tests. One three-hour examination paper. |

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| BOC654 | 16 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | Bioinformatics and Genomics (second quarter) | |
| Computational methods: databases and analysis of sequence data. The minimal genome, genome sequencing, existing and emerging technologies, genome annotation and metabolic pathway construction. Applications of genomics and metagenomics. | | | | | | Semester tests. One three-hour examination paper. |
| BOC674 | 16 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | Advanced Molecular Biology (second quarter) | |
| Training in the reading and interpretation of publications in molecular biology and the presentation of a seminar on a current molecular biology topic. The use of advanced molecular biology techniques as well as training in computer software associated with the analysis of DNA information. Students will also be expected to do self-study on selected topics that are related to molecular biology. | | | | | | Semester tests. One three-hour examination paper. |
| BOC622 | 8 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | Oral Examination of Theory and Practical (end of fourth quarter) | |
| The oral examination is normally scheduled for November. A panel consisting of lecturers from the divisions of Microbiology and Biochemistry, and including an external assessor, is convened for this purpose. The general knowledge of the student with regard to the subject area as well as aspects of the Biochemistry Honours course will be assessed during this oral examination. | | | | | | Semester tests. One three-hour examination paper. |
| BOC693 | 24 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | Research: Literature Study (second and third quarters) | |
| Students carry out a literature survey on a topic supplied to them by a lecturer acting as mentor. A literature review covering the chosen topic is written and also presented orally. The written portion of the module is evaluated by the mentor as well as an external assessor and marks are allocated by both. | | | | | | Semester tests. One three-hour examination paper. |
| BOC692 | 32 | 8 | CESM: 130204 | At least 64 credits in Biochemistry at third-year level. An average of 65% in undergraduate Biochemistry modules. | Research Essay (second to fourth quarter) | |
| Students conduct research on a topic supplied to them during the first semester by a lecturer acting as mentor, and in consultation with the departmental chair. A written research report is prepared and also presented orally. The written portion of the module is evaluated by the mentor as well as an external assessor and marks are allocated by both. | | | | | | Semester tests. One three-hour examination paper. |

MICROBIOLOGY

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| IQM242 | 8 | 6 | CESM: 130501 | NONE | | 2L |
| Quality management plays an important role in all industries. The skill to apply this important concept in practice will equip the student with a sought after skill. This module includes introductory quality management, control charts, implementation of HACCP as well as quality control. Emphasis is placed on application which is highlighted with relevant case studies. | | | | | | One two-hour examination paper. |
| MCB214 | 24 | 6 | CESM: 130501 | NONE | | 3L, 4P |
| The introductory module to microbiology gives basic overview on the historical development of microbiology, including the classification, cell structure, and characteristics of higher protists (algae, protozoa, fungi) and lower protists (bacteria, cyanobacteria, rickettsia and viruses). Microbial symbiotic relationships that occur in lichens, mycorrhizae, nitrogen fixation and in the rumen are discussed in more detail. The module also deals with basic virology which includes structure, properties and replication of bacteriophages, animal viruses and plant viruses. The growth and survival of microorganisms, factors affecting cell growth and death, and microbial growth control through antimicrobial agents, sterilisation and disinfection are discussed. Principles of immunology (immunization and types of immunity) are also handled in this module. | | | | | | One three-hour examination paper. |

| MKB216 | 24 | 6 | CESM: 130501 | BLGY1513 & BLGY1843 and (CEM124 OR 60% pass in CEM144 or CHE132+CHE122+CHE161) | 3L, 4P |
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| <p>Microbiology plays an important role in our everyday life. Some microorganisms cause disease while others are beneficial. This module covers the science and history of microbiology, the impact of microorganisms on human affairs by referring to agriculture, food, disease, environment and biotechnology. This module also covers imaging methods to visualize the microbial world, its evolutionary development and diversity. It also describes microbial locomotion, cell structure and function in <i>Bacteria</i> and <i>Archaea</i>. In addition, the influence of nutrition and different environmental conditions on microbial growth is covered. This module will also cover the characteristics of viruses and will look at the living and non-living characteristics and the structure of viruses. How viruses replicate and the different types of viral genomes will be covered. The importance of viruses to man, both negative and positive, will be covered. The different groups of viruses, bacteriophages, animal viruses, plant viruses and mycoviruses will be discussed. Methods for isolation and identification of the different groups of viruses will be covered. Knowledge of the basic methodology of isolating, handling and investigating the properties of microorganisms is crucial to microbiologists as well as workers in related disciplines that may require these skills. In this module, students learn to prepare and sterilize microbiological media and to isolate and culture microorganisms on or in these media. They also investigate both stained and living preparations of various microorganisms microscopically. Aspects of the metabolism of microorganisms are investigated. The effects of environmental conditions as well as inhibitors (including antibiotics) on microorganisms are demonstrated</p> | | | | | One three-hour examination paper. |
| MKB226 | 24 | 6 | CESM: 130501 | MKB216 | 3L, 4P |
| <p>Microbial evolution is the study of the patterns and processes that affect the dynamics of microbial diversity over time. This module focuses on the evolution of microbial life, from the origins of the earliest cells and metabolisms to the microbial diversity we see today. It will provide an evolutionary and systematic foundation for examining the diversity of microbial life. Methods for discerning evolutionary relationships and for systematic classification of organisms will be covered. Using the universal phylogenetic tree as a point of departure, major lineages of microorganisms within the three domains of life, <i>Bacteria</i>, <i>archaea</i> and <i>Eukarya</i>, will be discussed. Specific genera and species from the three domains which are of particular scientific interest or directly impact humans, either favourably through, for example, the production of useful products such as ethanol and antibiotics, or unfavourably as pathogens, will receive special attention. Diverse groups of microorganisms, when placed in an environment forming an ecosystem, will inevitably interact and adapt to specific habitats for superior survival. A few major habitats of microorganisms and their ecological outcomes will be explored. A number of animal-microbial and plant-microbial symbioses will also be covered.</p> | | | | | One three-hour examination paper. |
| MKB314 | 16 | 7 | CESM: 130501 | MKB216 | 2L, 3P |
| <p>A microbiologist should be conversant with the quantitative enumeration techniques for microorganisms and be able to describe microbial growth and death in terms of the applicable kinetic parameters. These skills are often required in microbiological research and in the operation of industrial bioprocesses. This module deals with the principles of and methods for the quantitative determination of microbial concentration, growth and death and the fundamental kinetics that is involved. The principles of microbial nutrition and the effects of various physical and chemical antimicrobial agents are also covered. The practical section of the module deals with the various enumeration methods, the construction of microbial growth and survival curves and the calculation of kinetic parameters. Bacterial isolations on selective and differential media are also done.</p> | | | | | One three-hour examination paper. |
| MKB324 | 16 | 7 | CESM: 130501 | MKB216 & BOC226 | 2L, 3P |
| <p>The study of physiology is defined as the study of the normal activities of an organism. Since important biotechnological processes as well as natural nutrient cycles are based on the activities of microbes, knowledge and understanding of microbial physiology forms the basis for the understanding and improvement of many biotechnological processes and of cycles in nature that sustain life.</p> <p>The use of light energy in phototrophy and the use of inorganic compounds as energy sources in chemolithotrophy.</p> <p>Major biosyntheses during which atmospheric carbon and nitrogen are fixed by microorganisms.</p> <p>The catabolism of organic compounds by fermentation and anaerobic respiration.</p> <p>Aerobic chemoorganotrophic processes.</p> <p>Nutrient cycles in nature.</p> | | | | | One three-hour examination paper. |
| MKB344 | 16 | 7 | CESM: 130501 | MKB216 | 2L, 3P |
| <p>One of the main problems associated with microorganisms is that they cause diseases in all living systems. This module will concentrate on animal diseases. The interaction between the pathogen and the host will be investigated as well as the requirements which a microorganism must adhere to in order to become pathogenic. The difference between the normal microbiota and pathogens will be discussed. Aspects of non-specific host defense mechanisms as well as control methods through the use of antibiotics and vaccines will be covered as well as a basic presentation of the immune system and methods of vaccine production. An introduction to epidemiology, as well as the methods used for the laboratory-based diagnosis of disease-causing agents will be presented. This will include the isolation and identification of viruses and bacteria as well as the detection of antibodies. In the last part of this module, selected important diseases of man, poultry, avian species, fish and insects will be covered as well as the role that microbiologists can play in the control of these diseases through different diagnostic approaches as well as the development of treatments. Aspects related to the protection against biological weapons will also be covered.</p> | | | | | One three-hour examination paper. |

| MKB364 | 16 | 7 | CESM: 130501 | MKB314 | | 2L, 3P |
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| <p>In the development, scaling-up and operation of industrial microbial bioprocesses, chemical engineers and microbiologists often have to work together, therefore, each group must be fairly familiar with the expertise of the other group. This module deals with the fundamentals of bioreactor design, fluid flow and mass transfer, cell and enzyme immobilisation, instrumentation and process control. Solid state cultivation, sterilisation principles and sterilisation kinetics and aspects of downstream processing are discussed. This module also covers the development of industrial microbiology and traditional biotechnology into modern biotechnology. Microbial processes for the production of food, pharmaceutical and chemical products as well as for water purification are introduced. Enzyme technology and several aspects of product recovery and purification (downstream processing) are also included. Legal issues relating to biotechnology are discussed.</p> | | | | | | One three-hour examination paper. |
| MKB614 | 16 | 8 | CESM: 130599 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314. | Advanced Techniques in Biotechnology | |
| <p>Research techniques in Microbiology: Handling and preservation of micro-organisms, serological techniques, chromatographic, spectroscopic and other analytical techniques for the analysis of organic compounds, data processing.</p> | | | | | | |
| MKB634 | 16 | 8 | CESM: 130599 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314. | Microbial Diversity | |
| <p>Yeasts: Identification of yeasts as required for quality assurance in the brewing and wine industry. Yeast taxonomy. <i>Fungi: Ecological concepts in mycology, endophytes, ecological succession, mating types and vegetative compatibility. Taxonomy, collection, preservation and description of fungi. Mycological techniques and the use of identification keys.</i> Bacteria: Bacterial nomenclature and classification. Numerical taxonomy. Serology and chemotaxonomy. Nucleic acids in bacterial classification. Putative taxa of prokaryotes. Polyphasic taxonomy. Chemical ecology. Viruses: Practical aspects of the propagation of viruses and the use of PCR for the identification of viruses.</p> | | | | | | |
| MKB654 | 16 | 8 | CESM: 130599 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314 | Applied Microbial Physiology | |
| <p>Food Microbiology: Physiology of food spoilage microorganisms. The application of microorganisms in biological control. Food spoilage and its prevention. Mycotoxins. The application of microorganisms in food processing. Microbial product formation: Principles and application of fermentative metabolism. Metabolic regulation and its implication for microbial product formation. Industrial processes based on microbial physiological activities.</p> | | | | | | One three-hour examination paper. |
| MKB674 | 16 | 8 | CESM: 130599 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314 | Advanced Molecular Biology | |
| <p>Training in the reading and interpretation of publications in molecular biology and the presentation of a seminar on a current molecular biology topic. The use of advance molecular biology techniques as well as training in computer usage that are associated with the analysis of DNA information. Students will also be expected to do self-study on selected topics that are related to molecular biology.</p> | | | | | | Continuous assessment . |
| MKB622 | 8 | 8 | CESM: 130501 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314 | Oral Examination in Theory and Practicals | |
| <p>The oral examination is taken in November. A panel consisting of lecturers of the Department of Microbiology and Biochemistry and which includes an external examiner is constituted for this purpose. Students are expected to answer questions about microbiology in general and evaluation is not limited to completed course contents.</p> | | | | | | |
| MKB693 | 24 | 8 | CESM: 130501 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314 | Seminar | |
| <p>Students conduct literature research on a topic supplied in the first semester by a lecturer who serves as their mentor. A literature report is written on the topic, which is also presented orally. The mentor as well as the external examiner for the module evaluates the written report and both allocate marks as will be explained to students.</p> | | | | | | |

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| MKB692 | 32 | 8 | CESM: 130501 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314 | Research Pproject | |
| Students complete a research project on a topic supplied in the first semester by a lecturer who serves as their mentor, in collaboration with the departmental chair. Students write a report on their results and also present their work as an oral presentation. The mentor as well as the external examiner for the module evaluates the written report and both allocate marks as will be explained to students. | | | | | | |
| MKB694 | 16 | 8 | CESM: 130501 | At least 64 credits in Microbiology at third-year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314 | Continuous and Batch Cultivation of Microorganisms | |
| Growth kinetics of batch cultures. Oxygen as substrate: volumetric oxygen transfer coefficient, critical dissolved oxygen concentration. Chemostat theory: material balances, Monod model, autoregulation, determination of kinetic and stoichiometric parameters. Deviations from the Monod model: maintenance energy, double substrate-limited growth, growth on mixtures of carbon substrates. Effect of growth rate on cell composition and size. Product formation: Kinetics: Effect of environmental factors. Complex chemostat systems and applications. Kinetics of fed-batch cultures. Degree of reduction and carbon balances. | | | | | | |
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FOOD SCIENCES

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| VWS212 | 8 | 6 | CESM: 010701 | | Introductory Food Science | 3L |
| The student will become acquainted to the nutritional aspects of food components and to the processing of milk, meat, fish, poultry, eggs, fruits and vegetables, cereals, alcoholic and non-alcoholic beverages, bakery and chocolate products. | | | | | | |
| <ul style="list-style-type: none"> • Demonstrate and understand the role of the food industry in the processing of raw food material into edible products • Demonstrate how the knowledge of the food science specialization relates to other disciplines and practices Demonstrate an ability to identify, evaluate and solve problems in food process | | | | | | |
| VWS222 | 8 | 6 | CESM: 010701 | VWS232 and [CEM114 or CHE112 + CHE142+Che151]] and [(CEM124/144) or (CHE132 + CHE122 + CHE161 | Chemical Analysis of Food | 3P |
| The student will learn techniques that are applied in the chemical analysis of food regarding water content, water activity, carbohydrates, proteins, lipids, minerals, vitamins and additives based on gravimetric, photometric and chromatographic techniques | | | | | | |
| <ul style="list-style-type: none"> • Demonstrate and understand the basic concepts of food analysis. • Carry out qualitative and quantitative analysis of the chemical compounds in food. • Demonstrate the ability to select information appropriately for specific food analyses. | | | | | | |
| VWS224 | 16 | 6 | CESM: 010701 | VWS212 and VWS232 | Food Systems | 3L,3P |
| The student will become acquainted with the classification and preparation of the food systems solids, liquids, gels, foams, emulsions, analogs and combinations thereof. The student will become acquainted with the nutrients and additives that are employed to obtain the different food systems and will integrate food chemistry knowledge to be able to understand the physical-chemical properties of the food systems. | | | | | | |
| Practical work: The students will use the classification, composition of the structure and application of food additives practically. | | | | | | |
| <ul style="list-style-type: none"> • Demonstrate and understand how nutrients and additives are employed to attain the different food systems. • Demonstrate and understand the physical-chemical properties of the different food systems. • Demonstrate how the knowledge of the food science specialization relates to other disciplines and practices. • Demonstrate the ability to select information appropriately for the preparation of specific food systems. | | | | | | |

| VWS232 | 8 | 6 | CESM: 010701 | CEM114 or CHE112 + CHE142+Che151]] and [(CEM124/144) or (CHE132 + CHE122 + CHE161)] | Food Chemistry | 3L |
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| <p>The student will be exposed to the following aspects: Chemical and physical properties of water, carbohydrates, proteins and lipids. WATER, physical properties of water and ice, sorption phenomena, water types, freezing and ice structure, water activity. CARBOHYDRATES: Classes, structure, chemical reactions and functions in food. PROTEINS: Amino acid composition, classification, protein structure, denaturation, chemical reactions and functions in food. Proteins of different origin. LIPIDS: Composition and structure, types, chemical reactions during deterioration due to heat, irradiation and storage, chemical reactions and functions in food. Minerals: Chemical reactions and functions in food. Vitamins: Classes, structure, chemical reactions and functions in food. Additives: Classes, structure, chemical reactions and functions in food.</p> <ul style="list-style-type: none"> • Demonstrate how the specialised knowledge of food chemistry relates to other disciplines and practices. • Demonstrate and understand the nutrient composition of foods. • Demonstrate and understand the chemical behaviour of food nutrients. • Demonstrate and understand the chemical functions and behaviour of additives in food. | | | | | | One examination paper of three hours. |
| VWS314 | 16 | 7 | CESM: 010701 | | Food Products From Animals | 3L,3P |
| <p>The following principles of processing of meat and milk will be addressed in the module: Meat: The composition of animal tissue and the effect of certain production factors on the chemical quality of meat. The conversion of muscle to meat. Pigments of meat and its effect on meat processing. Biophysical and enzymatic aspects of meat tenderness. Fresh meat and meat quality. Quality of fresh meat. Cold storage of meat. Packaging of meat. An introduction to meat processing. Dairy: Milk bio-synthesis and composition, the structure of milk, milk destabilisation, processing, the separation of milk and fat, evaporation (the production of milk powder and concentrated milk products), homogenisation (fat globule) Introduction to fermented products with special reference to cheese and yoghurt. Practical work: Meat-Meat classification. Carcass measurements. Colour and tenderness measurements of meat. Basic chemical analysis of meat. Meat processing. Dairy: Studying the processing line at a dairy plant. Evaluate the chemical and microbiological properties of milk. Homogenisation: The analysis of milk using the MilkcoScan, Evaporation of milk and the making of butter.</p> <ul style="list-style-type: none"> • Demonstrate and understand the nutrient composition of meat and milk. • Demonstrate and understand the processing technology of meat and milk. • Demonstrate integrated knowledge of the main areas of food science in understanding the chemical behaviour and changes of meat and milk components during processing. • Demonstrate the ability to evaluate information and develop appropriate food processes regarding animal material. | | | | | | One three-hour examination paper. |
| VWS324 | 16 | 7 | CESM: 010701 | | Food Products From Plants | 3L,3P |
| <p>The student will be qualified with knowledge for the processing of sorghum, barley, rice, malting and brewing practices, starch technology and extrusion practices. Plant pigment and flavours will be studied, as well as after-harvest technology of vegetables and fruit, minimal processing requirements, fruit juices, dehydration and drying of plant products, packaging of liquid and solid foods. Practical work: The student will evaluate ripeness stages and quality determinations of cereals, oil seeds, vegetables and fruit, as well as apply storage and basic processing techniques, milling and extrusion</p> <ul style="list-style-type: none"> • Demonstrate and understand the nutrient composition of plant material. • Demonstrate and understand the processing technology of plant material. • Demonstrate integrated knowledge of the main areas of food science in understanding the chemical behaviour and changes of plant material components during processing. • Demonstrate the ability to evaluate information and develop appropriate food processes regarding plant material. | | | | | | One three-hour examination paper. |
| VWS334 | 16 | 7 | CESM: 010799 | | Food Engineering | 3L,3P |
| <p>The student will learn the following principles: Factory planning. Energy, thermodynamics and heat transfer. Conduction, convection, radiation, heat exchangers. Mass transfer. Steam supply. Design of a factory for evaporation and drying of liquid foods and applicable principles. Supply of refrigeration and cold rooms. Compressed air: In work place cleaning and its engineering principles. Engineering aspects involved in factory effluents. Automatisation and instrumentation. Practical work: A study tour during the April holiday is undertaken during which the student will study the layout and functioning of production lines.</p> <ul style="list-style-type: none"> • Demonstrate integrated knowledge of the main areas of of engineering principles in food processing. • Demonstrate and understand engineering aspects involved in factory effluents. • Demonstrate and understand automatisation and instrumentation. • Demonstrate the ability to evaluate information and develop appropriate technological food processes. | | | | | | One three-hour examination paper. |

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| VWS344 | 16 | 7 | CESM: 010701 | MKB216 | Food Microbiology | 3L,3P |
| <p>The student will become knowledgeable with the following aspects: The microbiology of animal products (dairy and meat). Contamination, spoilage and pathogens in food products. Organisms involved in the processing of food products. Quality management and control in the food industry. Quality assurance programmes (PRP, HACCP, ISO, etc.). Sanitation with regard to quality and food safety assurance.</p> <p>Practical work: The student will master the following techniques: preparation of chemical and microbial media, quality control by microbial evaluation of the food factory environment and a wide variety of food products, determination of bacteriophage presence in the food factory, aerobic and anaerobic incubation techniques, isolation, identification and preservation of food spoilage bacteria and pathogens from food products:</p> <ul style="list-style-type: none"> • Demonstrate integrated knowledge of the main areas of food science in understanding microorganisms in the spoilage, safety and processing of food. • Demonstrate and understand quality management and sanitation in the food industry. • Demonstrate and apply microbial techniques in the quality evaluation of food products and the food environment. • Demonstrate the ability to evaluate information and develop appropriate food processes regarding the prevention of food spoilage by microorganisms, or the use of such in technological applications. | | | | | | One three-hour examination paper. |
| VWS403 | 12 | 8 | CESM: 010701 | VWS314 + VWS324 + VWS334 + VWS344 | Literature Study | |
| <p>The student prepares a comprehensive scientific literature review on a specific topic which is presented in the form of a seminar and oral presentation to:</p> <ul style="list-style-type: none"> • Demonstrate the ability to integrate and select specialised knowledge of food science to identify, analyse and address problems. • Unlock literature, organize information, conclude this information according to a structured format, as well as written and oral communication. • Be able to take responsibility and accountability of decisions made in the selection of existing knowledge in the choice of problem solving attempts. | | | | | | One report and one seminar. |
| VWS405 | 20 | 8 | CESM: 010701 | VWS314 + VWS324 + VWS334 + VWS344 | Research Project | |
| <p>Students will carry out under supervision of a study leader a research project on aspects of Food Science. It is expected of the student to hand in a report and prepare the results in the format of a scientific article as would be expected at a scientific congress, and deliver an oral presentation to:</p> <ul style="list-style-type: none"> • Demonstrate the ability to integrate specialised skills in food science to identify, analyse and address problems and draw on • Knowledge and methods to attempt solving the problems. • Apply skills in problem identification, hypothesis formulation, planning, carrying out experimental work in Food Science, as well as interpretation and communication of results in both written and oral presentation. The independence and scientific insight developed in this module will provide the student with the necessary background for further postgraduate studies. • Be able to take responsibility and accountability of decisions made and results obtained in the choice of problem solving attempts. | | | | | | One report and one seminar. |
| VWS414 | 16 | 8 | CESM: 010701 | VWS324 | Food Products From Plants: Advanced | 3L,3P |
| <p>The student studies the functional, biochemical and quality aspects of the components of wheat and their importance in baked goods. Functional biochemical and quality aspects of soy and their importance in soy products. Concerning vegetables and fruit, quality before and after processing, shelf life, microbiology with relationship to different processing techniques, biological and chemical changes during modified atmosphere storage of minimally processed vegetables and fruit is studied.</p> <p>Practical work: The student will learn to interpret quality parameters of wheat quality and oil quality, as well as the determination of anti-nutrients in legumes. Pigments and colour determinations will be mastered. Processing techniques of seeds, vegetables and fruit will be mastered in order to:</p> <ul style="list-style-type: none"> • Demonstrate and understand the nutrient composition of plant material. • Demonstrate and understand the processing technology of plant material. • Demonstrate and understand the chemical behaviour and changes of plant material components during processing. • Interrogate and evaluate knowledge of food processes regarding the processing of plant material. • Be able to take responsibility of decision making when processing plant material. | | | | | | One three-hour examination paper. |
| VWS434 | 16 | 8 | CESM: 010701 | VWS314 | Dairy Science | 3L,3P |
| | | | | | | One three-hour examination paper. |

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| VWS454 | 16 | 8 | CESM: 010701 | VWS314 | Dairy Science | 3L,3P |
| <p>Scientific principles during the industrial processing of cheese and other fermented dairy products. The evaluation and handling of raw products and raw material. Rennet and acid coagulation of milk and the factors that effect it. Handling of starter cultures. Curd processing. After treatment of curd. Ripening, packaging, storage and evaluation of cheese. Mechanisation. Classification of cheese. The major cheese varieties in the world. Processing, packaging and handling of yoghurt.</p> <p>Practical work: The dairy industry (visit), the destabilisation of casein micelles, the production of cheese (Ceddar and Gouda) The production of yogurt. The standardization of milk using the MilkcoScan. The identification of various cheese and yogurt products</p> <ul style="list-style-type: none"> • Demonstrate and understand the nutrient composition of milk. • Demonstrate and understand the processing technology of milk. • Demonstrate and understand the chemical behaviour and changes of milk components during processing. • Interrogate and evaluate knowledge of food processes regarding the processing of dairy material. • Be able to take responsibility of decision making when processing dairy material. | | | | | | One three-hour examination paper. |
| VWS464 | 16 | 8 | CESM: 010701 | VWS314 + VWS324 | Product Development and Sensory Analysis | 3L,3P |
| <p>The student studies the multi-disciplinary nature of product development. Definitions and criteria for new product development, principles and approaches. Relationship between sensory evaluation and product development.</p> <p>Practical work: The student will apply the knowledge obtained in the Food Science modules of the previous five semesters as well as the theoretical work of the current module to develop a product from a provided or a selfinitiated concept. Techniques used in sensory analysis will be mastered</p> <ul style="list-style-type: none"> • Demonstrate the ability to integrate specialised skills in food science to identify, analyse and address problems when designing new food products or processes. • Demonstrate and understand the sequence of design and development of a new food product from concept to final product. • Carry out the development of a new food product from concept to final product. • Be able to take responsibility of decision making when designing new food products or processes. | | | | | | One three-hour examination paper. |
| VWS474 | 16 | 8 | CESM: 010701 | VWS314 | Meat Science | 3L,3P |
| <p>The functional properties and the measurement of the functional properties of meat. Additives in meat products. Non-meat ingredients in meat products. Formulation of a meat product. Principles involved in manufacturing whole-muscle, minced and emulsified meat products. Restructured, canned, fermented, dried and intermediary moisture meat products. Spices and herbs.</p> <p>Practical work: Study the slaughter line at an abattoir. Meat cutting techniques. Effect of different additives during the preparation of model meat systems. Whole muscle meat technology. Emulsion meat technology. Meat product formulation. Case study whole muscle, minced and emulsion meat products. Advanced chemical analysis of processed meat products</p> <ul style="list-style-type: none"> • Demonstrate and understand the functional properties of meat proteins. • Demonstrate and understand the processing technology of meat an meat products. • Demonstrate and understand formulation chemical analysis of processed meat products. • Interrogate and evaluate knowledge of food processes regarding the processing of meat. • Be able to take responsibility of decision making when processing meat. | | | | | | One examination paper of three hours. |
| VWS601 | 24 | 8 | CESM: 010702 | | Food Microbiology | |
| The student will learn to know the following specific areas of food microbiology in five modules: food spoilage, food-borne disease and food poisoning, yeasts and yeast-like organisms in food, natural antimicrobial systems and food preservation, probiotics in food and the role of fermentation in food. | | | | | | |
| VWS602 | 24 | 8 | CESM: 010702 | | Food Chemistry | |
| Advanced aspects of food chemistry are covered in six modules, dealing with flavourants and flavour perception, new movements in the research and application of sweeteners, role and contribution of lipids and proteins to flavour, modification of functional properties of proteins, and molecular mobility and food stability. | | | | | | |
| VWS603 | 24 | 8 | CESM: 010605 | | Dairy Science | |
| The course consists of 5 modules on advanced aspects in dairy science. This includes residues in milk and milk products such as residues and contaminants, antimicrobials, paracitocides, pesticides and mycotoxins. Bacteriophages in the cheese industry. Accelerated cheese ripening with enzyme technology. HACCP in the dairy industry. Finally an assignment is required on the latest developments in Dairy Science. | | | | | | |

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| VWS604 | 24 | 8 | CESM: 010601 | Meat Science | |
| The course consists of six modules dealing with advanced aspects of importance in meat science. The following aspects are covered: composition and structure of muscle, the conversion of muscle to meat and muscle proteins in meat technology, an advanced study of the colour of meat, an advanced study of meat tenderness and the chemistry of meat flavour, restructured meat products and canning of meat and meat products, fermented and intermediate moisture meat products, and new technology for the meat processing industry. | | | | | |
| VWS605 | 24 | 8 | CESM: 010701 | Foods: General | |
| The objective of this course is to provide the student with knowledge of food ingredients in general. This course is divided in six modules. The first module deals with food systems, where the properties and structure of the different food systems are investigated. The second and third modules deal with the functional properties of hydrocolloids; their functions and applications in food. The last three modules investigate the application of fat substitutes, nutritive and non-nutritive sweeteners as well as neutraceuticals and other food additives. | | | | | |
| VWS606 | 24 | 8 | CESM: 010701 | Fruit, Vegetables and Seeds | |
| This course focuses on the functional, biochemical and quality aspects of fruit and vegetable processing. The course is divided into six modules and allows choices between fruit, vegetables and seeds. The focus is on the determination of quality as well as the influence of processing on quality, investigation of vegetable and fruit juices and related products, minimal processing of fruit and vegetables, modified atmosphere storage and freezing of fruit and vegetables, the factors influencing the shelf life of fruit and vegetables, and the factors that affect the quality of a variety of economically important cereals, legumes and oil seeds. | | | | | |
| VWS607 | 24 | 8 | CESM: 010701 | Selected topics in Food Science | |
| The course consists of six modules, consisting of choices of two modules from each of the above courses VWS 603, VWS 604 en VWS 606. It is ideal for students who have completed three-year BSc degrees or degrees in Consumer Science, where only the basic aspects of Food Science were included in the curriculum. | | | | | |
| VWS693 | 20 | 8 | | Research Project | |
| Students will carry out under supervision of a study leader a research project on aspects of Food Science. It is expected of the student to hand in a report and prepare the results in the format of a scientific article as would be expected at a scientific congress, and deliver an oral presentation. During the project the student will develop skills in problem identification, hypothesis formulation, planning, carrying out experimental work in Food Science, as well as interpretation and communication of results in both written and oral presentation. The independence and scientific insight developed in this module will provide the student with the necessary background for further postgraduate studies. | | | | | |
| VWS695 | 12 | 8 | | Literature Study | |
| The student prepares a comprehensive scientific literature review on a specific topic which is presented in the form of a seminar and oral presentation. After completion of this module the student will be capable of unlocking literature, organising information, concluding this information according to a structured format, as well as written and oral communication. | | | | | |

12.3.3 DEPARTMENT OF PLANT SCIENCES

BOTANY

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| ORH698 | 32 | 8 | CESM130301 | BSc degree in Environmental Rehabilitation | Research Project | |
| Students complete a research project within his / her field of interest under the guidance of a supervisor. A project hypothesis must be stated and tested so as to come to a logical conclusion. | | | | | | Assessment in the form of a report and an oral presentation at the end of the second semester. |
| ORH696 | 24 | 8 | CESM130301 | BSc degree in Environmental Rehabilitation | Literature Review | |
| Students complete a literature study on a given topic under the guidance of a supervisor. | | | | | | Assessment in the form of a report and an oral presentation at the end of the first semester. |
| ORH700 | 180 | 9 | CESM 130301 | BSc Honours degree in Environmental Rehabilitation | MSc degree in Environmental Rehabilitation | |
| Students do research on an approved topic for at least two semesters in consultation with the Division Head in preparation of a dissertation that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed dissertation. |

| ORH900 | 360 | 10 | CESM 130301 | MSc degree in Environmental Rehabilitation | Phd degree in Environmental Rehabilitation | |
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| Students do research on an approved topic for at least four semesters in consultation with the division head in preparation for a thesis that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed thesis. |
| PLK202 | 8 | 6 | CESM 130301 | BLGY1513 and BLG 143 and one of BLGY1623 or BLGY1663 or BLGY1683 | Field Excursion 1 | A field excursion during the September holiday. |
| Students will attend an eco-physiological field excursion. During the excursion, concepts like biotic and abiotic stress and its influence on plant growth types will be addressed. Students will be introduced to various physiological survey methods, data processing and analysis. Students will be taught to recognize and interpret morphological and physiological stress indicators in plants to ensure the sustainable rehabilitation of disturbed areas. | | | | | | Assessment in the form of a practical report and a test on work completed during the excursion. |
| PLK216 | 24 | 6 | CESM 130301 | BLG113 and BLG 143 and one of BLGY1623 or BLGY1663 or BLGY1683 | Plant Adaptations for Survival On Land | 3L, 5P |
| Different plant species grow in different habitats. Environmental factors (abiotic and biotic) play a role in the distribution of plants. Plants are very well adapted to survive in the different environments in which they are growing. In this module the focus will fall on the DNA structure, DNA replication, the cause of mutations and the evolutionary aspects that lead to speciation. Further, the anatomy, morphology and ecological adaptations of vegetative (roots, stems and leaves) and reproductive organs (flowers, inflorescence, fruit and seeds) to different environments will be discussed. The last section of the module deals with the environmental factors present on land and how these factors and the different landscapes influence the form and function of plant organs and the distribution of plants. The distribution of Africa's flora (plant biogeography) will be discussed with the emphasis on southern Africa's flora and landscape ecology. Key concepts: DNA structure and replication, mutations, speciation, plant anatomy and plant adaptations, environmental conditions and plant biogeography. | | | | | | Continuous assessment in the form of reports and tests with one three-hour examination paper. |
| PLK226 | 24 | 6 | CESM 130303 | BLGY1513 and BLG 143 and one of BLGY1623 or BLGY1663 or BLGY1683 | Introductory Plant Development and Biotechnology | 3L, 5P |
| Understanding the factors which affect plant growth and development will enable us to manipulate plants to promote optimum production for the benefit of mankind. These factors are related to the soil, water, nutrients, atmosphere and solar environments. This knowledge is important and of practical value in the plant-related industries such as agriculture, horticulture, nurseries, forestry, nature reservation, seed and fertilizer companies, etc., as well as teaching and research professions. Key concepts: Soil properties, water balance, mineral nutrition, ion traffic and transport of metabolites (phloem transport), nutrient cycles, hydroponic and organic cultivation of plants. Plant propagation - alleviation of seed dormancy, plant tissue culture techniques (micropropagation, embryo cultures, multiplication of transformed plants). Plant development - growth regulators, plant movement, photo-morphogenesis, biological clock, photo-periodism, the effect of temperature on growth and development. Secondary products - introduction to secondary plant metabolites. | | | | | | Continuous assessment in the form of reports and tests with one three-hour examination paper. |
| PLK314 | 16 | 7 | CESM 130301 | Min. PLK216 / PLK214 | Diversity and Systematics of Higher Plants | 2L, 3P |
| Southern Africa has 21 137 indigenous plant species, of which 80% are endemic to the region. This incredible diversity is comparable to that of the tropical rainforests. In terms of botanical diversity, southern Africa is one of the richest regions in the world. Understanding this diversity is the key to conservation and sustainable utilization of our indigenous plants. This module deals with processes through which the diversity of flowering plants originated and evolved, with specific focus on the South African flowering plants. Evidence from the fossil record will be evaluated and used to interpret the origin of flowering plants. The complex reproduction strategies of flowering plants are investigated. Students will also gain experience in taxonomic applications and principles such as herbarium management, plant identification, description and nomenclature. Sources of systematic evidence such as morphology, anatomy, palynology, cytology and secondary metabolites will also be investigated. Phylogenetic terms and various molecular techniques used to construct phylogenies will be discussed. Key concepts: systematics, angiosperm evolution, pollination, reproductive strategies, taxonomic evidence, identification, description, classification, nomenclature, molecular phylogenetics, phylogenetic trees | | | | | | Continuous assessment in the form of reports, presentations and tests with one three-hour examination paper. |
| PLK324 | 16 | 6 | CESM 130303 | | Plant Carbon Metabolism and Eco-Physiology | 2L, 3P |
| To live "green" and "organic", it is important that students understand the role of carbon and associated physiological processes in nature, as well as its role in the primary metabolic pathways of cellular respiration and photosynthesis. It is also important to understand how we contribute to our "carbon foot print", and how we can reduce it. The influence of environmental factors on the success of carbon sequestration and photosynthesis must be understood as well as its importance as a role player in the economy eg. food production. Key concepts: plant respiration, key enzymes, environmental factors, photosynthesis, chloroplasts, carbon footprint, photorespiration, C ₄ and CSM photosynthesis, fluorescence. | | | | | | Continuous assessment in the form of reports, presentations and tests with one three-hour examination paper. |

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| PLK334 | 16 | 8 | CESM 130301 | Min. PLK216 / PLK214 | Vegetation Science and Environmental Management | 2L, 3P |
| <p>Vegetation science deals with the structure and composition of plant communities. The vegetation is classified into ecologically recognizable units. Quantitative analyses, classification and ecological interpretation techniques, bio-monitoring techniques of land ecosystems, as well as rehabilitation methods will be discussed. During the practical, identification of species and plant survey techniques will be explained and the different environmental factors, influencing vegetation, will be pointed out.</p> <p>Key concepts: vegetation science, data interpretation and application.</p> | | | | | | Continuous assessment in the form of reports, presentations and tests with one three-hour examination paper. |
| PLK344 | 24 | 7 | CESM 130303 | Min PLK226/PLK224 | Plant Defence and Biotechnology | 2L, 3P |
| <p>The module deals with the defence mechanisms of plants against biotic (pathogens and insects) and abiotic (drought, heat, cold, ozone) stress factors on physiological and biochemical levels. Plants produce a high diversity of natural products or secondary metabolites which are used in pharmaceutical, agrochemical, flavour and aromatic industries. The accumulation of secondary metabolites in plants is also part of the defence response and plays a prominent function in the protection against predators and microbial pathogens. Plant secondary metabolites are described with the emphasis on their roles in plants, especially in the context of ecological interactions.</p> <p>Key concepts: Constitutive and induced defence, structural and biochemical defence, hypersensitive reaction, systemic acquired resistance, signal mechanisms, manipulation of resistance.</p> | | | | | | Continuous assessment in the form of reports, presentations and tests with one three-hour examination paper. |
| PLK354 | 16 | 7 | CESM 130304 | Min PLK216 / PLK212 | Plant Molecular Biotechnology | 2L, 3P |
| <p>The module focuses on the genetic analysis and transformation of plants which includes the cloning of plant genes, analysis of their roles <i>in planta</i> and the manipulation of plants through DNA transfer. Published research papers are used for all discussions where many different molecular techniques are described. The discussions focus on how these techniques are integrated in order to understand the roles of particular genes in plants. The cloning and analysis of the <i>Rpg1</i> plant disease resistance gene is used as an example.</p> <p>Key concepts: Gene cloning, plant defence, plant transformation, transgenic plants.</p> | | | | | | Continuous assessment in the form of reports, presentations and tests with one three-hour examination paper. |
| PLK302 | 8 | 7 | CESM 130301 | Min. PLK216 / PLK214 | Field Excursion 2 | A field excursion before the commencement of the first semester. |
| <p>Students will attend a field excursion to Hogsback in the Eastern Cape. During the excursion students will apply practical techniques in ecological and taxonomic research. Various vegetation survey techniques will be used to analyse vegetation structure and composition in grassland, fynbos and forest. Students will also learn to recognize the most common flowering plant families of the area and understand their relationship with more primitive plant groups like the Bryophytes, Pteridophytes and Gymnosperms. Students will gain experience in collecting herbarium specimens and management of collection data. Plant adaptations for survival in the forest, the characteristics of invasive alien plants and their impact on the indigenous vegetation will be studied in the field.</p> <p>Key concepts: Ecology, taxonomy, vegetation survey techniques, invasive alien plants, indigenous and endemic plants, morphological adaptations, herbarium collections, grassland, fynbos, forest, environmental factors.</p> | | | | | | Assessment in the form of posters, oral presentations, tests and practical work during the excursion. |
| PLK614 | 16 | 8 | CESM 130301 | 60 % for 4 PLK NQF level 7 modules | Advanced Plant Ecology | 3D, 6P |
| <p>This module deals with the nature of quantitative plant ecology and vegetation science, the description of natural vegetation, the characteristics of vegetation and environmental data, basic statistical analysis of the vegetation and environmental data, ordination and classification methods including the method of the Zürich-Montpellier school of vegetation classification. The latest on the mapping of southern Africa's vegetation will also be discussed.</p> <p>Key concepts: vegetation science, classification and ordination methods, vegetation description and mapping.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK624 | 16 | 8 | CESM 130303 | BSc degree in Botany | Plant Metabolism and Growth | 3D, 6P |
| <p>Different aspects of plant metabolism and growth control will be addressed in this module. It included the process and importance of mitochondrial electron transport in plants, the role and control of lipid mobilization in lipid rich seeds and hydroponics as an alternative plant cultivation and research technique.</p> <p>Key concepts:</p> <p>Mitochondrion: Cyanide sensitive electron transport, the alternative oxidase pathway, rotenone resistant electron transport, the exogenous NADH oxidase pathway, oxidative phosphorylation, energetics of electron transport</p> <p>Lipid mobilisation: lipases activity, beta-oxidation of fatty acids, the glyoxylate cycle, gluconeogenesis, interaction between glyoxysomes and mitochondria.</p> <p>Hydroponics: Hydroponic systems, nutrient media, sterilization, control of systems, nutrients - cycles and interaction. Hydroponic cultivation will be compared to organic and conventional cultivation practices.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |

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| PLK634 | 16 | 8 | CESM 130301 | BSc degree in Botany | Plant Molecular Systematics | 3D, 6P |
| <p>This module offers the study of phylogenetic systematics where the aim is to reconstruct the evolutionary history of a plant group. Concepts of phylogenetics will be discussed. DNA extraction, PCR techniques, sequencing and gel electrophoresis will be applied. Phylogenetic methods such as Parsimony and Bayesian Inference will be discussed and applied with computer based programmes using datasets to construct a phylogeny/cladogram. The measures of character fitness (CI, RI, HI) and testing support (Bootstrap, posterior probabilities) of clades in phylograms/cladograms will be discussed and applied for the different phylogenetic methods.</p> <p>Key concepts: Phylogenetic principles, DNA extraction, sequencing, cladograms, evolutionary history.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK644 | 16 | 8 | CESM 130303 | BSc degree in Botany | Plant Defence and Applications | 3D, 6P |
| <p>The response of plants during pest and/or pathogen attack is studied. Resistance and susceptibility are explained in terms of defence mechanisms. The concepts are discussed using published research articles where students must prepare and present articles during discussion sessions.</p> <p>Key concepts: Acquired resistance, elicitors, hypersensitive reaction (HR), induced resistance mechanism, signals and signal transduction.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK654 | 16 | 8 | CESM 130301 | BSc degree in Botany | Advanced Plant Taxonomy | 3D, 6P |
| <p>Plant systematics (which includes taxonomy) is the basis for information on biodiversity and almost all fields of biology rely on taxonomy. This module deals with the four main components of taxonomy, namely: Description, identification, classification and nomenclature. The principles and application of each of these components is investigated in terms of: Evolutionary research, ethno-botany, bio-prospecting and conservation planning. Students will gain practical experience in herbarium management and use of online resources for taxonomic research. The classification of flowering plants will be investigated and brought into context with South African flowering plant diversity.</p> <p>Key concepts: Description, identification, classification, nomenclature, evolution, ethno-botany, biodiversity, herbarium.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK664 | 16 | 8 | CESM 130303 | BSc degree in Botany | Ecosystem Management and Restoration | 3D, 6P |
| <p>Global warming and human overpopulation is a potential threat to existing ecosystems on the planet. Existing ecosystems should thus be managed and utilised in a sustainable manner. In cases where this much needed ecosystems are damaged or destroyed, intervention by man is required to ensure future food security and biodiversity. During this module, the causes and implications of disturbed terrestrial environments will be discussed in detail, and knowledge gained on the practical restoration of different types of disturbed environments.</p> <p>Key concepts: Ecosystems, sustainability, disturbed environments, restoration, food security, biodiversity.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK674 | 16 | 8 | CESM 130304 | BSc degree in Botany | Advanced Plant Molecular Biotechnology | 3D, 6P |
| <p>The response of plants following either a biotic or abiotic stimulus is very complex and specific. Using <i>Rpg1</i> as an example, the genetic improvement of resistance of crops against fungal diseases are discussed using published research articles. Students prepare and present these articles during weekly discussion sessions. Students will also present a short report in the form of an oral presentation on selected topics within the plant defence response.</p> <p>Key concepts: plant defence, pathogen infection, genetic engineering, transgenic plants.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK684 | 16 | 8 | CESM 130303 | BSc degree in Botany | Plant Analytical Biochemistry | 3D, 6P |
| <p>An introduction to plant secondary metabolites (natural products) including an overview of plant secondary metabolism, the classes, functions and biosynthesis of terpenoids, phenolic compounds and alkaloids. Finally, an introduction to biologically active plant secondary metabolites will be given.</p> <p>Key concepts: secondary metabolites, biosynthesis, biological activity and economic significance.</p> | | | | | | Continuous assessment in the form of a practical report, oral presentations and one three-hour examination paper. |
| PLK698 | 16 | 8 | CESM 130301 | BSc degree in Botany | Research Project | A research project that is presented over the course of the year. |
| <p>Students complete a research project within his/her field of interest under the guidance of a supervisor. A project hypothesis must be stated and tested so as to come to a logical conclusion.</p> | | | | | | Assessment in the form of a report and an oral presentation at the end of the second semester. |
| PLK696 | 24 | 8 | CESM 130301 | BSc degree in Botany | Literature Review | 3D, 6P |
| <p>Students complete a literature study on a given topic under the guidance of a supervisor.</p> | | | | | | Assessment in the form of a report and an oral presentation at the end of the first semester. |
| PLK700 | 180 | 9 | CESM 130301 | BSc Honours degree in Botany | Msc degree in Botany | |
| <p>Students do research on an approved topic for at least two semesters in consultation with the Division Head in preparation of a dissertation that will be submitted as the only requirement for obtaining the degree.</p> | | | | | | Assessment in the form of a completed dissertation. |

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| PLK900 | 360 | 10 | CESM 130301 | MSc degree in Botany | Phd degree in Botany | |
| Students do research on an approved topic for at least four semesters in consultation with the Division Head in preparation for a thesis that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed thesis. |
| PLK | 16 | 8 | CESM 130301 | BSc degree in Botany | | 3D, 6P |

PLANT BREEDING

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| PLT224 | 16 | 6 | CESM 010804 | Principles of Plant Breeding | 3L,3P |
| <p>Three lectures and three hours practical per week during the second semester.</p> <p>This module deals with the basic science of plant breeding with emphasis on genetic principles and concepts. This includes Mendelian, population and quantitative principles. The basic breeding techniques by which new varieties of self- and cross-pollinated crops as well as hybrids are developed will be studied. The emphasis is on conventional breeding but the student is exposed to laboratory and biotechnological techniques that serve as tools to improve breeding programmes.</p> <p>After completing this module the student will have an understanding of the basic concepts and techniques of plant breeding and their application. Assessment will entail questions in tests and exams that test basic knowledge of content and integration of knowledge.</p> | | | | | Assignments, class/ module tests and a final three-hour examination paper. The practical component will be evaluated based on a practical report. |
| PLT314 | 16 | 6 | CESM 010804 | Principles of Quantitative Genetics in Plant Breeding | 3L,3P |
| <p>This module concerns the principles of selection for qualitative and quantitative traits in plants. This includes the different methods that can be used to genetically improve self-pollinating, cross-pollinating and vegetatively propagated crops. The selection procedures are compared using mathematical formulae to determine response to selection. The influence of different environments on the phenotypical expression of traits as well as the genetic basis of inbreeding and heterosis are studied.</p> <p>After completion of the module, students will understand selection principles and will be able to decide on the best selection procedure for a specific breeding aim.</p> <p>Assessment will entail questions in tests and exams that test basic knowledge of content, integration of knowledge and solutions of problems.</p> | | | | | Assignments, class/module tests, and a final three-hour examination paper. The practical component will be evaluated on a practical report. |
| PLT324 | 16 | 6 | CESM 010804 | Breeding for Abiotic Stress Tolerance | 3L,3P |
| <p>This module covers important environmental factors and conditions that contribute to abiotic stress and how it reduces the plant's performance in production. Breeding procedures for different abiotic stresses like drought, heat, cold, salinity and water-logging will be addressed. Students will also apply breeding techniques in the greenhouse and will become familiar with key terms, concepts and principles of stress tolerance breeding.</p> <p>After successful completion of the module the student will be able to apply the principles that were dealt with and will be able to select the most appropriate breeding approach for crop improvement for stress tolerance.</p> <p>Assessment will entail questions in tests and exams that test basic knowledge of content, integration of knowledge and solutions of problems.</p> | | | | | Assignments, class/module tests, and a final three-hour examination paper. The practical component will be evaluated on a practical report. |
| PLT344 | 16 | 6 | CESM 010804 | Advanced Plant Breeding Techniques | 3L,3P |
| <p>This module will equip the student with knowledge on breeding techniques such as mutation breeding, tissue and anther culture, recombinant DNA-technology and plant transformation. Furthermore, legislative, labelling and ethical issues of genetically modified organisms (GMO's) will be addressed. After completion of the module the student will have a sound knowledge of breeding techniques which complement conventional breeding, as well as all aspects related to GMO's. Assessment will entail questions in tests and exams that test basic knowledge of content, integration of knowledge and solutions of problems.</p> | | | | | Three lectures and three hours practical per week during the second semester. Evaluation is by means of assignments, class/module tests, and a final three-hour examination paper. |
| PLT414 | 16 | 8 | CESM 010804 | Advanced Quantitative Genetics in Plant Breeding | 3L,3P |
| <p>This module consists of analysis of variance of data of different breeding techniques in early and late generations of self-pollinating plants, and in cross-pollinating and vegetatively propagated plants and calculation of variance components and heritability. The module also covers stability and genotype x environment interaction and the techniques used to analyse it.</p> <p>After completion of the module the students will know how to calculate variance components and heritability from different breeding systems, and know how to analyse and interpret genotype x environment interaction and stability of genotypes. Assessment will entail questions in tests and exams that test integration of knowledge, solutions of problems and test insight.</p> | | | | | Lecture blocks and computer practicals as arranged with the lecturer. Evaluation is by means of assignments, class/module tests, and a final three-hour examination paper. The computer component will be evaluated on an assignment report. |

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| PLT424 | 16 | 8 | CESM 010804 | | Quality and Stress Tolerance Breeding | 3L,3P |
| <p>In this module the student will gain knowledge on the application of plant breeding techniques for the improvement of quality, high and low temperature stress and moisture stress tolerance and insect and diseases resistance. On completion of the module the student will be able to initiate a breeding programme and formulate strategies for quality and stress tolerance and resistance breeding. Assessment will entail questions in tests and exams that test integration of knowledge, solutions of problems and test insight.</p> | | | | | <p>Lecture blocks and greenhouse practicals as arranged with the lecturer. Evaluation is by means of practical reports, assignments, class/module tests, and a final three-hour examination paper.</p> | |
| PLT434 | 16 | 8 | CESM 010804 | | Marker-Assisted Breeding | 3L,3P |
| <p>In this module students will be acquainted with different techniques used for marker-assisted breeding. Older as well as the newest DNA marker technologies and protein based methods will be studied. Students will learn to apply these techniques in DNA fingerprinting, for construction of linkage maps, for selection and use of mapping populations, in application of different strategies to target specific genes or genomic regions in plants and in functional genomics and gene discovery. On completion of the module, students will have a sound knowledge of the different techniques used for marker-assisted breeding and be able to apply these technologies in breeding programmes. Assessment will entail questions in tests and exams that test integration of knowledge, solutions of problems and test insight.</p> | | | | | <p>Lecture blocks and laboratory practicals as arranged with the lecturer. Evaluation is by means of student presentations, class/module tests, and a final three-hour examination paper.</p> | |
| PLT454 | 16 | 6 | CESM 010804 | | Statistics in Plant Sciences | |
| <p>In this module all statistics relevant to plant sciences will be covered in both theoretical classes as well as with computer analysis. Students will learn all principles related to statistical analyses and will learn how to design experiments, input data and interpret output of statistical analysis they did on different software packages. On completion of this module students will have an understanding of statistical concepts, and will be able to design experiments, input and analyse data and to interpret the data generated from statistical software. Assessment will entail questions in tests and exams that test integration of knowledge, solutions of problems and test insight.</p> | | | | | <p>Computer based tutorials and classes as arranged with the lecturer. Evaluation will be by means of computer tutorials, assignments, class/module tests, and a final three-hour examination paper.</p> | |
| PLT496 | 16 | 6 | CESM 010804 | | Literature Review | |
| <p>In this module the student will do a literature review on a specific topic in plant breeding, with the use of different resources. The student will learn how to present this information in an organised and logical format, which is scientifically correctly written, in the form of a seminar. On completion of this module students will know how to research a specific topic by using different resources, and how to write a literature review in a scientifically correct manner. Assessment will be done based on the written seminar and an oral presentation where the student will be evaluated on knowledge, insight and scientific writing skills.</p> | | | | | <p>Contact sessions as arranged by lecturers. No formal exams are required. The student hands in a written document for assessment and does an oral presentation.</p> | |
| PLT498 | 16 | 6 | CESM 010804 | | Research Project | |
| <p>The student will carry out a scientific project under supervision of a lecturer and will learn how to plan, and execute research, gather data, analyse and interpret the data, make conclusions from the data and write a scientific report. On completion of this module the student will be able to plan and execute a research project, know how to analyse the data, how to interpret it, and to compile a scientific report. Assessment will be done based on the written research report and an oral presentation where the student will be evaluated on knowledge, insight and scientific writing skills.</p> | | | | | <p>Contact sessions as arranged by lecturers. No formal exams are required. The student hands in a written document for assessment and does an oral presentation.</p> | |
| PLT614 | 16 | 8 | CESM 010804 | The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree. | Advanced Quantitative Genetics in Plant Breeding | L, P |
| <p>This module consists of analysis of variance of data of different breeding techniques in early and late generations of self-pollinating plants, and in cross-pollinating and vegetatively propagated plants and calculation of variance components and heritability. The module also covers stability and genotype x environment interaction and the techniques used to analyse it.</p> | | | | | <p>Assignments, class/module tests, and a final examination paper of three hours. The computer component will be evaluated on an assignment report.</p> | |
| PLT624 | 16 | 8 | CESM 010804 | The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree. | Quality and Stress Tolerance Breeding | L, P |
| <p>In this module the student will gain knowledge on the application of plant breeding techniques for the improvement of quality, high and low temperature stress and moisture stress tolerance and insect and diseases resistance.</p> | | | | | <p>Practical reports, assignments, Class/module tests, and a final three-hour examination paper.</p> | |

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| PLT634 | 16 | 8 | CESM 010804 | The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree. | Marker-Assisted Breeding | L, P |
| In this module students will be acquainted with different techniques used for marker-assisted breeding. Older as well as the newest DNA marker technologies and protein based methods will be studied. Students will learn to apply these techniques in DNA fingerprinting, for construction of linkage maps, for selection and use of mapping populations, in application of different strategies to target specific genes or genomic regions in plants and in functional genomics and gene discovery | | | | | Presentations, class/module tests, and a final three-hour examination paper. | |
| PLT654 | 16 | 8 | CESM 010804 | The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree. | Statistics in Plant Sciences | L, P |
| In this module all statistics relevant to plant sciences will be covered in both theoretical classes as well as with computer analysis. Students will learn all principles related to statistical analyses and will learn how to design experiments, input data and interpret output of statistical analysis they did on different software packages. | | | | | Computer tutorials, assignments, class/module tests, and a final three-hour examination paper. | |
| PLT696 | 16 | 8 | CESM 010804 | The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree. | Literature Review | L,P |
| In this module the student will do a literature review on a specific topic in plant breeding, with the use of different resources. The student will learn how to present this information in an organised and logical format, which is scientifically correctly written, in the form of a seminar. | | | | | No formal exams are required. The student hands in a written document for assessment and does an oral presentation. | |
| PLT698 | 16 | 8 | CESM 010804 | The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree. | Research Project | L,P |
| The student will carry out a scientific project under supervision of a lecturer and will learn how to plan, and execute research, gather data, analyse and interpret the data, make conclusions from the data and write a scientific report. | | | | | No formal exams are required. The student hands in a written document for assessment and does an oral. | |
| PLT700 | 16 | 8 | CESM 010804 | BSc Honours or BScAgric. degree in Plant Breeding or closely related field. | No formal exams are required. The student hands in a written document for assessment and does an oral. | L,P |
| Students do research on an approved topic for at least two semesters in consultation with the Division Head in preparation of a dissertation that will be submitted as a requirement for obtaining the degree. Extra modules may be required for students who do not have the correct scientific background. | | | | | Assessment in the form of a completed dissertation. | |
| PLK900 | 360 | 10 | CESM 010804 | MSc.Agric. degree in Plant Breeding or a closely related field | Phd degree in Plant Breeding | L,P |
| Students do research on an approved topic for at least four semesters in consultation with the Division Head in preparation for a thesis that will be submitted as a requirement for obtaining the degree. Extra modules may be required for students who do not have the correct scientific background. | | | | | | |

PLANT PATHOLOGY

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| PPG224 | 16 | 6 | CESM 130302 | Principles of Plant Pathology | 3L,3P |
| On completion of this module the student will be acquainted with the impact, causes and diagnosis of plant diseases and the reasons why plant pathology is considered an important field of study. The student will have a sound understanding, based on the basic concepts of infection and colonization of plant tissue, of how plant diseases arise and develop and how to approach disease problems. In conjunction with the theory of plant pathology the student will be capable of identifying diseases of the most important economic crops and of prescribing control methods. The student will also be experienced in the collection, identification, description and preservation of herbarium specimens. After completion of the module, students will: <ul style="list-style-type: none"> • Be able to understand the impact, causes and diagnosis of plant diseases and the reasons why plant pathology is considered an important field of study, • Have a sound understanding, based on the basic concepts of infection and colonization of plant tissue, of how plant diseases arise and develop and how to approach disease problems. Assessment criteria include knowledge, understanding, application and interpretation of concepts studied. | | | | | Two semester tests and a final three-hour examination paper. |

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| PPG314 | 16 | 7 | CESM 130302 | Mycological Plant Pathology | 3L,3P |
| <p>On completion of this module the student will be acquainted with the taxonomy and general characteristics of fungi, with specific reference to plant pathogens. The student will also be trained in the types of diseases, including post-harvest diseases that are caused by the main groups of fungi. In addition, the student will become acquainted with the use of fungal pathogens as biological control agents and their role in the production of mycotoxins that influence human and animal health. After completing the practical module the student will be able to identify the most important groups of plant pathogenic fungi and the symptoms they produce in plants.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Be able to understand the taxonomy and general characteristics of fungi and how to integrate this knowledge with the plant pathogenic abilities of mycelial fungi, • Be acquainted with the types of plant diseases that are caused by the main groups of fungi, • Have a good understanding of the use and application of fungi to the benefit of humans, • Have knowledge of the additional effects of fungal plant pathogens to the health and wellbeing of humans and animals. <p>Assessment criteria include knowledge, understanding, application and interpretation of concepts studied.</p> | | | | | Two semester tests and a final three-hour examination paper. |
| PPG324 | 16 | 7 | CESM 130302 | Plant Disease Management | 3L,3P |
| <p>On completion of this module the student will be acquainted with ecological and economic concepts that underlie the management of plant diseases within the context of a sustainable and integrated pest management (IPM) system. The student will be well versed in the basic ecological principles pertaining to the stability and diversity of natural ecosystem vs. agro-ecosystems as influenced by variation in agricultural crops and pathogenic micro-organisms.</p> <p>Together with a sound knowledge of integrating disease control tactics, by means of case studies, the student will thus be well trained in developing disease control strategies that are both efficient and cost-effective.</p> <p>Assessment criteria include knowledge, understanding and application of concepts studied.</p> | | | | | Practical reports and tests, presented assignments, class/module tests, and a final three-hour examination paper. |
| PPG334 | 16 | 7 | CESM 130302 | Bacterial and Viral Plant Pathology | 3L,3P |
| <p>This module will equip the successful student with a sound knowledge of the characterisation (i.e. morphology and classification), symptomology and diagnostics (the diseases caused), and ecology (survival and transmission) of bacteria and viruses that cause plant diseases. Various methods of managing and controlling diseases caused by these organisms will also be discussed. The practical module teaches the student how to isolate, identify and inoculate important plant pathogenic bacteria using specialised techniques.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Be able to understand the morphology and physiology of bacteria and viruses. • Be able to understand the basic principles of the taxonomy and classification. of plant bacteria and viruses. • Be able to understand the basic physiological processes that occur during infection of plants by bacteria and viruses. • Be able to understand the basic principles of managing plant diseases caused by bacteria and viruses. • Acquire a basic knowledge of the host ranges, distribution, epidemiology and management options for several examples of bacterial and viral diseases. <p>Assessment criteria include basic knowledge of the content, integration of knowledge, problem solving, and insight, as well as the application of techniques.</p> | | | | | Practical reports and tests, presented assignments, class/module tests, and a final three-hour examination paper. |
| PPG344 | 16 | 7 | CESM 130302 | Ecology of Plant Pathogens | 3L,3P |
| <p>On completion of this module the student is acquainted with the various disease causing organisms on plants. Their role in the environment and biological cycles, including infection, reproduction, dispersal and survival of fungi, bacteria and viruses will receive special attention.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Have an integrated knowledge of the ecological aspects on plant pathogens and their hosts. • Understand the range of ecological methods used to study plant pathogens. • Have detailed knowledge on the role the environment plays on the pathogenic behaviour of plant pathogens. <p>Assessment criteria include knowledge, understanding, application and interpretation of concepts studied.</p> | | | | | Practical reports and tests, presented assignments, class/module tests, and a final examination paper of three hours. |

| PPG444/PPG644 | 16 | 8 | CESM 130302 | Molecular Plant Pathology | 3L,3P |
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| <p>On completion of the module, students will have a basic overview and understanding of molecular plant pathology approaches and techniques, their application and how the use of the various molecular biology approaches can aid in various types of studies of plant pathogens. The course provides a basis on the structure and functionality of DNA and RNA, general and some more specialised but contemporary techniques used for molecular plant pathology, and how the various fields of molecular biology aid in understanding various aspects of plant pathology, such as pathogen detection or identification, molecular breeding, population studies, and host x pathogen interactions. After completion of the practical module the student will have some experience in certain basic aspects of molecular biology research, which is complementary to the theory.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Understand basic concepts of DNA and RNA. • Understand the basic principles of some of the most widely used molecular techniques used for plant pathology, and variations of these techniques. • Grasp what can be learnt from molecular plant pathology approaches, how it aids general plant pathology studies and which of the approaches are appropriate for what type of studies and questions, • Be able to choose these approaches and techniques in practical situations by understanding the principles, methodology, advantages and disadvantages of each. <p>Basic knowledge of the content, integration of knowledge, problem solving, and insight, as well as application of techniques.</p> | | | | | <p>Practical reports and tests, presented assignments, class/module tests, and a final three-hour examination paper.</p> |
| PPG424/PPG624 | 16 | 8 | CESM 130302 | Plant-Pathogen Interactions | 3L,3P |
| <p>The successful student will after completing this module have a sound knowledge of the physical and physiological effects that plant pathogens have on their hosts, particularly the methods they use to attack plants and how plants in turn defend themselves. Tutorial classes dealing with case studies of specific diseases extend the knowledge base of the student, particularly with regard to the variety of interactions between host and pathogen.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Be able to explain the physical and physiological interactions between plant pathogens and hosts. • Have a good concept of the role that the environment plays in plant/pathogen interactions. <p>Assessment criteria include knowledge, understanding, application and interpretation of concepts studied.</p> | | | | | <p>Practical reports and tests, presented assignments, class/module tests, and a final three-hour examination paper.</p> |
| PPG434/PPG634 | 16 | 7 | CESM 130302 | Epidemiology and Control of Plant Diseases | 3L,3P |
| <p>After completing this module the candidate will understanding the temporal and spatial aspects of plant disease development. The student will also be acquainted with how these aspects, together with the environment and host factors influence disease development in populations and how they can be integrated to control diseases. Following this module, the student will have practical experience in quantitative epidemiology.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Be able to measure and explain the temporal and spatial aspects of plant disease development. • Understand the role of environmental and host factors on disease development and how this can be integrated with disease control. • Be acquainted with the application of quantitative epidemiology. <p>Assessment criteria include knowledge, understanding, application and interpretation of concepts studied.</p> | | | | | <p>Practical reports, assignments, class/module tests, and a final three-hour examination paper.</p> |
| PPG496/PPG696 | 24 | 8 | CESM 130302 | Literature Review | 3L,3P |
| <p>A literature review that is presented over the course of the first semester. Students complete a literature study on a given topic under the guidance of a supervisor. The student compiles a review of a specific subject and delivers presentations of selected articles in plant pathology journals. On completion of this module the student is acquainted with literature searches, organising information, the compilation of information according to a specific format, as well as in written and verbal communication skills.</p> <p>After completion of the module, students will:</p> <ul style="list-style-type: none"> • Have knowledge in an area at the forefront of a selected field in Plant Pathology. • Have an understanding of the theories, research methodologies, methods and techniques relevant to the selected field. • Have the ability to critically review information gathering, evaluation and management processes in specialised contexts. • Have the ability to present and communicate academic, professional or occupational ideas effectively to an audience. | | | | | <p>Assessment will entail:</p> <ol style="list-style-type: none"> a report on the literature review. an oral presentation on the literature review at the end of the first semester where students must defend their own viewpoint. |
| PPG498/PPG698 | 32 | 8 | CESM 130302 | Research Project | |
| <p>Students complete a research project within his / her field of interest under the guidance of a supervisor. A project hypothesis must be stated and tested so as to come to a logical conclusion.</p> <p>The student completes a research project under the guidance of a supervisor and becomes skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.</p> <p>Students will be able to:</p> <ul style="list-style-type: none"> • Use a range of specialised skills to identify, analyse and address complex and/or abstract problems in the field of Plant Pathology. • Have an ability to critically review data gathering, evaluation and management processes in specialised contexts. • Have an ability to present and communicate academic, professional or occupational ideas effectively to an audience. | | | | | <p>A research project that is presented over the course of the year.</p> <p>Assessment will entail:</p> <ul style="list-style-type: none"> • a report in the form of a research article on the project results. • an oral presentation on the research project results at the end of the second semester. |

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| PPG701 | 180 | 9 | CESM 130302 | BScAgric degree in Plant Pathology | Msc Agric degree in Plant Pathology | |
| Students do research on an approved topic for at least two semesters in consultation with the Division Head in preparation of a dissertation that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed dissertation. |
| PPG702 | 180 | 9 | CESM 130302 | BSc Honours degree in Microbiology or relevant topic | MSc Agric degree in Mycology | |
| Students do research on an approved topic for at least two semesters in consultation with the Division Head in preparation of a dissertation that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed dissertation. |
| PPG901 | 360 | 10 | CSEM 130302 | MSc Agric degree in Plant Pathology | PhD degree in Plant Pathology | |
| Students do research on an approved topic for at least four semesters in consultation with the Division Head in preparation for a thesis that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed thesis. |
| PPG901 | 360 | 10 | CSEM 130302 | MSc degree in Mycology or relevant topic | PhD degree in Mycology | |
| Students do research on an approved topic for at least four semesters in consultation with the Division Head in preparation for a thesis that will be submitted as the only requirement for obtaining the degree. | | | | | | Assessment in the form of a completed thesis. |

12.3.4 DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY

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| DRK216 | 16 | 6 | CESM: 130601 | Parasites, Vectors and Toxic (Poisonous And Venomous) Animals | 3L |
| Evaluation by work assignments, class tests, two module tests and one examination paper of three hours. Identification, morphology, life cycles, pathology and treatment of parasites and vectors of medical and veterinary importance in Africa. Identification, nature and extent of veterinary and medically important poisonous and venomous invertebrates (excluding insects) and vertebrates in South Africa. Nature and action of different toxins as well as emergency treatment. | | | | | |
| DRK224 | 16 | 6 | CESM: 130601 | Africa Vertebrates | 3L |
| The unique diversity of the vertebrate fauna of Africa is pointed out with emphasis on the endemic fauna of the southern African sub region: Systematics, ecology, survival status, utilisation, etc. | | | | | |
| | 8 | 6 | CESM: 130601 | Invertebrate Biodiversity (Practical) | 1P |
| Taxonomy, functional morphology and anatomy, phylogeny, ontogeny and biology of selected invertebrate phyla. | | | | | |
| DRK262 | 8 | 6 | CESM: 130601 | Vertebrates: Research Techniques (Practical) | 1P |
| Research techniques which can be used for the efficient collection and analysis of data with regard to vertebrates in natural environments are explained and practically implemented. | | | | | |
| DRK314 | 16 | 7 | CESM: 130601, 131201 | Marine and Freshwater Ecology | 2L, 1P |
| The South African coast is unique largely as a result of ocean currents, which result in dividing our coastline into three distinct regions, each hosting a unique intertidal fauna. The composition of these ecosystems is studied with special reference to sandy beaches, rocky shores, kelp beds and estuaries. The practical component of this module is in the form of a marine field excursion during the autumn recess. In freshwater ecology basic limnological techniques are demonstrated. These include mapping of small dams, determining pH, conductivity, dissolved oxygen, etc., as well as techniques for collection, identification and quantification of aquatic organisms such as plankton, benthos, epibiont and fishes. | | | | | |
| DRK324 | 16 | 7 | CESM: 130601 | Life Strategies in Arid Environments | 2L, 1P |
| This module deals with life strategies of animals living in arid environments with special reference to thermoregulation, respiration, water balance and bioenergetics. | | | | | |
| DRK334 | 16 | 7 | CESM: 130601, 131201 | Conservation Ecology | 3L |
| The influence of human activities on ecosystems is critically reviewed. This includes humans as latecomers in evolution, man's ecological footprint, biodiversity, speciation, extinction and Africa's natural history. Some conservation issues are analysed. These include an evaluation of the state of our natural resources, translocation and introduction of aquatic animals, aquaculture, the mining industry and in particular the exploration of alluvial diamonds on the west coast, damming of rivers, etc. | | | | | |

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| DRK344 | 16 | 7 | CESM: 130604 | Animal Behaviour | 2L, 1P |
| Evaluation by work assignments, class tests, two module tests and one examination paper of three hours. Introduction to the study of animal behaviour where the logic of natural selection forms a continuous theme. As such aspects of genetics, ecology, evolution, physiology and human behaviour are also raised. | | | | Evaluation by work assignments, class tests, two module tests and a three-hour examination paper. | |
| ENT114 | 24 | 5 | CESM: 130699, 131201 | Introduction to Morphology, Anatomy and Bio-Ecology of Insects, as well as Agriculturally Important Insect Pests and Control Measures (Agricultural Service Module) | 3L, 1P |
| Introduction to entomology, morphology of body wall, head, thorax and abdomen, types of mouth parts, internal anatomy of organ systems, growth and metamorphosis, insect orders with examples and life cycles, identification of the most important pests of agricultural and veterinary importance and the damage and diseases caused by them, insects as vectors of plant and animal diseases, life cycles. Introduction to pesticide classification, development, method of operation, formulations and toxicity. Outcome: After completing this module, the student will have a better insight in basic morphology, anatomy and functioning of the insect body, and relate this to the most important pest insects in South African agriculture. | | | | Evaluation: class tests, two module tests, practical tests, work assignments and a three-hour examination paper. | |
| ENT216 | 24 | 6 | CESM: 130602 | Functional Morphology and Anatomy, Classification and Identification and Evolutionary Biology of Insects | 3L, four hours P |
| Characteristics of arthropods, in particular those of hexapods (insect-like organisms), morphology of head, thorax and abdomen, locomotory organs, mouth parts and reproductive organs, segmentation, growth and metamorphosis, anatomy of internal organs, characteristics to differentiate between orders, insect systematics and insect biology according to evolutionary form and function, processes and patterns, time and space and scale. Microscope and key identification of all developmental stages of insects up to family level, morphological and anatomical dissections of adult insects, elementary comparative morphology, basic classification of invertebrates and arthropods. | | | | Class tests, assignments, two module tests, one three-hour theory examination paper and one three-hour practical examination paper. | |
| ENT226 | 24 | 6 | CESM: 130602 | Ecophysiology of Insects | 3L, four hours P |
| Respiration, feeding and feeding habits, digestion, physiology of body wall, blood system, reproduction, metamorphosis, excretion and water regulation, thermoregulation, exo- and endocrine glands and pheromones, nervous system and light, mechanical and chemical reception of insects under variable environmental conditions. Laboratory trials concerning feeding and digestion, characteristics of body wall, respiration, excretion, blood circulation, communication and endocrine system. | | | | Service learning, class tests, assignments, two module tests, one three-hour theory examination paper and one three-hour practical examination paper. | |
| ENT314 | | | CESM: 130602 | Advanced Insect Ecology | 2L, three hours P |
| Main components of and basic processes in ecosystems, influences of environmental forces, insect – plant relationships, prey – predator interactions, parasite – host interactions, population dynamics, mutualism, pollination ecology, energy flow, characteristics of populations and communities, the niche concept. Practical determination of ecosystem functioning, habitat differentiation, biotic and abiotic components of a habitat, importance of environmental factors, species richness, life strategies, host relationships, guild structure and interaction, niche structure, population composition, morphological form and function, quantitative and qualitative analysis. | | | | Class tests, module tests, seminars, literature discussions, practical tests, practical reports, one three-hour theory examination paper and one three-hour practical examination paper. | |
| ENT324 | 16 | | CESM: 130699 | Applied Insect Pest Management | 2L, three hours P |
| Definition of a pest, economical threshold values, pest prediction- and monitoring, ecological principles, pest control and the environment, chemical control, integrated pest management, pesticide application. Practical field applications of pest management, case studies, calibration of pesticide application equipment, pesticide application techniques and principles. | | | | Class tests, two module tests, community service, practical tests, one three-hour theory examination paper and one three-hour practical examination paper. | |
| ENT334 | | | CESM: 130602 | Advanced Medical, Veterinary and Forensic Entomology | 2L, 1P |
| Identification of the medical and veterinary important insects, identification of the diseases they transmit, insects as vectors of diseases of man and animals, biology and life cycles, ecological preferences and host specificity, identification of forensic important insects and their role in forensic medicine. | | | | Class tests, module tests, seminars, literature discussions, practical tests, one three-hour theory examination paper and one three-hour practical examination paper. | |
| ENT344 | 16 | | CESM: 130602 | Applied Insect Biochemistry and Pharmacology | 2L, 1P |
| Biochemistry of flight muscles, metabolism of carbohydrates, lipids, amino acids, proteins and nucleic acids, biochemistry of growth and development, nervous system, pharmacology, detoxification and defensive excretions and application in chemical control. Setting up and conducting laboratory experiments on biochemical and pharmacological aspects of metabolism and key enzyme inhibition, pesticide identification and pesticide development. | | | | Class tests, two module tests, practical tests, one three-hour theory examination paper and one three-hour practical examination paper. | |

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| ENT354 | | | CESM: 130602 | Agricultural Entomology | 2L, three hours P |
| Identification of the most important South African pests of agricultural crops, biology, ecology and life cycles of pest species, the physical damage indices on agricultural crops, insects as vectors of diseases of agricultural crops, ecological preferences and host specificity. | | | | | Class tests, module tests, seminars, literature discussions, practical tests, one three-hour theory examination paper and one three-hour practical examination paper. |
| DRK614 | 16 | 6 | CESM :130601 | Research Techniques, Scientific Methodology and Scientific Communication | |
| After completion of this module the student will be familiar with selected techniques applicable in Zoology, as well as accessing scientific literature, organising and evaluating scientific information, compilation of information according to scientific standards and format, and written and oral scientific communication skills. | | | | | |
| DRK622 | 8 | 6 | CESM :130699 | Quantitative Ecology | |
| This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem | | | | | Evaluation on written and oral tasks. |
| DRK632 | 8 | 6 | CESM :130699 | Biodiversity (Evolution & Biogeography) | |
| Upon completion of this module students will be familiar with evolutionary change as the cornerstone of biological sciences | | | | | |
| DRK634 | 16 | 6 | CESM :130699 | Wetland ecology | |
| Wetland Ecology: The course will include the following topics: Wetlands in southern Africa, chemical and physical conditions in wetlands, biotic community of wetlands, wetlands as biological filters, threats to wetlands, production and productivity, as well as wetlands in arid environments | | | | | This course includes class work, presentations by students, practical work, seminars and an open book examination. |
| DRK642 | 8 | 6 | CESM :130699 | The Environment | |
| This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarise students in the latest developments regarding environmental sustainability and the role of man in this regard | | | | | Evaluation on written and oral tasks. |
| DRK654 | 16 | 6 | CESM :130699 | Veterinary Ectoparasitology | |
| The course focuses on the occurrence, biology, interaction with hosts and the environment, transmission of pathogen organisms to host and control of selected ectoparasites associated with domesticated animals and pets. Specific attention will be given to the development of resistance against chemical control and in management of this in especially farming activities. The course included both theoretical and practical components. This course will contribute to the student's ability to following a career in research, developing and marketing divisions of pharmaceutical companies. It could further contribute to the ability of a student to become involved in contract research. | | | | | |
| DRK664 | 16 | 6 | CESM : | Animal Behaviour / Veterinary Endoparasitology | |
| Animal Behaviour: A holistic approach is followed in order to understand and explain vertebrate animal behaviour under natural conditions. Attention is given to the basic principles of ethology, ecology and evolution. A sound knowledge of behavioural studies prepares students for a career in nature conservation, agriculture, academic institutions and for consulting work. Veterinary Endoparasitology. The course focuses on training the students in aspects of biology, epidemiology, diagnosis, treatment and control of veterinary important helminthes, protozoa and rickettsia parasites, as well as zoonoses of economic importance in South Africa. The practical aspects of this course include laboratory diagnostics and molecular parasitological techniques | | | | | |
| DRK674 | 16 | 8 | CESM :130699 | Aquatic Parasitology / Wetland Ecology | |
| Aquatic Parasitology: This course deals with water borne parasites, which spend at least a part of their lifecycle in water. It includes taxonomy, ecology, pathology, parasite host associations, epizootology and control of parasites. Wetland Ecology: The course will include the following topics: Wetlands in southern Africa, chemical and physical conditions in wetlands, biotic community of wetlands, wetlands as biological filters, threats to wetlands, production and productivity, as well as wetlands in arid environments. | | | | | |
| DRK684 | 16 | 8 | CESM :130699 | African Ornithology / Immunology | |
| African Ornithology: A comprehensive course dealing with the occurrence, distribution and behaviour of birds in an African context. Special attention will be given to factors regulating distribution and behaviour of birds. The course is a valuable addition to an ecological background, forming the basis for a wide spectrum of disciplines. Immunology: The course focuses on aspects of innate and specific immunology, and cell mediated and humoral immunity. It also includes antibody structure, biological characteristics of immunoglobulins, transfusion-immunology and immunological aspects of HIV-Aids. The practical aspects include an introduction to serological testing, immuno-diagnostics and immunological research techniques. | | | | | |

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| DRK692 | 32 | 8 | CESM :130601 | Research Essay | |
| The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analysing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies. | | | | | An oral examination and project report is required. The research project extends over the whole year. |
| DRK692 | 32 | 8 | CESM :130601 | Research Essay | |
| The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analysing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies. | | | | | An oral examination and project report is required. The research project extends over the whole year. |
| ENT614 | 16 | 8 | CESM :130601 | Research Techniques, Scientific Methodology and Scientific Communication | |
| After completion of this module the student will be familiar with selected techniques applicable in Entomology, as well as accessing scientific literature, organising and evaluating scientific information, compilation of information according to scientific standards and format, and written and oral scientific communication skills. | | | | | |
| ENT622 | 8 | 8 | CESM :130699 | Quantitative Ecology | |
| This module will be presented jointly by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem. | | | | | |
| ENT632 | 16 | 8 | CESM :130699 | Biodiversity (Evolution & Biogeography) | |
| Upon completion of this module students will be familiar with evolutionary change as the cornerstone of biological sciences | | | | | |
| ENT642 | 8 | 8 | CESM :130699 | The Environment | |
| This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarise students in the latest developments regarding environmental sustainability and the role of man in this regard | | | | | |
| ENT654 | 16 | 8 | CESM :130602 | Insect - Plant Interactions | |
| Upon completion of this module students will be familiar with the close association that exists between plant-feeding insects and their host plants. Knowledge of this has a strong application value in investigations where natural vegetation and cultivated plants are concerned. | | | | | |
| ENT664 | 16 | 8 | CESM :130602 | Medical and Veterinary Entomology | |
| This module deals with the bio-ecology, vector potential, and disease transmission and parasite-host relationships of insects of medical and veterinary importance. | | | | | |
| ENT674 | 16 | 8 | CESM :130602 | Forensic Entomology | |
| This module deals with the use of insects in criminal investigations of crime, especially violent crime such as murder, homicide, suicide and the neglect of children and elderly people. | | | | | |
| ENT684 | 16 | 8 | CESM :130699 | Pest Management | |
| After completion of this module students will have attained knowledge regarding the modern approaches towards all facets of pest management on plants and animals. | | | | | |
| ENT694 | 32 | 6 | CESM :130601 | Research Essay | |
| The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analysing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies | | | | | An oral examination and project report is required. The research project extends over the whole year. |
| DRK614 | 16 | 6 | CESM :130601 | Research Techniques, Scientific Methodology and Scientific Communication | |
| After completion of this module the student will be familiar with selected techniques applicable in Zoology, as well as accessing scientific literature, organising and evaluating scientific information, compilation of information according to scientific standards and format, and written and oral scientific communication skills. | | | | | |
| DRK622 | 8 | 6 | CESM :130699 | Quantitative ecology | |
| This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem | | | | | Evaluation on written and oral tasks. |

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| DRK632 | 8 | 6 | CESM :130601 | Biodiversity (Evolution & Biogeography) | |
| Upon completion of this module students will be familiar with evolutionary change as the cornerstone of biological sciences | | | | | |
| DRK634 | 16 | 6 | CESM :130601 | Wetland Ecology | |
| Wetland Ecology: The course will include the following topics: Wetlands in southern Africa, chemical and physical conditions in wetlands, biotic community of wetlands, wetlands as biological filters, threats to wetlands, production and productivity, as well as wetlands in arid environments | | | | | This course includes class work, presentations by students, practical work, seminars and an open book examination. |
| DRK642 | 8 | 6 | CESM :130601 | The Environment | |
| This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarise students in the latest developments regarding environmental sustainability and the role of man in this regard | | | | | Evaluation on written and oral tasks. |
| DRK654 | 16 | 6 | CESM :130699 | Veterinary Ectoparasitology | |
| The course focuses on the occurrence, biology, interaction with hosts and the environment, transmission of pathogen organisms to host and control of selected ectoparasites associated with domesticated animals and pets. Specific attention will be given to the development of resistance against chemical control and in management of this in especially farming activities. The course included both theoretical and practical components. This course will contribute to the student's ability to following a career in research, developing and marketing divisions of pharmaceutical companies. It could further contribute to the ability of a student to become involved in contract research. | | | | | |
| DRK664 | 16 | 6 | CESM :130604 | Animal Behaviour / Veterinary Endoparasitology | |
| Animal Behaviour: A holistic approach is followed in order to understand and explain vertebrate animal behaviour under natural conditions. Attention is given to the basic principles of ethology, ecology and evolution. A sound knowledge of behavioural studies prepares students for a career in nature conservation, agriculture, academic institutions and for consulting work. Veterinary Endoparasitology. The course focuses on training the students in aspects of biology, epidemiology, diagnosis, treatment and control of veterinary important helminthes, protozoa and rickettsia parasites, as well as zoonoses of economic importance in South Africa. The practical aspects of this course include laboratory diagnostics and molecular parasitological techniques. | | | | | |
| DRK674 | 16 | 8 | CESM :130699 | Aquatic Parasitology / Wetland Ecology | |
| Aquatic Parasitology: This course deals with waterborne parasites, which spend at least a part of their lifecycle in water. It includes taxonomy, ecology, pathology, parasite host associations, epizootology and control of parasites. Wetland Ecology: The course will include the following topics: Wetlands in southern Africa, chemical and physical conditions in wetlands, biotic community of wetlands, wetlands as biological filters, threats to wetlands, production and productivity, as well as wetlands in arid environments | | | | | |
| DRK684 | 16 | 8 | CESM :130699 | African Ornithology / Immunology | |
| African Ornithology: A comprehensive course dealing with the occurrence, distribution and behaviour of birds in an African context. Special attention will be given to factors regulating distribution and behaviour of birds. The course is a valuable addition to an ecological background, forming the basis for a wide spectrum of disciplines. Immunology: The course focuses on aspects of innate and specific immunology, and cell mediated and humoral immunity. It also includes antibody structure, biological characteristics of immunoglobulins, transfusion-immunology and immunological aspects of HIV/Aids. The practical aspects include an introduction to serological testing, immuno-diagnostics and immunological research techniques. | | | | | |
| DRK692 | 32 | 8 | CESM :130601 | Research Essay | |
| The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesising, planning, executing, analysing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies. | | | | | An oral examination and project report is required. The research project extends over the whole year. |
| DRK692 | 32 | 8 | CESM :130601 | Research Essay | |
| The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analysing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies. | | | | | An oral examination and project report is required. The research project extends over the whole year. |
| ENT614 | 16 | 8 | CESM :130601 | Research Techniques, Scientific Methodology and Scientific Communication | |
| After completion of this module the student will be familiar with selected techniques applicable in Entomology, as well as accessing scientific literature, organising and evaluating scientific information, compilation of information according to scientific standards and format, and written and oral scientific communication skills. | | | | | |

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| ENT622 | 8 | 8 | CESM :130699 | Quantitative Ecology | |
| This module will be presented jointly by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem. | | | | | |
| ENT632 | 16 | 8 | CESM :130699 | Biodiversity (Evolution & Biogeography) | |
| Upon completion of this module students will be familiar with evolutionary change as the cornerstone of biological sciences. | | | | | |
| ENT642 | 8 | 8 | CESM :130699 | The Environment | |
| This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarise students in the latest developments regarding environmental sustainability and the role of man in this regard | | | | | |
| ENT654 | 16 | 8 | CESM :130602 | Insect - Plant Interactions | |
| Upon completion of this module students will be familiar with the close association that exists between plant-feeding insects and their host plants. Knowledge of this has a strong application value in investigations where natural vegetation and cultivated plants are concerned. | | | | | |
| ENT664 | 16 | 8 | CESM :130602 | Medical and Veterinary Entomology | |
| This module deals with the bio-ecology, vector potential, and disease transmission and parasite-host relationships of insects of medical and veterinary importance. | | | | | |
| ENT674 | 16 | 8 | CESM :130602 | Forensic Entomology | |
| This module deals with the use of insects in criminal investigations of crime, especially violent crime such as murder, homicide, suicide and the neglect of children and elderly people. | | | | | |
| ENT684 | 16 | 8 | CESM :130699 | Pest Management | |
| After completion of this module students will have attained knowledge regarding the modern approaches towards all facets of pest management on plants and animals. | | | | | |
| ENT694 | 32 | 6 | CESM :130601 | Research Essay | |
| The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analysing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies. | | | | | An oral examination and project report is required. The research project extends over the whole year. |
| LIM692 | 32 | 8 | CESM :130601 | Research Essay | Research project stretches over the whole year |
| The student completes a research project under the guidance of a supervisor and is acquainted with problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results. | | | | | An oral presentation and a project report are required. |
| LIM693 | 24 | 8 | CESM :130601 | Research: Literature Study | |
| On completion of this module the student is acquainted with literature searches, organising information, the compilation of information according to a specific format, as well as in written and verbal communication skills. | | | | | A dissertation must be written of a specific subject and delivers a presentation on the topic. |
| LIM694 | 16 | 8 | CESM :130601 | Advanced Specialised Module | |
| A combination of advanced modules or subjects from [Botany or] a honours module from an appropriate discipline, which would be a meaningful supplement to the student's field of study. | | | | | |
| MOB614 | 16 | 8 | CESM :130699 | Water Resource Management | T,L,P |
| Introduction to the principles and protocols of aquatic resource management, which relate mainly to the functional ecology of water bodies. Stress will be laid on bio-monitoring protocols related to the national River Health Programme. Biological indices of water quality will be covered. The identification and ecology of mainly animal communities in rivers, lakes and temporary waters will be examined. This is a practical and tutorial-based course, which may be presented as a short block of intensive study. | | | | | Assessment via practical work, one written assignment, one oral assignment, and one three-hour examination. |
| PLK614 | 16 | 6 | CESM : | Plant Ecology | |
| PWS614 | 16 | 6 | CESM : | Research Techniques | Full-time lectures and practicals for the first three weeks of the Honours study |
| Lectures and practical sessions pertinent to techniques and skills. | | | | | An oral examination will be undertaken on completion of the module. |

12.3.5 DEPARTMENT OF CHEMISTRY

Take note: CHE112 + CHE122 + CHE132 + CHE142 + CHE151 + CHE161 is equivalent to CEM114 + CEM124.

Admission to second and third-year chemistry is subject to a selection process as only the 70 best students can be accommodated.

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| CEM112 | 8 | 4 | CESM: 140401 | Introduction to General Geosciences | 2L, 1T |
| <p>Energy and matter: Properties and states of matter, changes of states, energy involved in changes of state, composition of matter. Structure of matter: Fundamental particles inside the atom, isotopes, arrangement of electrons in the atom, energy sublevels, the periodic table. Chemical bonding: Molecules, stability of the atom, symbols and formulas, electron-dot structures, formation of ions, the covalent and ionic bond, oxidation numbers, percentage composition. Chemical equations and reactions: Balancing chemical equations, chemical equilibrium, reaction dynamics.</p> <p>The gaseous state: The kinetic molecular theory and combined gas laws, air pollution and health hazards. Oxygen and other gases: physical and chemical properties, preparation and medical application of a series of gases. Oxidation and reduction: Basic principles of redox chemistry, the importance of redox reactions in medicine. Water: Physical and chemical properties, purification and uses. Liquid mixtures: Properties and concentration of solutions, isotonic, hypo- and hypertonic solutions, diffusion and osmosis in living cells. Acids and bases: Chemical properties of acids and bases, medical applications, weak and strong acids/bases, the principle of pH, pH and health. Salts: Formation and medical applications of salts, buffer solutions. Organic chemistry: Introduction to organic chemistry, alkanes, alcohols, ethers, organic acids, the medical importance and applications of organic compounds, <i>as well as effective interaction and co-operation within the learning group.</i></p> | | | | | <p>Continuous: a minimum of four assignments. Formal: two written assessments and a final one-hour assessment.</p> |
| CEM114 | 16 | 5 | CESM: 140401 | Inorganic and Analytical Chemistry (Mainstream) | 3L, 1P |
| <p>Fundamental principles and stoichiometry: Classification of matter, valency, oxidation numbers, rules or nomenclature, stoichiometry, mole concept, empirical and molecular formula. Atomic structure: Quantum numbers, orbital filling with electrons ($Z = 36$), ionisation energy, electron affinity, atom and ion sizes. Volumetric analysis: Titration types, concentration terminologies like percentage, molar concentration with reference to milli-mol, μ-mol, mg l^{-1}, ppt and ppm, balancing or redox reactions, stoichiometric relations, standard solutions, volumetric measurements, mass measurements). Chemical bonding: Covalent bond theory, Lewis structures, resonance structures, electronegativity, polarity, hydrogen bond, ionic bond. Chemical equilibrium: Equilibrium constant, calculations involving equilibrium concentrations, Le Chatelier's principle, solubility product constant. Acids and base: Ionisation or H_2O and pH, strong acids and bases, titration curves for a strong acid/strong base, indicators, weak acids and bases, K_a and K_b, Brønsted-Lowry and Lewis acid theories, hydrolysis or salts, oxyacids, buffers. Chemistry in practice: Acetic acid and ammonia, modern materials, liquid crystals, ceramics and chemistry in the environment.</p> | | | | | <p>Continuous: a minimum of seven practical experiments and six assignments. Formal: two two-hour written assessments and a two-hour final assessment.</p> |
| CHE112 | 8 | 4 | CESM: 140401 | Introduction to Chemistry Development Module | 2L,1T |
| <p>Mathematical skills: Significant numbers, mathematical calculations, handling of logarithms to the base 10 and natural logarithms, the drawing of graphs on scale on graph paper. Classification of matter. The Periodic table, chemical formulas and nomenclature, basic structure of the atom, fundamental principles, ions and formation of molecules, relative atomic mass, molar mass. The mole concept, molar concentration, parts per million and percentage concentration, Introduction to acids and bases, relevant acid-base theories and pH-calculation. Introduction to gases – laws of Boyle, Charles and the combined gas laws as well as the Kelvin temperature.</p> | | | | | <p>Continuous: a minimum of four assignments. Formal: two written assessments and a final assessment of at least 1½ hours.</p> |
| CHE132 | 8 | 6 | CESM: 140404 | Organic Chemistry | 2L,1T |
| <p>Hybridisation of the carbon atom, properties, preparation and reaction of hydrocarbons, alkyl halides, alcohols, ketones, aldehydes, carboxylic acids, derivatives of carboxylic acids, introduction to stereoisomerism and reaction mechanisms.</p> | | | | | <p>Continuous: a minimum of four assignments. Formal: two written assessments and a final assessment of at least 1½ hours.</p> |
| CHE122 | 8 | 6 | CESM: 140405 | Physical Chemistry | 2L,1T |
| <p>Phases and Solutions: Description of the phases of matter and the influence of solutes on the phase characteristics of the gas phase (atmospheric pressure, pressure of a column {barometer, manometer}, Gas laws {Boyle, Charles, Avogadro, Ideal gas law, Dalton, Henry}). Colligative properties: Boiling point elevation and freezing point depression. Thermodynamics: Elementary calculation on heat transfer, the First Law of thermodynamics, thermochemical processes and introduction to reaction entropy and free energy. Reaction kinetics: Reaction orders and calculation of reaction rates, reaction times and half-lives. Electrochemistry: Voltaic cell, cell notation, cell potential, spontaneity.</p> | | | | | <p>Continuous: a minimum of four assignments. Formal: two written assessments and a final assessment of at least 1½ hours.</p> |
| CHE142 | 8 | 5 | CESM: 140403 | Inorganic and Analytical Chemistry | 2L,1T |
| <p>Empirical and molecular formulas as well as stoichiometry, Quantitative analyses: Gravimetry en Volumetry. Oxidation, reduction, oxidation number and balancing of redox reaction equations, Quantum mechanical atomic theory, electron distribution, polarity and periodicity, bonds, Lewis structures and molecular geometry. Chemical equilibrium and solubility products, acids, bases, pH and buffers.</p> | | | | | <p>Continuous: a minimum of four assignments. Formal: two written assessments and a final assessment of at least 1½ hours.</p> |

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| CHE151 | 4 | 5 | CESM: 140401 | Inorganic and Analytical Chemistry (Practical) | 3P |
| Chemistry. | | | | | Continuous: a minimum of seven practical experiments. A 70% attendance is compulsory for practicals. Formal: a final assessment of at least 1½ hours. |
| CHE161 | 4 | 6 | CESM: 140401 | Analytical, Physical and Organic Chemistry (Practical) | 3P |
| Analytical, Physical and Organic Chemistry. | | | | | Continuous: a minimum of seven practical experiments. A 70% attendance is compulsory for practicals. Formal: a final assessment of at least 1½ hours. |
| CEM124 | 16 | 6 | CESM: 140401 | Physical and Organic Chemistry (Mainstream) | 3L, 1P |
| Phases and Solutions: Description of the phases of matter and the influence of solutes on the phase characteristics or the gas phase (atmospheric pressure, pressure or a column {barometer, manometer} Gas laws {Boyle, Charles, Avogadro, Ideal gas law, Dalton, Henry}). Colligative properties: Boiling point elevation and freezing point depression. Thermodynamics: Elementary calculations on heat transfer, the first law or thermodynamics, thermochemical processes and introduction to reaction entropy and free energy. Electrochemistry: Voltaic cell, cell potential, cell notation, spontaneity. Reaction kinetics: Reaction orders and calculation of reaction rates, reaction times and half-lives. Quantum chemistry: Introductory concepts with respect to theoretical, structural and spectroscopic aspects. Hybridisation of the carbon atom, properties, synthesis and reactions of hydrocarbons, alkylhalides, alcohols, ketones, aldehydes, carboxylic acids and derivatives or carboxylic acids, introduction to stereochemistry and reaction mechanisms. | | | | | Continuous: a minimum of seven practical experiments and six assignments. Formal: two two-hour written assessments and a two-hour final assessment. |
| CEM144 | 16 | 5 | CESM: 140401 | Physical and Organic Chemistry | 3L, 1P |
| Phases and Solutions: Description of the phases of matter and the influence of solutes on the phase characteristics or the gas phase (atmospheric pressure, pressure or a column {barometer, manometer} Gas laws {Boyle, Charles, Avogadro, Ideal gas law, Dalton, Henry}), Colligative properties (boiling point elevation and freezing point depression). Thermodynamics: Elementary calculations on heat transfer, the first law or thermodynamics and thermochemical processes. Introductory Electrochemistry: Voltaic cell, cell potential, cell notation, spontaneity. Introductory Reaction kinetics: Reaction orders and calculation of reaction rates, reaction times and half-lives. (Emphasis on first order kinetics). Introduction to Organic Chemistry. Hybridisation of the carbon atom, properties, synthesis and reactions of hydrocarbons, alkyl halides, alcohols, ketones, aldehydes, carboxylic acids, derivatives or carboxylic acids, introduction to stereoisomerism and simple reaction mechanisms. Everyday applications, including the influence of chemical structure on physical properties and biological activity will be emphasised. | | | | | Continuous: a minimum of seven practical experiments and six assignments. Formal: two two-hour written assessments and a two-hour final assessment. |
| CEM214 | 16 | 6 | CESM: 140405 | CEM114, CEM124/144, WTW114/134 Physical Chemistry | 2L, 12P |
| Dynamics: Properties of gases and the kinetic molecular theory. Thermodynamics: Advanced application of the first, second and third laws of thermodynamics to chemical systems as well as thermochemical calculations. Phase studies: Properties of liquids and solutions. Phase equilibria: Quantify real gas-, liquid- and solid mixtures. Electrolytic solutions: To quantify electrolytic conductivity and transport. Quantum chemistry: Atomic structure through the Schrodinger equation as well as own functions, own values and amplitudes of selected examples. Quantum mechanics: Application of concepts in practice. | | | | | Continuous: a minimum of 10 practical experiments and seven assignments. Formal: two two-hour written assessments and a two-hour final assessment. |
| CEM224 | 16 | 6 | CESM: 140404 | CEM124/144, WTW114/134 Organic Chemistry | 2L, 12 P |
| Extension of the chemistry of carbonyl compounds, carboxylic acids and carboxylic acid derivatives. The chemistry of aromatic compounds: structure of benzene, aromaticity, electrophilic substitution, the influence of substituents on electrophilic substitution, aromatic halides and hydrocarbons, carbonyl and nitro compounds, phenols and hydroxycarbonyl compounds. Stereochemistry and conformation: synthesis and reactions of stereo-isomers. | | | | | Continuous: a minimum of nine practical experiments and seven assignments. Formal: two two-hour written assessments and a two-hour final assessment. |
| CEM232 | 8 | 6 | CESM: 140402 | CEM114, CEM124/144, WTW114/134 Analytical Chemistry | 1L, 8P |
| Basic principles of error of observation and analysis thereof, buffer systems, analytical techniques of gravimetry, oxidimetry and spectrophotometry. | | | | | Continuous: a minimum of six practical experiments and four assignments. Formal: two one-hour written assessments and a one-hour final assessment. |

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| CEM242 | 8 | 6 | CESM: 140403 | CEM214, CEM232 | Inorganic Chemistry | 1L, 8P |
| <p>Properties of covalent bonding (localised and delocalised) employing the Molecular Orbital theory, calculations on electronegativity, effective nuclear charge and magnetism, molecular geometry, chemical properties of the 3d transition metal ions, chemistry of π-acid ligands and their complexes such as carbonyls, isocyanide, dinitrogen, phosphines and cyano complexes, nomenclature of complex compounds.</p> | | | | | | <p>Continuous: a minimum of six practical experiments and four assignments. Formal: two one-hour written assessments and a one-hour final assessment.</p> |
| CEM314 | 16 | 7 | CESM: 140402 | CEM214, CEM232, CEM242, min.WTW124/144 | Analytical Chemistry | 2L, 10P |
| <p>Modern analytical techniques such as nuclear magnetic resonance, spectrometry, electroanalytical methods and classical analytical techniques such as potentiometry, voltammetry and amperometry. Gas chromatography, complexometry and UV/visible spectrometry.</p> | | | | | | <p>Continuous: a minimum of eight practical experiments and four assignments. Formal: two two-hour written assessments and a two-hour final assessment.</p> |
| CEM324 | 16 | 7 | CESM: 140403 | CEM314 | Inorganic Chemistry | 2L, 10P |
| <p>Bonding theories and the chemistry of organometallic complexes, solution behaviour of metal complexes, introductory theory of X-ray crystallography (powder and single-crystal X-ray crystallography) in structure analysis in the solid state, Solid state analyse of ionic compounds in centric cubic space groups. Advanced knowledge on coordination chemistry, specifically aimed at the crystal field and molecular orbital theories (as reflected in simple electronic spectra and magnetic properties), organometallic chemistry, substitution mechanisms in square-planar and octahedral complexes and general industrial and catalytic applications of organometallic catalysts.</p> | | | | | | <p>Continuous: a minimum of eight practical experiments and four assignments. Formal: two two-hour written assessments and a two-hour final assessment.</p> |
| CEM334 | 16 | 7 | CESM: 140405 | CEM214, CEM232, min.WTW124/144 | Physical Chemistry | 2L, 10P |
| <p>Dynamics: Chemical kinetics and surface chemistry. Thermodynamics: Advanced chemical thermodynamics, free energy, chemical equilibrium, multicomponent systems and electrochemistry. Macromolecular chemistry: The syntheses, characterisation and molecular mass determination of polymers. Basic principles of nuclear and radiochemistry.</p> | | | | | | <p>Continuous: a minimum of eight practical experiments and four assignments. Formal: two two-hour written assessments and a two-hour final assessment.</p> |
| CEM344 | 16 | 7 | CESM: 140404 | CEM224 | Organic Chemistry | 2L, 10P |
| <p>The principles and applications of physical techniques (e.g. NMR). Introduction to dynamic stereochemistry. Advanced reactions, mechanisms and their stereochemistry including reactions of carbohydrates, the Diels-Alder reaction, the addition of alkenes (e.g. oxymercuration, hydroboration, analyse addition), nucleophilic addition of aldehydes and ketones (e.g. Wittig reaction, Cannizzarro reaction), alpha substitution of carbonyl compounds (e.g. alpha-halogenation, alkylation of enolate ions) and carbonyl condensation reactions (e.g. Claisen condensations).</p> | | | | | | <p>Continuous: a minimum of eight practical experiments and four assignments. Formal: two two-hour written assessments and a two-hour final assessment.</p> |
| CEM614 | 16 | 7 | CESM: 140403 | A selection process | Inorganic Chemistry | 1L, 12P |
| <p>Multi-Nuclear NMR applications with regard to structure/reactivity relationships in Organometallic Chemistry, Industrial processes and chemicals, The chemical industry, Volume of activation, Metal carbonyls, as well as the acquisition and development of skills and techniques with respect to inorganic applications and clear concise scientific reporting of experimental procedures and effective interaction and co-operation within the learning group. Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments. Formal: A final assessment of 2 hours.</p> |
| CEM624 | 16 | 7 | CESM: 140403 | A selection process | Inorganic Chemistry | 1L, 12P |
| <p>Nuclear medicine, Reaction mechanisms, homogeneous catalysis, X-ray crystallography, as well as the acquisition and development of skills and techniques with respect to inorganic applications and clear concise scientific reporting of experimental procedures and effective interaction and co-operation within the learning group. Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments. Formal: A final assessment of 2 hours.</p> |
| CEM634 | 16 | 7 | CESM: 140405 | A selection process | Physical Chemistry | 1L, 12P |
| <p>Depending on the research focus for a particular year, as determined by this division, selected topics will be chosen from the following list to stimulate post graduate research. After successful completion of this module the learner will be able to demonstrate knowledge, and understanding of the fundamental principles underpinning physical chemistry of the selected topics. The topics are: Polymer Chemistry (A), Polymer Chemistry (B), Molecular Structure and Spectroscopy, Thermodynamics, Activation parameters and molecular dynamics, Electrolytic Chemistry, Statistical Thermodynamics, Bio- Inorganic Chemistry, Electrochemistry, Inorganic polymer chemistry, Computational Chemistry, Heterogeneous Catalysis, as well as the acquisition and development of skills and techniques with respect to analysis of physical/chemical applications and clear concise scientific reporting of experimental procedures and effective interaction and co-operation within the learning group. Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments. Formal: A final assessment of 2 hours.</p> |

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| CEM644 | 16 | 7 | CESM: 140405 | A selection process | Physical Chemistry | 1L, 12P |
| <p>Depending on the research focus for a particular year, as determined by this division, selected topics will be chosen from the following list, excluding topics already chosen for CEM634, to stimulate post graduate research. After successful completion of this module the learner will be able to demonstrate knowledge, and understanding of the fundamental principles underpinning physical chemistry of the selected topics. The topics are: Polymer Chemistry (A), Polymer Chemistry (B), Molecular Structure and Spectroscopy, Thermodynamics, Activation parameters and molecular dynamics, Electrolytic Chemistry, Statistical Thermodynamics, Bio- Inorganic Chemistry, Electrochemistry, Inorganic polymer chemistry, Computational Chemistry, Heterogeneous Catalysis, as well as the acquisition and development of skills and techniques with respect to analysis of physical/chemical applications and clear concise scientific reporting of experimental procedures and effective interaction and co-operation within the learning group.</p> <p>Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments.</p> <p>Formal: A final assessment of 2 hours.</p> |
| CEM654 | 16 | 7 | CESM: 140404 | A selection process | Organic Chemistry | 1L, 12P |
| <p>NMR and Mass spectrometry, Protecting groups in organic synthesis, Organometallic reactions. After successful completion of this module the student will have knowledge and understanding of the fundamental principles underpinning organic chemistry of the selected topics.</p> <p>Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments.</p> <p>Formal: A final assessment of 2 hours.</p> |
| CEM664 | 16 | 7 | CESM: 140404 | A selection process | Organic Chemistry | 1L, 12P |
| <p>Radical and photo chemistry, Secondary metabolites, Retrosynthesis, Stereochemistry and stereoselective reactions. After successful completion of this module the student will have knowledge and understanding of the fundamental principles underpinning organic chemistry of the selected topics.</p> <p>Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments.</p> <p>Formal: A final assessment of 2 hours.</p> |
| CEM674 | 16 | 7 | CESM: 140402 | A selection process | Analytical Chemistry | 1L, 12P |
| <p>NMR, Statistical aids to hypothesis, Chromatography, Analysis of real samples, Spectrophotometric methods, Ion exchange, Ion selective electrodes, Validation Statistical evaluation of analytical data. Theories of specific molecular analyses like Nuclear Magnetic Resonance Spectroscopy, spectrophotometric methods such as UV/visible spectroscopy, Inductive Coupled Plasma and Atomic Absorption Spectroscopy. Other topics include Infrared spectroscopy, Fundamentals of Chromatographic separations, Ion selective electrodes and Statistical evaluation of analytical data. Chemical analyses using ion exchange and electro-gravimetry as well as method development and validation in line with the requirements of ISO 17025.</p> <p>Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments.</p> <p>Formal: A final assessment of 2 hours.</p> |
| CEM684 | 16 | 7 | CESM: 140402 | A selection process | Analytical Chemistry | 1L, 12P |
| <p>Theories on Separation Techniques, XRD/XRF, Mass Spectroscopy, Liquid/liquid extraction. Radiochemical and Thermal Methods as well as surface characterisation. Continuation of technical and managerial requirements for method development and validation in line with the requirements of ISO 17025.</p> <p>Practical work: 12 sessions of 8 hour practicals.</p> | | | | | | <p>Continuous: Reports on practical experiments and minimum 2 tests/seminars/assignments.</p> <p>Formal: A final assessment of 2 hours.</p> |
| CEM700 | 180 | 9 | CESM: | BSc Honours degree in Chemistry | Chemistry Dissertation | 2 Semr R |
| <p>Research work on an approved topic in one of the following research areas, namely: Inorganic, analytical, Physical, or Organic Chemistry of the department. These provide evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and as well as that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.</p> | | | | | | <p>An oral examination can be required after submission of the dissertation in which the research results are thoroughly presented.</p> |

12.3.6 DEPARTMENT OF PHYSICS

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| FSK112 | 8 | 4 | CESM: 140101 | Physics for Students in the Building Sciences | 2L | |
| <p>Mechanics: Revision of the concepts displacement, velocity, acceleration, force, work, energy, power and momentum. Addition and resolving of vectors. Equilibrium. Moment of force and equilibrium. Equations of motion: Linear motion. Newton's second law, mass, weight. Work and energy. Elasticity and surface tension.</p> <p>Heat and thermodynamics: Temperature and its measurement, thermal expansion. Heat, units and transfer.</p> <p>Electricity: Potential, electrical current and circuits, electromagnetic induction, electromagnetic waves, alternating currents and transformers.</p> <p>Light, sound and colour: Nature and propagation, optics, reflection, refraction, illumination.</p> | | | | | One two-hour examination paper. | |
| FSK114 | 16 | 5 | CESM: 140101 | With WTW114/134 | Mechanics, Optics and Electricity | 3 L, 1 T/P |
| <p>Logical exposition of fundamental principles and the development of problem solving skills are addressed.</p> <p>Mechanics: Revision of the elementary concepts: Displacement, velocity, acceleration, force, work, energy, power, projectile motion and rotation. In the above vector quantities and simple calculus is used wherever needed.</p> <p>Geometrical optics: The electromagnetic spectrum, plane mirrors, spherical mirrors, image formation, thin lenses, optical instruments.</p> <p>Electricity: Electrical charge, electrical field, electrical potential, current, resistance, circuits.</p> | | | | | One two-hour examination paper. | |
| FSK124 | 16 | 6 | CESM: 140101 | Min.FSK114/134, min.WTW114/134 | Mechanics, Thermodynamics, Electricity and Magnetism | 3I, 1T/P |
| <p>Logical exposition of fundamental principles and the development of problem solving skills are addressed.</p> <p>Mechanics: Momentum, collisions, rotation, gravitation, oscillations, waves.</p> <p>Thermodynamics: Temperature, heat, first law of thermodynamics, kinetic theory of gases, entropy, second law of thermodynamics.</p> <p>Electricity and magnetism: Gauss's law, capacitance, magnetic field, ampere's law, induction and inductance, simple alternating current circuits.</p> | | | | | One two-hour examination paper. | |
| FSK134 | 16 | 5 | CESM: 140101 | | Mechanics, Optics, Electricity, Biologically and Medically Relevant Topics | 3L |
| <p>Applications of physics in biology and medicine are discussed in this module.</p> <p>Mechanics: Revision of the elementary concepts: Displacement, velocity, acceleration, force, work, energy, power. Treatment of the above without calculus.</p> <p>Geometrical optics: The electromagnetic spectrum, plane mirrors, spherical mirrors, image formation, thin lenses, optical instruments.</p> <p>Electricity: Electrical charge, electrical field, electrical potential, current, resistance, circuits.</p> <p>Biologically and medically relevant topics: Physical principles of apparatus used in biology and medicine, some applications of physics in these fields.</p> | | | | | One two-hour examination paper. | |
| FSK144 | 16 | 5 | CESM: 140101 | | Mechanics, Thermodynamics, Electricity, Magnetism, Biologically and Medically Relevant Topics | 3L,1T/P |
| <p>Applications of physics in biology and medicine are discussed in this module.</p> <p>Mechanics: Momentum, collisions, rotation, gravitation, oscillations, waves.</p> <p>Thermodynamics: Temperature, heat, first law of thermodynamics, kinetic theory of gases, entropy, second law of thermodynamics.</p> <p>Electricity and magnetism: Gauss's law, capacitance, magnetic field, amperé's law, induction and inductance, simple alternating current circuits.</p> <p>Biologically and medically relevant topics: Physical principles of apparatus used in biology and medicine, some applications of physics in these fields.</p> | | | | | One two-hour examination paper. | |
| FSK154 | 16 | 5 | CESM: 140201 | | Introductory Astronomy | 1L |
| <p>The sky as a celestial sphere, including the visibility of stars and constellations, Cycles of the moon, the seasons and eclipses, Heliocentric universe and Kepler's laws of planetary motion, Stars, their types, structure, spectral classification and the Hertzsprung-Russell diagram, formation, evolution and death of stars, neutron stars and black holes, Galaxies and the Milky way, The big bang and the age of the universe, astronomical measurements and techniques applicable to multi-wavelength astronomy.</p> | | | | | One two-hour examination paper. | |
| FSK164 | 16 | 6 | CESM: 140201 | FSK154 | Principles and Practice of Observational Astronomy | 3L, 6P |
| <ul style="list-style-type: none"> Astronomical Instrumentation: Telescopes (Radio, Infrared, Optical, X-ray and Gamma-Ray). Telescope Optics (Resolving Power and Magnification). Astronomical Observations and Measurements: Photometry, Spectroscopy, Parallax measurements to determine distances to stars. Introduction to the Celestial Sphere, Basics of spherical geometry. Coordinate systems: Equatorial (RA-Dec), alt-Az system, Ecliptic coordinates, Galactic Coordinates, Sidereal Time. Introduction to Celestial Mechanics (Two Body problem). Introduction to practical CCD photometry. | | | | | One two-hour examination paper. | |

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| FSK214 | 16 | 6 | CESM: 140101 | FSK114/134, FSK124/144, WTW114/134, WTW124/144 | Mechanics, Waves and Optics | 3L |
| <p>Much of physics and engineering demands a thorough knowledge of vibrating systems and wave behaviour. After a review of Newtonian dynamics, it is applied to systems experiencing a restoring force, leading to simple harmonic motion. This theory is generalised to the cases of damped and driven oscillators. The wave equation is derived, and standing waves, as well as the reflection and transmission of waves are explained. Polarization, interference and diffraction of light, illustrating its wave nature, are then discussed.</p> | | | | | | One three-hour examination paper. |
| FSK224 | 16 | 6 | CESM: 140101 | FSK114/134, FSK124/144, WTW114/134, WTW124/144 | Electronics | 2L, 1P |
| <p>Electronics: Properties of semiconductors, diodes, rectifier circuits, zener diodes, power supplies, transistors, transistor amplifiers, operational amplifiers, operational amplifiers in feedback circuits, timer circuits, digital circuits and computers ports. Practical work in electronics: Diodes, power supplies, transistors, operational amplifiers in feedback circuits, timer circuits, digital circuits and computers control. A project and seminar.</p> | | | | | | One three-hour examination paper. |
| FSK232 | 8 | 6 | CESM: 140101 | With FSK232 | Practical Work: Physics | 1P |
| <p>Practical work on oscillations, waves and optics: Experiments with mechanical oscillations, light interference, and computer simulations of waves and Fourier analysis.</p> | | | | | | One practical session of five hours per week during the first semester. |
| FSK242 | 8 | 6 | CESM: 140101 | FSK214 | Electromagnetism | 2L |
| <p>The electromagnetic force is one of the four fundamental forces in nature. It dominates the interaction of matter on the atomic scale and governs the behaviour of the full spectrum of electromagnetic waves.</p> | | | | | | One practical session of five hours per week during the first semester. |
| FSK254 | 16 | 6 | CESM: 140101 | | Ophthalmic Optics/Visual Optics | 3L |
| <p>This module covers the basics of lens materials including single vision lenses, prisms, bifocals and vertical imbalance. Optical principles are applied to the study of ophthalmic lenses including spheres, cylinders, prisms, multi-focal lenses and contact lenses. Design parameters for ophthalmic lenses and applications to the correction of vision defects are also discussed. Students are familiarised with the basic optical structure of the eye as well as the cornea and lens as refracting components, the pupil as a limiting aperture and paraxial schematic eye. Other topics in the module will include the following: image formation and refraction, optical effects of ophthalmic lenses, light and the eye, aberrations and retinal image quality.</p> | | | | | | One three-hour examination paper. |
| FSK264 | 16 | 6 | CESM: 140101 | FSK114/134, FSK254, FSK124/144 | Special Ophthalmic Optics | 3L |
| <p>Fundamentals of optics with specific application to the ocular system, Concepts of optics, geometrical optics and paraxial optics, Spectacle design and materials, Commercial coatings, treatments and tints, Contact lens design materials, Differences in optical property calculations between contact lenses and spectacles, New surgical and laser treatments.</p> | | | | | | One three-hour examination paper. |
| FSK314 | 16 | 7 | CESM: 140101 | FSK214 | Modern Physics | 3L |
| <p>Special relativity: Galilean and Lorentz transformations, length contraction, time dilation, relativistic Doppler shift and aspects of relativistic mechanics. Particle properties of waves: Black-body radiation, photo-electric effect, Compton effect, gravitational red and blue shift, Mössbauer effect and applications. Wave properties of particles: Electron diffraction, de Broglie waves, probability waves, Heisenberg's uncertainty principle. Introductory quantum physics: Schrödinger's equation, one dimensional potential well, quantum mechanical tunnelling and its applications, hydrogen atom, orbital angular momentum and electron spin, Zeeman effect and applications. Nuclear Physics: The atomic nucleus, radioactivity, quantum mechanical treatment of alpha-decay, nuclear fission and fusion reactions, reaction rate, neutron transport in reactors.</p> | | | | | | One three-hour examination paper. |
| FSK324 | 16 | 7 | CESM: 140101 | FSK314 | Solid-State Physics | 3L |
| <p>Structure of solids: Crystallography, crystal planes, crystal lattice, reciprocal lattice, Defects: point defects, dislocations, X-ray diffraction. Lattice dynamics: Lattice vibrations: Einstein and Debye models, normal modes and density of states, thermal properties, Brillouin zones. Free electron model: Electrical and thermal conduction, Fermi level, Hall effect. Periodic Potential: Band theory: Nearly free electron and tight binding approach.</p> | | | | | | One three-hour examination paper. |
| FSK332 | 8 | 7 | CESM: 140101 | FSK214 | Statistical Physics I | 1L |
| <p>Phase space, distribution function, the most probable distribution, Lagrange multipliers, Boltzmann distribution, degeneracy of energy levels, the Maxwell-Boltzmann velocity distribution, the Maxwell-Boltzmann speed and energy distributions, the derivation of the equation of state of an ideal gas using the Maxwell-Boltzmann distribution, paramagnetism. Applications in terms of transport processes like effusion and diffusion, derivation of the hydrodynamic equations of motion of gases and fluids, heat conduction, propagation of sound waves, and viscosity.</p> | | | | | | One three-hour examination paper. |

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| FSK342 | 8 | 7 | CESM: 140101 | FSK332 | Statistical Physics II | 1L |
| Quantum statistics, the Fermi-Dirac and Bose-Einstein statistics and distributions, the equation of state of a quantum gas, Fermi temperature, low-temperature properties of a degenerate gas, the degenerate electron gas, valence and conduction bands in semiconductors, degenerate gases in astrophysics: white dwarfs and neutron stars, Blackbody radiation, the photon gas, stimulated emission, Debye specific heat, electron specific heat. | | | | | | One two-hour examination paper. |
| FSK352 | 8 | 7 | CESM: 140101 | FSK232 (with FSK314 and FSK332) | Practical Work: Physics | 1P |
| Practical work on phenomena that are explained by modern physics, as well as a few experiments in statistical physics and thermodynamics. | | | | | | |
| FSK362 | 8 | 7 | CESM: 140101 | FSK232 (with FSK324 and FSK342) | Practical Work: Physics | 1P |
| Practical work on phenomena that are explained by solid state theory as well as a few experiments in statistical physics and thermodynamics. | | | | | | |
| FSK372 | 8 | 7 | CESM: 140101 | FSK214, FSK242 | Radiative Processes I | 1L |
| Fundamentals of radiative transport, intensity, radiative momentum and transfer, thermal radiation, the Einstein coefficients, scattering effects random walks and radiatediffusion. A brief introduction of radiation fields, review of Maxwell's equations. Plane electromagnetic waves, Electromagnetic potentials. The radiation of moving charges: the Larmor formula, Thomson scattering, radiation from harmonically bound charges. Introduction of relativistic mechanics, emission of relativistic particles, invariant phase volumes and specific intensity. An investigation of the fundamentals of radiation propagating through a magnetised plasma, e.g. introducing the plasma frequency, Faraday rotation and Cerenkov radiation, the Razin effect. | | | | | | One two-hour examination paper. |
| FSK382 | 8 | 7 | CESM: 140101 | FSK314, FSK332, FSK372 | Radiative Processes II | 1L |
| The emission of single speed electrons in the vicinity of a massive nucleus, thermal bremsstrahlung emission, relativistic bremsstrahlung, synchrotron emission, expressions for the total emitted power, beaming, Compton and Inverse-Compton scattering, cross section, energy transfer and spectral regimes, atomic structure (review of the Schrodinger equation and fundamentals of atomic physics), Zeeman effect and hyperfine structure, thermal distribution of ionised energy levels leading to the Saha equation, radiative transitions (Milne relations) and line broadening mechanisms, e.g. Doppler broadening, natural broadening and collisional broadening mechanisms. | | | | | | One two-hour examination paper. |
| FSK700 | 180 | 9 | CESM: | BSc Honours degree in Physics | Physics Dissertation | 2 Sem R |
| Research work on an approved topic in one of the research fields of the department. These provide evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and as well as that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny. | | | | | | An oral examination can be required after submission of the dissertation in which the research results are thoroughly presented. |
| FSK791 | 100 | 9 | CESM: | BSc Honours degree in Physics | Physics Dissertation | |
| National Astrophysics and Space Science Programme (NASSP) must do an Extended research essay on an approved subject, in consultation with the departmental chair, after having already completed a theoretical course component. | | | | | | An oral examination can be required after submission of the dissertation in which the research results are thoroughly presented. |
| FSK725 | 100 | 9 | CESM: | BSc Honours degree in Physics | Astrophysics and Space Science | |
| FSK725 – Astrophysics and Space Science (80 credits) presented by the University of Cape Town (UCT) consisting of a total of 5 UCT weight points from the NASSP Master's programme (www.star.ac.za). | | | | | | An oral examination may be required which will be arranged with the candidate after the extended research essay has been submitted. |

12.3.7 DEPARTMENT OF COMPUTER SCIENCES AND INFORMATICS

- Computer Literacy: BRS111 and BRS121 do not contribute to the credits of the degree, but are compulsory if the programme prescribes it and the student did not pass the promotion test at the beginning of the semester. If the student passes the promotion test, he/she is exempted from it and does not need to register for it. Students who passed grade 12 Information Technology (IT) on performance level 5(60%), or Computer Application Technology (CAT) on performance level 6 (70%), are exempted from BRS111.
- It will be expected from BSc (IT) students to do at least one student assistantship in the Department of Computer Science and Informatics in the second or third year of study.
- The contents of BRS111, BRC111 and BRS131 are the same.
- The contents of BRS121 and BRS141 are the same.

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| BRS 111 | 4 | 5 | CESM: 060599 | | Computer Literacy: Part 1 | 1L, 3P |
| A basic knowledge of the principles of microcomputers and microcomputer hardware, the basic commands of the operating system, a general word processing program, a spreadsheet program, presentation program and the internet. The student must also be able to apply the knowledge. | | | | | Continuous assessment, no special examinations are granted. | |
| BRS 121 | 4 | 5 | CESM : 060599 | BRS 111 | Computer Literacy: Part 2 | 1L, 3P |
| Basic commands of a database program, as well as advanced commands of a general word processing program, a spreadsheet program and a presentation program. The student must also be able to apply the knowledge. | | | | | Continuous assessment, no special examinations are granted. | |
| RIS114 | 16 | 6 | CESM: 060201 | with BRS111 | Programming And Problem Solving: Part 1 | 3L, 3P |
| A student should be well acquainted with the professional implementation of computerised solutions in an object-oriented, high-level programming environment. The module provides an introduction to problem solving, algorithms, classes, objects, properties and methods. Control structures, e.g. selection and iteration, and input and output are also covered. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 124 | 16 | 6 | CESM : 060201 | RIS114 or RIS 144 | Programming and Problem Solving: Part 2 | 3L,3P |
| This module is a continuation of RIS114 and deals with information systems and problem solving in business and scientific environments. Advanced object oriented concepts, debugging, storing data in files and access to simple databases. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 134 | 16 | 6 | CESM : 060201 | with BRS 111 | Introduction To Programming: Part 1 | 3L,3P |
| This module provides an extended introduction into the world of computer programming and is aimed at students who do not intend to take RIS modules in the second or third year of study. The module deals with aspects that include the origins and development of the computer, the basic working of a computer, computerised problem solving and an introduction of algorithms, control structures, classes, objects, properties and methods using a high-level programming language | | | | | This is a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 144 | 16 | 6 | CESM : 060201 | RIS 134 | Introduction to Programming: Part 2 | 3L,3P |
| The module is a continuation of RIS134 and deals with the use of control structures, classes, objects, properties and methods to do computerised problem solving in a high-level programming language. | | | | | This is a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 153 | 12 | 5 | CESM : 060103 | | Introduction to Computer Hardware | 3L,3P |
| The underlying electronics of computer hardware, supporting Microsoft Windows, servicing and supporting personal computers, operating system overview, computer basics , tools and safety, inside the PC, disk storage, input/output devices, printers, miscellaneous hardware, local area networks, troubleshooting, customer service. | | | | | This is a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 164 | 16 | 6 | CESM : 060904 | RIS 114 OR RIS 144 | Introduction to the Internet and Web Page Development | 3L,3P |
| The development of good web pages requires that the programmer has knowledge of various web aspects and technologies. This includes the working of the Internet, graphical interfaces, Internet protocols and web page development. | | | | | This is a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 182 | 8 | 6 | CESM : 060202 | BRS 111 | Visual Basic for Applications (VBA) with the Focus on Excel | 2L,3P |
| This module presents concepts to insert text strings as macros, automate frequently performed tasks, automate repetitive operations, creating a custom command, toolbar button, menu command, front end, new worksheet functions, create complete macro-driven applications. | | | | | Continuous evaluation will be applied in this module, no special examinations will be granted. | |

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| RIS 214 | 16 | 6 | CESM : 060201 | RIS 124 | Data Structures and Advanced Programming | 2L,3P |
| Advanced programming requires an understanding of data structures and the professional implementation thereof. | | | | | This is a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 224 | 16 | 6 | CESM : 060302 | RIS 124 | Human-Computer Interaction | 2L,3P |
| If the potential computer user is not accommodated throughout the design process of a computer system, the system will not be used and money and energy will be wasted. This module provides the user with an introduction to Human-Computer Interaction (HCI). Aspects that are covered include usability, human factors, models of interaction, data collection, the design of user interfaces, visual interfaces and the evaluation of interfaces. | | | | | This is a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 242 | 8 | 6 | CESM : 060501 | BRS 111 + BRS 121 | Information Technology Service Learning | C/A |
| This module enables the students to serve the community by ploughing back the IT knowledge gained during their studies. While serving the community the students will learn how to work with people with varying computer literacy skills or levels. By teaching or helping others, their own knowledge will be expanded. | | | | | Continuous assessment is applied in this module and no special examinations are allowed. | |
| RIS 264 | 16 | 6 | CESM : 060201 | RIS 214 | Software Design | 2L,3P |
| This module entails an introduction to UML and to class types("patterns"). Various patterns are discussed and analysed in detail. Various sub-patterns of patterns will be covered. Practical work includes the implementation of patterns in various applications. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 314 (2014) RIS294 (2014) | 16 16 | 7 6 | CESM : 060702 | RIS214 RIS124 | Introduction to Databases and Database Management Systems: Part 1 | 2L,3P |
| Old RIS314 (2014) = new RIS294 (2014) This module deals with database concepts, design and implementation concepts, transaction management and concurrency control, distributed database management systems, object-oriented databases and database programming. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 314 (2015) | 16 | 7 | CESM : 060702 | RIS294 | Introduction to Databases and Database Management Systems: Part 2 | 2L,3P |
| This module deals with advanced database concepts, advanced queries, optimising queries, distributed databases, cloud computing and administrative tasks related to data and database management. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 324 | 16 | 7 | CESM : 060401 | RIS314 | Software Engineering | 2L,3P |
| This module provides the student with an introduction to Software engineering. Aspects covered are requirement definition, program design, programming practice, programming languages, tests and debugging, documentation, maintenance, and aids. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 334 | 16 | 7 | CESM : 060904 | RIS 164 + RIS 264 | Internet Programming | 2L,3P |
| This module deals with server-side Internet programming and web management. | | | | | This is not a promotion module. One three-hour examination paper (written and/or practical). | |
| RIS 344 | 16 | 7 | CESM : 060801 | RIS154 OR RIS153 | Computer Networks | 2L,3P |
| This module provides the student with an overview of network concepts. Aspects that are covered are network architecture, network technologies, coupling techniques, internetwork concepts, end-to-end protocols, security, and network applications, standards and models, transmission basics. | | | | | One three-hour examination paper (written and/or practical). | |
| RIN 104 | 16 | 6 | CESM : 060201 | None | Programming for Engineering Students | 3L,3P |
| Typical engineering problem solving: Basic structures, object oriented, in a high-level programming language. | | | | | This is not a promotion module. One examination paper (written and/or practical). | |
| RIN 2612 | 24 | 6 | CESM : 060601 | None | Boolean Algebra | 2L |
| Number systems. conversion between number systems and operations on numbers with different bases, 1's and 2's complement in binary numbers (specifically binary, octal and hexadecimal numbers). Venn diagrams, Boolean algebra, gates, logic and boole operators. Truth tables, canonical form, min- and maxterms. Simplification of logic circuits with algebra, Karnaugh diagrams. Intoduction to state machines. | | | | | This is not a promotion module. One written examination paper. | |

| Prerequisite: A minimum average of 60% for the prescribed third-year modules | | | | | | |
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| RIS604 | 16 | 8 | CESM : 060903 | | Information Security | 2L, P |
| Fundamental concepts of computer security, including: security threats, harden internal systems and services, harden internetwork devices and services, secure network communications, security best practices for creating and running web-based applications, managing public key infrastructure (PKI), managing certificates, enforcing organisational security policies, monitoring the security infrastructure and security incidents. | | | | | | Continuous evaluation or written or practical examination. |
| RIS606 | 16 | 8 | CESM : 060103 | | Theory of Algorithms | 2L, P |
| The theory of algorithms is a subfield of information theory and computer science that concerns itself with the relationship between computation and information. Algorithmic information theory principally studies complexity measures on strings (or other data structures). Because most mathematical objects can be described in terms of strings, or as the limit of a sequence of strings, it can be used to study a wide variety of mathematical objects, including integers and real numbers. | | | | | | Continuous evaluation or written or practical examination. |
| RIS609 | 16 | 8 | CESM : 061003 | | Knowledge-Based Systems | 2L, P |
| The basic knowledge management principles, concepts, technologies and systems, including knowledge discovery systems, knowledge capture systems, knowledge sharing systems and knowledge application systems, as well as the evaluation and application thereof in practice. | | | | | | Continuous evaluation or written or practical examination. |
| RIS610 | 16 | 8 | CESM : 060702 | | Business Intelligence | 2L, P |
| The emphasis here is on business intelligence deployed in corporate environments, including approaches for turning e-commerce data into knowledge that organizations can act upon and tools and techniques for deploying these systems. | | | | | | Continuous evaluation or written or practical examination. |
| RIS615 | 16 | 8 | CESM : 060302 | | Human-Computer Interaction | 2L, P |
| Theoretical background and practical experience in Human-Computer Interaction, with specific emphasis on Usability Engineering. The module provides an in-depth knowledge and understanding of issues involved in the evaluation of user interfaces for interactive systems. | | | | | | Continuous evaluation or written or practical examination. |
| RIS619 | 16 | 8 | CESM : 060904 | | Advanced Internet Programming | 2L, P |
| Client side programming of web sites, scripting languages, cookies and session objects, request & response objects, and server side programming. | | | | | | Continuous evaluation or written or practical examination. |
| RIS620 | 16 | 8 | CESM : 060201 | | Advanced Programming I | 2L, P |
| Compulsory. The programming skills of the students are taken to the next higher level compared to pre-graduate programming. | | | | | | Continuous evaluation or written or practical examination. |
| RIS621 | 16 | 8 | CESM : 060201 | | Advanced Programming II | 2L, P |
| Compulsory. Learning advanced programming concepts through game programming. | | | | | | Continuous evaluation or written or practical examination. |
| RIS622 | 16 | 8 | CESM : 060302 | | Advanced Databases | 2L, P |
| The administration of a database requires thorough knowledge from planning through to creating the database, the database users, their privileges and determining backup and recovery strategies, including: Architecture and installation options, physical structures and settings of the database, and queries of data dictionary views to manage a database. | | | | | | Continuous evaluation or written or practical examination. |
| RIS626 | 16 | 8 | CESM : 0699 | | Introduction to Research | 2L, P |
| Compulsory: Guidance on how to conduct research in a structured, methodical manner, to analyse collected data and subsequently how to write a well-structured report/article. | | | | | | Continuous evaluation or written or practical examination. |
| RIS625 | 16 | 8 | CESM : 060702 | | Data Warehousing | 2L, P |
| The development of a data warehouse requires thorough knowledge from planning through to implementing the warehouse, as well as the mining of the information in the warehouse. | | | | | | Continuous evaluation or written or practical examination. |
| RIS693 | 30 | 8 | CESM : 060202 | | Project | None |
| The development of a complete working project to solve a real life or theoretical problem. | | | | | | Continuous evaluation. |
| Prerequisites: A minimum average of 60% for Honours in IT. | | | | | | |
| RIS715 | 24 | 9 | CESM : 0699 | | Human-Computer Interaction | As arranged |
| The module is adapted each year in order to stay abreast in this research area. The outcome of this module is a document that contains an introduction and literature study based on the chosen research topic in Human-Computer Interaction, as well as the problem statement and research questions of a possible research dissertation that might flow from it. | | | | | | As arranged. |

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| RIS725 | 24 | 9 | CESM : 0699 | Data Warehousing and Mining | As arranged |
| The module is adapted each year in order to stay abreast in this research area. The outcome of this module is a document that contains an introduction and literature study based on the chosen research topic in data warehousing, as well as the problem statement and research questions of a possible research dissertation that might flow from it. | | | | | As arranged. |
| RIS730 | 24 | 9 | CESM : 0699 | Educational Technology | As arranged |
| The module is adapted each year in order to stay abreast in this research area. The outcome of this module is a document that contains an introduction and literature study based on the chosen research topic in educational technology, as well as the problem statement and research questions of a possible research dissertation that might flow from it. | | | | | As arranged. |
| RIS731 | 24 | 9 | CESM : 0699 | Eye-Tracking | As arranged |
| The module is adapted each year in order to stay abreast in this research area. The outcome of this module is a document that contains an introduction and literature study based on the chosen research topic in eye-tracking, as well as the problem statement and research questions of a possible research dissertation that might flow from it. | | | | | As arranged. |

12.3.8 DEPARTMENT OF CONSUMER SCIENCES

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| CNST134/KLE134 | 16 | 5 | CESM 100601 | Basic Construction | 2L, 4P |
| Pattern alterations, implementation and evaluation of basic construction techniques, use of a commercial pattern. Fashion development: The role of designer, technology and world trends. Fashion cycles: Introduction, acceptance and rejection. Fashion forecast: Designer, manufacturer, merchandise and the media. Fashion research sources. | | | | | One two-hour examination paper. |
| CNST144/KLE144 | 16 | 6 | CESM 100604 | Children's Clothing and Outfit Planning | 1L, 3P |
| Children's clothing: Classification, needs and requirements. Implementation of principles in construction and trimming of children's clothing. Wardrobe planning: Implementation of design elements and principles, personality and figure types, personal style and good taste. | | | | | One two-hour examination paper. |
| CNST214/KLE214 | 16 | 6 | CESM 100601 | Socio-Cultural Aspect of Clothing | 2L, 3P |
| Origin and functions of clothing. Interrelationship between clothing and cultural patterns, national habits and customs. Clothing expectations regarding social role, status and mobility. Fashion as a social phenomenon. Clothing values, attitudes and interests. Special fabrics: Principles and guidelines for the handling of special fabrics. Application of principles for the handling of special fabrics. Application of principles for the handling of special fabrics when planning and constructing of articles (sleepwear, bra's and panties). | | | | | One two-hour examination paper. |
| CNST334/KLE334 | 16 | 7 | CESM 100601 | Apparel Industry | 2L, 4P |
| International fashion centres. Design, financing, production and distribution in the apparel industry. Wholesale and retail. Fashion promotion. Tailoring: Principles and guidelines and the application in construction of a coat. | | | | | One two-hour examination paper. |
| CNST344/KLE344 | 16 | 7 | CESM 100602 | Pattern Design | 1L, 5P |
| Flat pattern design: Principles and guidelines. Style variations Practical application in designing a flat pattern and construction of the designed garment | | | | | One two-hour examination paper. |
| CNSC134/ITR134 | 16 | 5 | CESM 100401 | Interior Design – Fabric Study | 2L, 3P |
| Design: Basic principles of design and guidelines. Design elements: Line, form, shape, space, texture and colour. Design elements: Proportion, scale, balance, rhythm, emphasis, harmony and character. Interior design, design style and designers are discussed. Study of material and furniture. Classification, origin, manufacture, properties, uses, care and maintenance. Aspects such as lighting, ventilation, temperature- and noise control are discussed. | | | | | One two-hour examination paper. |
| CNCS124/ITR124 | 16 | 6 | CESM 100401 | Home Planning | 2L, 3P |
| Planning and arranging the home for individual families and communities of different socio-economic groups as well as special groups (disabled). Design application and evaluating of social, private and work areas are done. To be successful in planning a home the determination of needs, identification of problems and problem solving are essential. Selection of suitable soft furnishings. | | | | | One two-hour examination paper. |
| CNCS224/BES324 | 16 | 7 | CESM 100401 | Introductory Housing | 3L |
| Man and his housing needs are influenced by the individual and family values, standards and objectives in the different stages of the family life cycle. A variety of housing types are available to select from to fulfil the specific need. The family and its housing is dependent on the environment, therefore we emphasise a sustainable environment. | | | | | One two-hour examination paper. |

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| CNCS122/VBW122 | 8 | 6 | CESM 100101 | Ergonomics, Apparatus Studies | 3L |
| Ergonomics: Work, worker and work place are studied. Productivity. Study of apparatus which include the selection, use and maintenance of household apparatus. | | | | | One two-hour examination paper. |
| CNCS322/VBW312 | 8 | 7 | CESM 100102 | Recourse Management | 2L |
| Management and decision-making processes in the family as well as the using of resources available to the family are of importance. Different forms of management and decision-making are discussed. The handling of the finances of the family are discussed with special attention to aspects as the use of credit, personal financial management, protection planning, retirement planning and health planning. | | | | | One two-hour examination paper. |
| CNCS332/VWB332 | 8 | 7 | CESM 100103 | Community Development | 2L, 4P |
| Module 1 The communication process. Method of presentation. Teaching aids. Evaluation. Module 2 Community development with regard to individuals, families and groups. Programme and project planning. | | | | | One two-hour examination paper. |
| CNCS344/VBW344 | 16 | 7 | CESM 100104 | Consumer Science | 3L |
| The interior, food or clothing business. | | | | | One two-hour examination paper. |
| CNCS324/VBW324 | 16 | 7 | CESM 100104 | Consumer Study | 3L |
| A study is made of the diversity in the market and how the market is segmented. The motivation and behaviour of the consumer are investigated as well as the perception and learning processes. | | | | | One two-hour examination paper. |
| CNST312/TSK312 | 8 | 7 | CESM 100601 | Textile Fibres. Textile Fabric Construction and Finishes | 2L, 2P |
| The properties of textile fibres and fabrics determine their suitability towards a specific product. Textile fibres are classified according to their source of origin or manufacture. The macro- and microstructure, physical and chemical properties and construction and finishing influence the uses and maintenance of different textile fabrics. | | | | | |
| CNST354/SK342 | 8 | 7 | CESM 100601 | Weaving Surface Enrichment of Fabrics | 1L, 6P |
| Weaving, knitting and crocheting. Surface enrichment of fabrics. Elements and principles of art in successful designs of textile items. | | | | | |
| CNCT322/TSK322 | 8 | 7 | CESM 100601 | Classification and Construction of Yarns and Fabrics | 2L, 2P |
| Classification and construction of yarns and fabrics. The influence of construction on the fabric properties. Finishing, dyeing and printing of textile fabrics. Care and maintenance of textile fabrics. | | | | | One two-hour examination paper. |
| CNFD214/VDS214 | 16 | 6 | CESM 010702 | Food Preparation | 3L, 4P |
| Measuring and recipe science: Practical application of principles. Food preparation basics, Meal management, Food safety, Food chemistry, Food selection and evaluation, Poultry, Meat, Fish and shellfish, Vegetables, Fruit, Soup and salads, Cheese, Milk, Eggs WATER: Latent and specific heat. Conventional heat and microwave heat transfer. COOKING METHODS: Dry and moist heat. Practical work: Food preparation concerning aspects of the theory. | | | | | One three-hour examination paper. |
| CNFD224/DS224 | 16 | 6 | CESM 010702 | Food Preparation II | 3L, 4P |
| Cereal, grains and pasta, Flour and flour mixtures, Starches and sauces, Quick breads, Yeast breads, Cakes and cookies, Pastries and pies, Candy, Food preservation, beverages, frozen desserts, sweeteners, Fats and oils Practical work: Food preparation concerning aspects of the theory. | | | | | One three-hour examination paper. |
| CNFD344/VDS344 | 16 | 7 | CESM 010702 | | 3L, 4P |
| Meal planning: Nutrition, food preferences, menus and application of economic and gastronomic principles, budgets, time plans, etiquette, table setting, different forms of entertaining: Formal and informal. International eating habits, SA wines. Home Preserving. Freezing of food. Packaging of food. Industrial food preserving: Preserving principles, preparing raw material, irradiation, blanching, pasteurisation, UHT, heat sterilisation, microwave and infrared radiation, freeze-drying, coating, packaging. Practical work: Preserving. Planning and preparation of meals and receptions. | | | | | One two-hour examination paper. |
| CNFD132/VDS322 | 8 | 7 | CESM 100399 | Food Security | 2L |
| Introduction to food security on household, community, national, regional and global level. Food security as a social challenge. The five components of food security: Availability, accessibility, adequacy, acceptability, agency. | | | | | One two-hour examination paper. |

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| VDG314 | 8 | 7 | CESM 100302 | Nutrition | 2L,3P |
| Nutrition information, dietary guidelines, aids in dietary planning and nutritional status, digestion, absorption and Assimilation of food, energy, carbohydrates – sugar, starch and fibre, lipids, protein, vitamins, and water, minerals and trace elements. After completion of this module, you will be able to use dietary guidelines to evaluate the nutrient content of diets. | | | | | One two-hour examination paper. |
| VGM334 | 8 | 7 | CESM 100303 | Quantity Nutrition | 2L,3P |
| The development of large-scale foodservices. Different food systems and the use of sophisticated food distribution systems. Institutional kitchen planning. The evaluation of food systems. Detail planning of large-scale foodservice units. Specific planning aspects to consider when planning a food service unit. Hygiene and safety measures in food service units. | | | | | Continued evaluation and a two-hour examination paper. |
| VGM344 | 8 | 7 | CESM 100303 | Nutrition | 2L,3P |
| Selection, buying and storing of food. Quantity food preparation. Preparation of meat, fish, eggs, dairy products, vegetables, salads, sandwiches and desserts. Foodservice equipment: General principles, choice of quantity foodservice equipment, metals and materials. Mechanical equipment, cooking and serving equipment. Refrigerators and freezers, extractor fans, work tops and transport equipment. Mobile equipment. Cleaning equipment. Specification and standards. Leadership and management. Decision making process. Marketing. Human resource management. Material management. Workflow, operational procedures and production planning. Implementing policy in management. Productivity. Quality control. The budgeting process. Business plans. Financial management. Managing information. Managing change. | | | | | Continued evaluation and a two-hour examination paper. |
| CNFD313 | 8 | 7 | CESM 100303 | Food Preservation | 2L,3P |
| The home and industrial food preservation: Preserving principles, preparing raw material, blanching, freezing, pasteurisation, UHT, heat sterilisation, microwave and infrared radiation, freeze- drying, coating and packaging. Practical work: Application of home preservation methods. | | | | | One two-hour examination paper. |
| CNFD332 | 8 | 7 | CESM 100303 | Product Development | 2L,3P |
| Development of food products. The criteria, principles and approaches. Practical work: Demonstration and or practical application of the steps in food product development. | | | | | One two-hour examination paper. |
| CNSC409 | 36 | 8 | CESM | Research Project | |
| Planning a research project: Introduction, aim, literature review, methodology, data collection, analysis, discussion of results, conclusion and a summary. | | | | | Research essay. |
| CNST414 | 16 | 8 | CESM 100602 | Clothing Industry | 2L |
| The clothing industry. Construction in mass production, construction of clothing for the handicapped. | | | | | One three-hour examination paper. |
| CNST 424 | 16 | 8 | CESM 100602 | Quality Management | 2L |
| Quality management, standards and specifications, uniforms. | | | | | One three-hour examination paper. |
| CNST434 | 16 | 8 | CESM 100105 | Social Aspects of Clothing | 2L |
| The social aspects of clothing: Origin, functions, culture and clothing patterns, clothing and the social role. | | | | | One three-hour examination paper. |
| CNST444 | 16 | 8 | CESM 100105 | Psychological Aspects Of Clothing | 2L |
| Psychological aspects of clothing: Self-concept, clothing symbolism, conformity, individuality. | | | | | One three-hour examination paper. |
| CNST454 | 16 | 8 | CESM 100601 | Natural Textile Fibres | 2L |
| Natural vegetable fibres, natural protein fibres, manmade fibres from natural origin. | | | | | One three-hour examination paper. |
| CNST464 | 16 | 8 | CESM 100601 | Finishes for Natural Fibres | 2L |
| Finishes to improve the appearance and function of natural fibres. | | | | | One three-hour examination paper. |
| CNSC414 | 16 | 8 | CESM 10199 | History | 2L |
| The early history of clothing, interiors, foods or textiles. | | | | | One three-hour examination paper. |
| CNSC424 | 16 | 8 | CESM 10199 | History | 2L |
| More recent history of textiles, clothing, interiors, foods or textiles. | | | | | One three-hour examination paper. |
| CNFD408 | 32 | 8 | CESM 100399 | Consumer Analysis of Foods | 2L |
| Advanced aspects in consumer preference and analysis of foods. | | | | | One three-hour examination paper. |
| CNSC409 | 36 | 8 | CESM | Research Project | |
| Planning a research project: Introduction, aim, ,literature review, methodology, data collection, analysis, discussion of results, conclusion and a summary. | | | | | Research essay. |

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| CNST414 | 16 | 8 | CESM 100602 | Clothing Industry | 2L |
| The clothing industry. Construction in mass production. Construction of clothing for the handicapped. | | | | | One three-hour examination paper. |
| CNST 424 | 16 | 8 | CESM 100602 | Quality Management | 2L |
| Quality management. Standards and specifications. uniforms. | | | | | One three-hour examination paper. |
| CNST434 | 16 | 8 | CESM 100105 | Social Aspects of Clothing | 2L |
| The social aspects of clothing, origin, functions, culture and clothing patterns, clothing and the social role. | | | | | One three-hour examination paper. |
| CNST444 | 16 | 8 | CESM 100105 | Psychological Aspects of Clothing | 2L |
| Psychological aspects of clothing, self-concept, clothing symbolism, conformity, individuality. | | | | | One three-hour examination paper. |
| CNST454 | 16 | 8 | CESM 100601 | Natural Textile Fibres | 2L, |
| Natural vegetable fibres, natural protein fibres, manmade fibres from natural origin. | | | | | One three-hour examination paper. |
| CNST464 | 16 | 8 | CESM 100601 | Finishes for Natural Fibres | 2L, |
| Finishes to improve the appearance and function of natural fibres. | | | | | One three-hour examination paper. |
| CNSC414 | 16 | 8 | CESM 10199 | History | 2L |
| The early history of clothing, interiors, foods or textiles. | | | | | One three-hour examination paper. |
| CNSC424 | 16 | 8 | CESM 10199 | History | 2L |
| More recent history of textiles, clothing, interiors, foods or textiles. | | | | | One three-hour examination paper. |
| CNFD408 | 32 | 8 | CESM 100399 | Consumer Analysis of Foods | 2L, |
| Advanced aspects in consumer preference and analysis of foods. | | | | | One three-hour examination paper. |

12.3.9 DEPARTMENT OF GEOGRAPHY

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| GEO114 | 16 | 6 | CESM: 140501 | NCS Mathematics level 4 | Introduction to Physical Geography | 3L, 3P |
| Universe, solar system, earth, Climatology, hydrogeography, soilgeography, biogeography, weathering and erosion, geomorphology, environmental geography. Practicals: Elementary cartography and the representation and interpretation or data. | | | | | One three-hour examination paper. | |
| GEO124 | 16 | 6 | CESM: 140501 | GEO114 | Introduction to human Geography and cartography | 3L, 3P |
| Population dynamics, development of rural and urban settlements, urbanisation, agriculture and the provision of food, rural land use, sources of energy, economic geography. | | | | | One three-hour examination paper. | |
| GEO214 | 16 | 6 | CESM: 140501 | GEO124 | Urban development | 3L, 3P |
| Components of development: theoretical framework: development and criteria of measuring, spatial models, characteristics of third world countries, local development. Urban components: human settlements, spatial models, intra urban structure, urbanisation in first and third world context, impact of urbanisation on the physical and social environment, economic activities, residential function, housing and services, transport, social dynamics, institutional framework, problems and challenges of first and third world cities, case studies. Spatial analysis: collection and preparation of data, statistical principles of application in spatial analysis, application programmes, interpretation of results, case studies. | | | | | One three-hour examination paper. | |
| GEO224 | 16 | 6 | CESM: 140503 | GEO114 | Environmental studies | 3L, 3P |
| Environmental problems and causes, history of the use and conservation of resources, ecosystems and how they work, population dynamics, economy and the environment, water sources, pollution: air and water pollution, solid waste. | | | | | One three-hour examination paper | |
| GEO234 | 16 | 6 | CESM: 140503 | GEO114 | Process geomorphology and geomorphologic hazards | 3L, 2P |
| Fluvial geomorphology. Aeolian geomorphology. Introduction to coastal geomorphology. Slopes and slope processes. Geomorphologic hazards. | | | | | One three-hour examination paper. | |

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| GEO314 | 16 | 7 | CESM: 140501 | GEO214 | Applied urban development and spatial transformation | 3P |
| Geography of apartheid, inequality and post-apartheid, spatial transformation of urban areas, changing urbanisation processes and patterns, spatial re-integration of the former homelands. The following objectives are to be achieved during the module: <ol style="list-style-type: none"> to analyse the geography of apartheid scientifically; to interpret the geography of inequality on national, regional and local level; to understand the geography of post-apartheid and to be able to apply the concept; to critically analyse urbanisation and urban growth as spatial processes, to identify challenges associated with fast growing cities and to propose possible solutions; to critically analyse the spatial transformation of urban areas, to identify future challenges and to propose possible solutions in this regard. | | | | | | One three-hour examination paper. |
| GEO324 | 16 | 7 | CESM: 140504 | GEO224 | Environmental management and analysis | 3L, 3P |
| The South African environment and processes and systems in the environment, environmental management plans, integrated environmental management procedures, environmental impact analyses, environmental auditing, evaluation models. | | | | | | One three-hour examination paper. |
| GEO334 | 16 | 7 | CESM: 140503 | GEO234 | Environmental Geomorphology | 3L, 2P |
| Development of geomorphology as a discipline. Micro-scale geomorphologic processes. Introduction to geomorphology in Quaternary studies. Soils and sediments in geomorphology. Applied geomorphology. Geomorphology for engineers and geomorphology in environmental management. | | | | | | One three-hour examination paper. |
| GEO344 | 16 | 7 | CESM: 140501 | GEO214 | Rural Geography | 3L, 2P |
| Theory: The course aims to provide an introduction to rural development issues globally. It investigates the sustainable development of rural areas, the impact of migration on the development of rural areas, poverty at it manifests itself in different forms in rural areas, how poverty can be reduced in rural areas and finally the course studies rural-urban linkages. Tutorial: The course aims to provide an introduction to rural geography as to engage students in discussions related to rural development issues. Students will be provided with readings and must critically engage with concepts discussed during theory sessions. | | | | | | One three-hour examination paper. |
| GIS224 | 16 | 6 | CESM: 140502 | (GEO114 & GEO124) OR (GLG114 & GLG124) OR (GKG124 & GKD214) | Geographic Information Systems | 3L, 3P |
| Theoretical framework of GIS, computer cartography, data structures and databases, collection and verification of data with spatial analysis and spatial modelling and the presentation of information with the aid of GIS. Elementary surveying. Identification of features and measurement on aerial photographs; image processing. | | | | | | One three-hour examination paper. |
| GIS324 | 16 | 7 | CESM: 140501 | GIS224 | Geographic Information Systems | 2L, 4P |
| Geographical data and the computer, data collection and data acquirement, data verification, quality control, raster data models, vector data models, interpolation, spatial analysis and spatial modelling, errors, the management of a GIS. Application programmes, data digitising, topology, data processing, removing of errors, digital image processing as data source, representation of information, report writing. | | | | | | One three-hour examination paper. |
| GEO616 | 16 | 8 | CESM: 140501 | 64 CREDITS AT NQF LEVEL 7 IN GEOGRAPHY | | 1S |
| The module aims to familiarise students with philosophy in general, and the philosophy of geography in particular. It starts with a brief introduction to philosophy in general, the universe around us, and the general ethics behind scientific enquiry and research. It proceeds to examine the development of geographical thought and the evolution of the discipline. Conceptions in geography from the late seventeenth century, through positivism and into post modernism are assessed and evaluated. | | | | | | |
| GEO692 | 16 | 8 | CESM: 140501 | | | 2S, 1FT |
| This course advances a framework for designing a research study in Geography. This process includes deciding on a paradigm; using literature; writing an introduction; stating a purpose for the study; identifying research questions and hypotheses; using theory; defining, delimiting and stating the significance of the study and advancing methods and procedures for data collection and analysis. The objective of this course is to guide the research student through this process in a structured manner. The course is divided into a number of seminars that will entail a presentation by a number of staff members. These theory presentations are followed by a discussion of the practical considerations the student will need to think through to successfully complete the final year-end project. In addition, there are four report back sessions during which students will make a 10-minute presentation to both staff and fellow research students on the progress he/she has made in the chosen field of investigation. This presentation also provides the opportunity for both staff and fellow students to ask questions, as well as make suggestions, relating to the research. The course culminates in the presentation of a research report that is a compulsory element of the Honours degree in Geography. | | | | | | |

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| GGF626 | 16 | 8 | CESM: 140504 | | 2S,1E |
| The GGF626 (Environmental Geography) builds on the GEO324 work. The course examines various environmental laws and the implications these have on environmental management. The module continues to investigate Environmental Impact Assessments from an academic and theoretical point of view by trying to answer questions regarding the goal, achievement, success, quality and contribution towards sustainability of EIA. This part also includes a group practical assignment focused on EIA. The last part of the course looks at Environmental Management Systems from an academic and theoretical point of view and tries to answer similar questions as those posed for EIA. | | | | | |
| GGF636 | 16 | 8 | CESM: 140501 | | 1S |
| GGH363 | 16 | 8 | CESM: 140501 | | 1S |
| The module aims to familiarise students with the role of geomorphology as a significant branch of earth science. Students are familiarised with: <ul style="list-style-type: none"> • the development of nineteenth, twentieth and twenty first century geomorphology • the move towards process-oriented studies and new methodologies (microgeomorphology) • southern African geomorphology and the Quaternary of southern Africa • the geomorphology of semi-arid and arid southern Africa, including the Free State province | | | | | |
| GGF636 | 16 | 8 | CESM: 140504 | | 2S,3E |
| * applied geomorphology in the context of land management in the Free State, in particular aeolian processes, and wind erosion and its impacts on the Free State's landforms and agricultural base. | | | | | |
| GIS616 | 16 | 8 | CESM: 140502 | | 2S, 24P /y |
| The aim of the module is to expand knowledge obtained in GIS324 and focuses on more advanced principles and concepts of spatial analyses. The successful student will: Know the organising concepts of geospatial analysis and their methodological context Know the core components of geospatial analysis including distance and directional analysis, geometrical processing map algebra and grid models Understand how to use exploratory spatial data analysis and spatial statistics, including spatial auto correlation and spatial regression Understand surface analysis, including gridding, interpolation and analysis of form Understand network and locational analysis Have a working knowledge of geocomputational methods such as cellular automata, agent based modelling, neural networks and genetic algorithms | | | | | |
| GIS626 | 16 | 8 | CESM: 140502 | | 2S,18P/y |
| At an intermediate level, the module aims to provide a working knowledge of GIS to students with little or no previous experience of the science After successful completion of the module, the student should have a thorough knowledge of the basic principles of Geographic Information Systems and be able to do simple data import, processing, analyses and presentation on a computer. The student will have basic cartographic and surveying skills; be able to identify features on photographs; and have basic knowledge of satellite images and image processing. | | | | | |
| GIS646 | 16 | 8 | CESM: 140502 | | 2S |
| The module consists of theoretical principles and practical applications under the following broad topics: Professionalism and professional ethics. The SA geospatial profession. SA Council for Professional and Technical Surveyors (including legislation and rules), social responsibility, also included are topics on social issues in GIS such as public participation, data privacy, project management and participatory GIS. | | | | | |
| GGF656 | 16 | 8 | CESM: 140502 | | 2S |
| The course aims to give the student a theoretical understanding of remote sensing and to cover basic practical procedures used. Topics for discussion include the fundamental of remote sensing, elements and basic principles of photogrammetry, visual image interpretation, multispectral, thermal and hyperspectral sensing, resource satellites such as Landsat and Spot as well as microwave and radar sensing. Basic practical procedures include image rectification and enhancement, contrast and spatial manipulation and various classification methods. | | | | | |
| GGH666 | 16 | 8 | CESM: 140503 | | 2S |
| This course focuses on the relationship between society and what we call "nature". It is divided into three sections during which the following issues are examined: perceptions of wilderness and the social implications of these, especially in Africa and especially those created by the tourism industry; social justice issues related to poverty and access to wildlife and land resources; the history of more inclusive forms of conservation management, in particular community-based natural resource management, and their success in achieving conservation and equity goals; transfrontier conservation; and, on a more philosophical level, relationships between humans and the non-human, in particular animals. | | | | | |

12.3.10 DEPARTMENT OF GEOLOGY

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| GLG114 | 16 | 6 | CESM: 140601 | SELECTION. NCS Mathematics Level 5 Physical Sciences level 5 | Introduction to Geology | 3L, 3P |
| Universe, solar system, earth, internal structure of the earth, palaeomagnetism and age determination, plate tectonics, crystallography, mineralogy, rock types, structural geology, stratigraphical principles and introduction to economic geology. Practical work: Crystallographic systems, identification of the most common minerals and rock formations. Students that successfully complete this module should be able to demonstrate and understand earth processes active in and on the earth. | | | | | | Two semester tests, two practical tests and one three-hour examination paper. |
| GLG124 | 16 | 6 | CESM: 140601 | GLG114 | General Geology | 3L, 3P |
| Mineralogy: Crystal structure, minerals. Igneous rocks: volcanism, origin, nature and composition. Sedimentary rocks: origin, nature and composition. Metamorphic rocks: origin, nature and composition. Plate tectonics: Processes and products. Palaeontology: Fossils, geological timetable. Stratigraphy: Principles, South African stratigraphy, with reference to economic mineral deposits and fossil content. African Plate: origin and development. Practical work: Study of crystals, minerals, rocks and fossils. | | | | | | One three-hour examination paper. |
| GLG202 | 8 | 6 | CESM: 140699 | Selection: 55% average for GLG114 and GLG124. | Geology of Southern Africa: Genesis and Age Relationships | 40 E |
| Stratigraphical relationships, occurrences and origin of rocks and ores. | | | | | | Continuous evaluation by means of tasks, reports and tests. |
| GLG212 | 8 | 6 | CESM: 140606 | Selection: 55% average for GLG114 and GLG124. | Petrographical Mineralogy | 1P |
| The petrographic microscope, optical mineralogy, minerals in hand sample, crystal morphology. | | | | | | Continuous evaluation by means of practical examinations. |
| GLG214 | 16 | 6 | CESM: 140606 | Selection: 55% average for GLG114 and GLG124 | Advanced Mineralogy | 3L |
| Crystallography: Crystal lattices, unit cell, Miller symbols, crystal morphology and growth. Optical mineralogy: Refractive indicatrices, polarization and birefringence, indicatrices, observations in orthoscopic and conoscopic view. Crystal chemistry: Bonds in metals and minerals, coordination polyhedra, ionic radii. Systematic mineralogy: study of the most important minerals in each mineral class with special reference to chemical composition, crystal chemical structure, optical and physical characteristics, formation conditions and uses. | | | | | | One three-hour examination paper. |
| GLG222 | 8 | 6 | CESM: 140601 | Selection: 55% average for GLG114 and GLG124 | Sedimentological Applications | 1P, 2X8E |
| Practical application of sedimentological principles in borehole core logging, measurement of geological profiles and the compilation of geological maps in order to define palaeo depositional environments. | | | | | | Continuous evaluation by means of tasks. |
| GLG224 | 16 | 6 | CESM: 140601 | Selection: 55% average for GLG114 and GLG124 | Advanced Sedimentology | 3L |
| Introduction to sedimentology, physical characteristics, composition and classification of sedimentary rocks, sedimentary structures and depositional environments, sedimentary facies and basin analysis, stratigraphic definitions, analysis of selected depositional basins in southern Africa, reconstruction of Gondwana. | | | | | | One three-hour examination paper. |
| GLG232 | 8 | 6 | CESM: 140699 | Selection: 55% average for GLG114 and GLG124 | Geological Techniques: Uses and Applications | 1p |
| Geohydrological principles: Groundwater, structures and dewatering. Stratigraphy: Depositional basins and rock types. Structural geology: Basic structures and tectonites. Sedimentology: Rock types, principles and techniques. Igneous geology: rock types and characteristics. Metamorphic geology: rock types, structures and textures. Economic geology: Rock types and associated ore. Geological field techniques: Geophysical techniques, compass use, mapping, stratigraphic profiling, core mapping, GPS, collecting, documentation and interpretation of field observations and report writing. Geotechnical properties of rocks. | | | | | | Continuous evaluation by means of tasks and tests. |
| GLG242 | 8 | 6 | CESM: 140699 | Selection: 55% average for GLG114 and GLG124. | Geological Environmental Management | 1P |
| The identification and handling of environmental problems, pollution of surface and underground water, visits to waste storage and/or reclaimed mining areas. | | | | | | Continuous evaluation by means of tasks and tests. |
| GLG244 | 16 | 6 | CESM: 140699 | Selection: 55% average for GLG114 and GLG124. | Environmental Geology | 3L |
| Basic principles of geology, geochemistry and Geohydrology, weathering, engineering geological aspects, impact studies, geological risk areas, waste management, earth and human health, legal aspects. | | | | | | One three-hour examination paper. |

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| GLG252 | 8 | 6 | CESM: 140699 | Selection: 55% average for GLG114 and GLG124. | Geological Structure and Maps | 1P |
| Geological structures, maps and stratigraphic sections. | | | | | | Continuous evaluation by means of tasks and tests. |
| GLG314 | 16 | 7 | CESM: 140606 | Selection: GLG214 and GLG212 | Igneous Petrology | 3L, 1P |
| Principles of igneous petrogenesis: Magma and the formation of igneous bodies, fractional crystallisation and magmatic differentiation. Igneous rocks within specific tectonic provinces: Layered complexes, granites, basalt occurrences, alkaline rocks, kimberlite and carbonate associations and massive-type anorthosite. Practicals: Microscopic description and classification of igneous rocks. | | | | | | One three-hour examination paper. |
| GLG324 | 16 | 7 | CESM: 140606 | Selection: GLG224 and GLG222 | Economic and Exploration Geology | 3L, 1P |
| Processes of ore formation with southern African examples: Orthomagmatic, hydrothermal (magmatic-), sedimentary, supergene and metamorphic, aspects of industrial minerals and fossil fuel formation. Mineral economics: Mineral legislation, mineral resource and ore reserve estimation and evaluation. Practicals: The process of geological modelling, identification of ore minerals and textures in hand specimen, calculation of ore reserves, mine visit. | | | | | | One three-hour examination paper. |
| GLG334 | 16 | 7 | CESM: 140699 | Selection: GLG252, GLG224 and GLG222 | Advanced Structural Geology | 2L, 1P |
| Principles of deformation: Geometry of stress, mechanical behaviour of crystals and rocks, shearing models, analysis of deformation. Structures: Faults, joints, folds and fabrics. Practical work: Study of stress, faults, folds and deformation. | | | | | | One three-hour examination paper. |
| GLG344 | 16 | 7 | CESM: 140606 | Selection: GLG224 and GLG314 | Metamorphic Petrology | 2L, 1P |
| Macro-characteristics of metamorphites, classification, typomorphic minerals, chemographic representation. Processes of metamorphism. Practical work: Identification of typomorphic minerals, metamorphic textures, metamorphic rocks. | | | | | | One three-hour examination paper. |
| GLG354 | 16 | 7 | CESM: 140606 | Selection: GLG214 | Introduction to Geochemistry | 3L, 1P |
| The processes by which chemical elements form in stars, and element distribution in the universe and our solar system, geochemical classification of elements, and element distribution in the rock cycle (chemical differentiation of the earth, including geochemical aspects of tectonic processes), calculation of reaction boundaries of geochemical reactions, the use of mineral geochemistry to construct geothermobarometric constraints, geochemistry of sedimentary rocks, multi-element normalised diagrams, the basic principles and uses of radioactive, radiogenic and light stable isotopes in geochronology and petrology, the use of major element data for rock classification. Practicals: Mineral chemistry calculations and whole rock normative mineralogy. Graphic representation of geochemical data. Self-study and the preparation of a geochemical research report, presentation of the report to a peer group audience. | | | | | | One three-hour examination paper. |
| GLG364 | 16 | 7 | CESM: 140606 | Selection: GLG214 | Exploration Geochemistry | 3L, 1P |
| Geochemical dispersion, anomalies, weathering effects on geochemical anomalies and geochemistry as a prospecting aid, volatile components, fluid inclusions, model systems and isochores. The secondary environment as a prospecting medium. Mineral economics and exploration, reconnaissance exploration, prospect and predevelopment, remote sensing, geophysical methods, exploration geochemistry, evaluation techniques, feasibility studies, case studies. Practicals: Analytical techniques in exploration geochemistry, threshold calculation in probability plots, statistical processing of data, modelling and interpretation of geochemical data, solving practical exploration problems according to Levinson. | | | | | | One three-hour examination paper. |
| GLG374 | 16 | 7 | CESM: 140606 | Selection: GLG214 | Petrochemical Applications | 3L, 1P |
| The use and interpretation of geochemical data in a responsible manner, sampling of rocks, soils and water for geochemical analysis, methods for data quality assurance, the principles of instrumental analysis, the interpretation of electromagnetic and mass spectra, common analytical methods, statistical concepts needed for the intelligent reduction of geochemical data, the basic principles of physical metallurgy, interpretation of, geochemical maps and profiles. Practicals: Reduction, manipulation and interpretation of geochemical data, analytical methods for isotope analysis, methods for mineral separation prior to chemical analysis, preparation and presentation of geochemical reports. | | | | | | One three-hour examination paper. |
| GLG384 | 16 | 7 | CESM: 140606 | Selection: GLG214 | Environmental Geochemistry | 3L, 1P |
| Basic principles of the distribution and geochemical behaviour of chemical elements in soil, water and air, interaction of surface geochemistry with humans, techniques for prediction and location of pollution, remediation and protection of the natural environment, the geochemical implications to the environment of various methods to generate energy on an industrial scale. Practicals: Geochemical modelling, field-based project. | | | | | | One three-hour examination paper. |

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| GLG616 | 24 | 8 | CESM: 140699 | Approval to register for BScHon in Geology programmes | Plate Tectonics | 8L |
| The module in plate tectonics provides a useful backdrop for understanding the dynamic circumstances that give rise to deformational movements that create rock-forming environments, which in turn give rise to the fundamental original properties of regional rock assemblages (sedimentary, igneous and metamorphic rocks), their deformational characteristics and associated economic deposits. | | | | | | One three-hour examination paper. |
| GLG623 | 24 | 8 | CESM: 140699 | Approval to register for BScHon in Geology programmes and GLG344, GLG354, GLG374 and GLG384 | Sedimentology | 4L |
| The module entails experience building in sedimentological principles in both the understanding and the practical application thereof. | | | | | | One three-hour examination paper. |
| GLG626 | 24 | 8 | CESM: 140606 | Approval to register for BScHon in Geology programmes | Economic Geology | 8L |
| The module entails: the study of economic geology, metallogenesis, geometalurgy, industrial minerals and fossil fuels covering aspect such as aspects of mining, metallurgy, reserves, grades, resources, environmental and legal issues. A small metallogenic research project focusing on deposit description, geological setting, ore-forming processes, economic significance and results of microscopic descriptions. A literature assignment on primary literature of metallogenetic case studies (e.g. Economic Geology, Mineralium Deposita) will be requested, including the acquisition of articles. | | | | | | One three-hour examination paper. |
| GLG636 | 24 | 8 | CESM : 140606 | Approval to register for BScHon in Geology programmes | Mineralogy | 8L |
| The module entails the theory and practical application of advanced mineralogical techniques and instruments, including: reflected light petrographic microscopy (for the study of ore minerals), X-ray diffraction and scanning electron microscopy, systematic mineralogy, mineralogical principles and processes and their applications in various industries. Applied mineralogy focused on the use of mineralogical knowledge in the optimisation of extraction and purification of ores | | | | | | One three-hour examination paper. |
| GLG643 | 12 | 8 | CESM : 140606 | Approval to register for BScHon in Geology programmes & GLG344 | Metamorphic Geology | 4L |
| The module involves a study of topical themes within the subject area with reference to recently published works. Students are also introduced to techniques that can be used to decipher the petrogenesis of metamorphic rocks. | | | | | | One three-hour examination paper. |
| GLG646 | 24 | 8 | CESM : 140606 | Approval to register for BScHon in Geology programmes & GLG354, GLG374 & GLG384 | Advanced Geochemistry | 8L |
| The module is based around sophisticated isotopic systematics to investigate geochemical problems. The topics include geometric dating, radiogenic isotope geochemistry, extinct radio-isotopes and their uses, fractionation of light isotope ratios and their application to igneous and environmental geochemistry, and the use of isotope geochemistry to investigate ore forming processes. | | | | | | One three-hour examination paper. |
| GLG653 | 12 | 8 | CESM : 140606 | Approval to register for BScHon in Geology programmes and GLG314, GLG354, GLG374 and GLG 384 | Igneous Geology | 4L |
| The module involves a study of topical themes within the subject area with reference to recently published works. Students are also introduced to techniques that can be used to decipher the petrogenesis of igneous rocks. | | | | | | One three-hour examination paper. |
| GLG656 | 24 | 8 | CESM: 140699 | Approval to register for BScHon in Geology programmes & GLG334 | Structural Geology | 8L |
| The module covers the principles and techniques associated with structural geology and the applications thereof. | | | | | | One three-hour examination paper. |
| GLG663 | 12 | 8 | CESM : 140606 | Approval to register for BScHon in Geology programmes | Mineral Exploration | 4L |
| The module entails: The study of mineral exploration, metallogenesis, geochemical and geophysical exploration methods for various commodities, recent findings worldwide, and exploration techniques, aspects of exploration, as well as environmental and legal issues. Own involvement in exploration projects compiling a SAMREC-compliant exploration report is required. A literature assignment on primary literature of exploration case studies (e.g. Journal of Exploration Geochemistry, Journal of Environmental Geochemistry) is required. | | | | | | One three-hour examination paper. |

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| GLG673 | 12 | 8 | CESM : 140699 | Approval to register for BScHon in Geology programmes | Environmental Geochemistry | 4L |
| The module constitutes prevention and rehabilitation of geochemical damage as a result of mining and industrial operations. Health aspects as a result of the activities are also included. | | | | | | One three-hour examination paper. |
| GLG683 | 12 | 8 | CESM :140699 | Approval to register for BScHon in Geology programmes | Capita Selecta | 4L |
| Capita Selecta of advanced aspects, applications and processes related to the geological environment. | | | | | | |
| GLG693/6 | 24 | 8 | CESM :140699 | Approval to register for BScHon in Geology programmes | Research Essay | |
| The research project stretches over a year under the guidance of a supervisor. The topic is chosen in consultation with the supervisor and in collaboration with the departmental chair. The short research essay will be evaluated by the supervisor and an external examiner. | | | | | | Research essay |

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| GLG711 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Overview of Geology, Mining, Metallurgy and Business Processes | 3B | |
| Introduce learners to the different functional disciplines through an overview of the important principles of Mineral Resource Throughput Management in strategic, tactical and operational environments, each in the different functional areas. The functional areas include geology, mining, beneficiation, marketing, finance, human resources, plant maintenance, planning and scheduling, budgeting, maintenance and supporting processes To develop an adequate level of understanding in each of the functional areas and the interdependencies between functional areas present in the production environment with specific emphasis on product production, income, costs and market demand. | | | | | | One three-hour examination paper. |
| GLG712 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Mineral Resource Management I (Methodology) | 3B | |
| Highlight the principles and methodology of Mineral Resource Throughput Management through the identification and quantification of process variables. The development of a business process concept with emphasis on product delivery, cost, income and market demand for the strategic, tactical and operational environments. Included are strategic evaluation of the long-term environment, as well as management and control of operations in terms of the budget and short-term plan. To enable learners to apply MRTM principles to a business analysis with the purpose of identifying variables and dependencies that impact product delivery. To align the variables through planning and operations processes of the functional areas as a single business process. | | | | | | One three-hour examination paper. |
| GLG713 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Applied Geology | 3B | |
| Understand and identify the influence of geological variables in the Mineral Resource Throughput Management environment in terms of the exploitation needs in the long-term and production environments. The learners will be lectured in the application of geology and geological information to the total production process to achieve optimum ore-utilisation through the application of a product focus. To enable the learner to determine and quantify variables pertaining to ore and ore- body morphology that has a critical influence on product delivery and profit. To equip the learner to structure and apply geological information in the Mineral Resource Throughput Management environment in order to better exploit the resource and utilise information to do target driven grade control. | | | | | | One three-hour examination paper. |
| GLG714 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Applied Mining | 3B | |
| Application of variables and condition-driven standards in mine planning, scheduling and production management and control. Methods to determine the influence of "run-of-mine" quality on plant efficiency and product delivery. Exposure to the quantification, application and relevance of mining information to the production process (beneficiation, stockpile management). Included are the effects of maintenance performance and strategy in terms of condition-driven standards. To equip the learner to structure and apply information pertaining to different mining conditions and variables in terms of the Mineral Resource Throughput Management approach to improve planning and scheduling. The learner will be exposed to methods to align the "run-of-mine" volume and quality with the plant process, as well as determine the impact of ore and ore body morphology on the budget, economic evaluations and ore reconciliation. The practical application of the concepts in a production environment to optimise and improve income and profit on a daily basis will be emphasised. | | | | | | One three-hour examination paper. |
| GLG715 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Applied Metallurgy | 3B | |
| The influence of plant condition and standards on the long-term and production environments, with particular focus on product range, will be examined using Mineral Resource Throughput Management principles. The value of beneficiation information when focussing on adding value to the production process (beneficiation, stockpile management and product specifications) will be highlighted as well as the way in which the information is used to achieve optimum product delivery. To equip the learner to structure and apply the process variables in terms of the influence on product delivery, production cost and income by using beneficiation information. The learner will be exposed to methods to align the process, process efficiency, plant feed quality, product recovery and optimum yield to determine which critical variables have to be managed. | | | | | | One three-hour examination paper. |

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| GLG721 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | MRTM Implementation Practices | 3B |
| <p>The applicability of project management as a major critical performance area in sustainable Mineral Resource Throughput Management will be examined and discussed. The module will emphasise the practical application of TOC thinking processes in structuring projects on how to deal with the challenges in implementing MRTM in a mining operation. Examples and exercises will be presented in the course To equip learners to design, implement and operate a Mineral Resource Throughput Management programme.</p> | | | | | One three-hour examination paper. |
| GLG722 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | MRTM Information Practices | 3B |
| <p>Availability of flow information is an important component for sustainable Mineral Resource Throughput Management. This module will examine all the key elements of data structures, recording challenges, validation issues and presentation. The question of information provision to management structures and the timeliness impact on the mining value chain will be examined. Examples and exercises will be presented in the course To equip learners to understand, identify, implement and manage the flow information environment for the mining value chain.</p> | | | | | One three-hour examination paper. |
| GLG723 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | MRTM Organisational Change Practices | 3B |
| <p>Change management is often misunderstood and methodologies are used with little visible return on investment. The reason is that typical training approaches are neither appropriate nor effective within this environment. The subject-matter will be examined and discussed in four broad areas under the heading of enterprise resource alignment. These areas are strategy and guidance mapping, mobilisation, enablement and performance, and competence tracking. The processes methodologies and how they apply within Mineral Resource Throughput Management will be discussed. Practical and simplistic management procedures to ensure HR optimisation are imparted for continuous measurable results. To equip the learner to understand the broad change management issues applicable when implementing MRTM. The learner will be enabled to identify critical performance areas of change management, to design a basic change management strategy and learn how to execute that strategy.</p> | | | | | One three-hour examination paper. |
| GLG724 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | 'Virtual Mining' Simulation and Optimisation | 3B |
| <p>This module covers the design of a cost and production simulation model based on the total production process (reserve to market). The simulation model will incorporate relevant variables and dependencies. Strategic, tactical and operational planning and budgeting will be addressed in terms of the variables and condition-driven standards, as well as the application of the model in an operational management and control environment. To equip the learner to build strategic, tactical and operational simulation models. To enable the learner to apply simulation models in the management and control environment.</p> | | | | | One three-hour examination paper. |
| GLG725 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Mineral Resource Throughput Management II (Advanced): Grade Control, Ore Balance Sheets, Ore Utilisation | 3B |
| <p>The methodology for the evaluation of strategic drivers for the total production process will be discussed. The variables to be evaluated include quality and reliability of information, dilution, production rate, mining method, etc. and how these variables influence one another as well as the final product quality, quantity and cost. In the production environment, the identification and implementation of working procedures for grade control, an ore balance sheet, ore-utilisation and measurement of production rate, system availability and utilisation are covered. Determination of economically recoverable ore and its associated processes will also be included. To equip the learner to identify the critical business process variables through evaluation of a production process and to design and implement suitable business changes to enhance value. To evaluate the influence on final product and production cost in the production process. Included are specific business processes, improved knowledge of dilution control, slimes control, plant efficiency, procurement standards, product stockpile optimisation, selective mining, and many others.</p> | | | | | One three-hour examination paper. |
| GLG726 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Geological Modelling and Applied Geo-Statistics | 3B |
| <p>The importance of accurate and reliable geological information to the short-term mine schedule and production environment is significant. In the mining environment, the most important information is contained in the geological models. Understanding the role of geo-statistics in Mineral Resource Throughput Management and how it is used to determine optimum ore-utilisation and product delivery is imperative. Geo-statistical approaches can also be applied strategically to optimise ore-utilisation and maximise product delivery in the long-term. To equip the learner with the knowledge and ability to make relevant and accurate geological information available to all role players in the production process to enable them to make better decisions.</p> | | | | | One three-hour examination paper. |
| GLG371 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Capita Selecta | 3B |
| Course Placeholder | | | | | One three-hour examination paper. |

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| GLG732 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Mining Throughput Accounting and Modelling | 3B |
| <p>Application of throughput accounting, so that the learner understands how to calculate and make operational financial decisions that guarantee/deliver the required financial returns. Learning what determines optimal profitability, cash-flow and a healthy balance sheet as applied to daily and practical operational performance and improvement decisions, considering efficiencies and productivity. Understanding what necessary inputs are required, why, where and how to obtain it. Basic understanding of financial statements and what they mean. Making of decisions that are based on financial statements and where these decisions lead to. Learn how to define a goal (its boundaries) and what should be evaluated and the function and purpose of assumptions.</p> <p>To create a relevant operational financial decision model, and to calculate this into a net profit, with some basic simulation scenarios for investment ranking. Utilise MS Excel with some practical examples also using return on investment ratio's, and know how to decide whether an investment or change should either proceed or not. Understanding what differentiates cash-flow and net profit, and how to apply it.</p> | | | | | One three-hour examination paper. |
| GLG733 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Mineral Resource Throughput Management Risk Practices | 3B |
| <p>Application of risk management principles as applied to the minerals industry in terms of Health, Safety and the Environment. Responsibilities of owners, employers and suppliers will be highlighted with special reference to mandatory Codes of Practice (COP's). The COP's referred to include Trackless Mobile Mining Equipment, the Construction of Mine Residue Dumps, the prevention of Rockfall Accidents, Underground Fires and Explosions.</p> <p>To equip the learner with sufficient knowledge, background and understanding of what a risk is and practical tools to identify and evaluate risks typically encountered in the mining industry. Risks that could hamper the performance of the production process and the implementation of the MRTM programme will be highlighted. The learner will further be exposed to Risk Management Principles that could ensure a safe and healthy working environment.</p> | | | | | One three-hour examination paper. |
| GLG734 | 9 | CESM: 140601 | Approval to register for MSc in MRTM | Modern Mining Supply Chain Principles | 3B |
| <p>To obtain an overview of the traditional and MRTM-adjusted supply chain principles and mining value and supply chain optimisation through, Systems and business process integration, Internal and external collaborative planning and Studying the interlinked nature of downstream processes with the ore characteristics and what can be done about it. A case study to aid the learner, in identifying and exploring the hurdles in supply chain optimisation, in exploring ways to plan collaboratively. Mineral Resource Throughput Management requires that the traditional way of thinking about supply chain management needs to be enhanced when applied to the mining industry. Understanding and applying these principles will maximize the current and future profitability of the organisations.</p> <p>The mining supply chain management module aims at highlighting the key aspects of the process of optimizing the flow of materials, intermediary and final products throughout the chain of operations.</p> <p>Research Dissertation 4</p> <p>The subject of the research essay will be chosen in consultation with course co-ordinator. The candidate must carry out a research task under supervision and present a research essay.</p> <p>To test the candidates understanding and assimilation of Mineral Resource Throughput Management.</p> | | | | | One three-hour examination paper. |

12.3.11 DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS

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| WTV154 | 16 | 4 | CESM | National Senior Certificate (NCS) Mathematics on performance Level 3 (40%) | Basic Mathematics | 3L, 5T |
| <p>Development of skills with arithmetic and mathematical calculations. Real numbers, algebraic expressions. Algebraic and graphical solution of equations. Logarithms and exponents. The use of a pocket calculator. Basic geometry and elementary trigonometry, the calculation of areas and volumes. Simple and compound interest. Grouping of data and descriptive statistics.</p> | | | | | Tutorials, homework, class/ tutorial/ semester tests, and one three-hour paper. | |
| WTV164/194 | 16 | 5 | CESM | National Senior Certificate (NCS) Mathematics on performance Level 4 (50%) | Precalculus II | 4L, 3P |
| <p>Algebra overview. Functions and graphs. Algebraic, linear, quadratic and polynomial functions. Trigonometric functions and trigonometry. Exponential and logarithmic functions.</p> | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. | |
| WTW174 | 16 | 5 | CESM | National Senior Certificate (NCS) Mathematics on performance Level 4 (50%) | Precalculus I | 3L, 3P |
| <p>Contents: Number systems and proving theorems by induction, arithmetic and geometric series, simple and compound interest, depreciation, inflation, ratio and proportion, exponentials and logarithms and the exponential and logarithmic laws, graphs of lines, parabolas, circles and hyperbolae, factoring of algebraic expressions, principles of geometry, principles of trigonometry and solving triangles, applications and modelling.</p> | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. | |

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| WTW184 | 16 | 5 | CESM | WTW184 | Precalculus II | 3L, 3P |
| Definition of a function, domain and range, symmetry, even and odd functions, translating and combining functions, composite functions, inverse functions, linear and quadratic functions, power functions and polynomials, rational functions and their properties, exponential and logarithmic functions, the exponential and logarithmic laws, the trigonometric functions and their inverses, trigonometric identities, limits and continuity, basic statistics and probability theory. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW134 | 16 | 5 | CESM | Mathematics on performance Level 5 (60%) or WTW164/WTV164 or WTW184. | Calculus | 3L, 3T |
| Functions, graphs, limits, continuity and the derivative. Polynomial, trigonometric, exponential and logarithmic functions. Differentiation. Critical points and local maxima and minima. Introduction to modelling. The definite integral. Integration techniques. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW144 | 16 | 6 | Cesm | Wtw134 Or At Least 40% In Wtw114. | Calculus and Linear Algebra | 3l, 3t |
| Further Integration, Elementary Differential Equations, Systems Of Linear Equations, Matrices, Complex Numbers. | | | | | | Tutorials, Tutorial/Semester Tests, And One Three-Hour Paper. |
| WTW142 | 16 | 6 | CESM | National Senior Certificate (NCS) Mathematics on performance Level 5 (60%) or WTW164/WTV164 or WTW184. | Introductory Calculus and Statics For Achitecture, Quantity Surveying and Construction Management | 2L, 1T |
| Calculus: Polynomial, trigonometric, exponential and logarithmic functions, curve sketching, the function concept, an outline of differentiation and integration. Statics: Forces and moments, stress and strain, shear force and bending moment, trusses. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW114 | 16 | 6 | CESM | National Senior Certificate Mathematics on performance Level 7 (80%) or a minimum pass mark of at least 70% in WTW164/WTV164 or at least 60% in WTW184 or a pass in WTW134 is required. | Calculus | 4L, 3T |
| The real numbers. Functions. Limits and continuity. Differentiation: theory, techniques and applications. The Mean Value theorem. Sketching curves. Inverse functions. Transcendental functions. Integration: theory, techniques and applications. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW124 | 16 | 6 | CESM | NCS Mathematics on performance Level 7 (80%) or a minimum pass mark of at least 70% in WTW164/WTV164 or at least 60% in WTW184 or a pass in WTW134 is required. | Algebra and Differential Equations | 4L, 3T |
| The binomial theorem. Complex numbers. Introductory linear algebra: Systems of linear equations, matrices, determinants, vectors in R^2 and R^3 , lines and planes, Conic sections. Multivariable functions. Partial derivatives. Elementary differential equations. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW214 | 16 | 6 | CESM | WTW 114 & minimum 40% in WTW124 | Vector Analysis | 2L, 2P |
| Vector functions: Limits, derivatives and integrals. Curves: Parameterisation, tangent vectors, arc length. Multivariable functions: quadratic surfaces, partial derivatives, limits, continuity, differentiability, gradients and directional derivatives, the Mean Value theorem, the chain rule for partial derivatives, tangent planes. Multiple and line integrals: Theory and applications. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW224 | 16 | 6 | CESM | Minimum 40% in WTW114 of WTW134 and minimum 40% in WTW114 of | Linear Algebra | 2L, 2P |
| Real vector spaces: Basis, dimension, subspace. Linear mappings: Kernel, image, representation of a linear mapping as a matrix, inverse. Inner product and orthogonality: Orthogonal bases, rank, bilinear mappings, quadratic forms. Determinants. Eigenvalues and eigen-vectors: Characteristic polynomial of a linear mapping, symmetric matrices, diagonalisation. The Cayley-Hamilton theorem. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW234 | 16 | 6 | CESM | Minimum 40% in WTW114 of WTW134 and minimum 40% in WTW114 of WTW144 | Mathematical Modelling | 2L, 2P |
| Principles of modelling. Optimisation models. Dimensional analysis. Physical, chemical, biological and financial models. Modelling assignment. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |

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| WTW244 | 16 | 6 | CESM | WTW124 of WTW144 | Ordinary Differential Equations | 2L, 3P |
| Non-linear first order differential equations: substitution techniques, exact equations, integration factors. Non-homogeneous second order differential equations with constant coefficients. Series methods. Systems of linear first order differential equations. Elementary eigenvalue problems. Applications in Physics, Chemistry, Biology and Medical Science such as mixtures, mechanical vibrations, electronic circuits and resonance problems. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW254 | 16 | 6 | CESM | WTW124 of WTW144 | Scientific Computing | 2L, 2P |
| Programming with Matlab. Scientific computing. Introductory numerical techniques. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW264 | 16 | 6 | CESM | WTW114 & WTW124 | Sequences and Series | 2L, 2P |
| Sequences of real numbers: Convergence, limits, boundedness, indeterminate forms, L'Hospital's rule. Improper integrals. Infinite series: tests for convergence, absolute and conditional convergence. Taylor series. Power series: Intervals of convergence. Fourier analysis | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW314 | 16 | 7 | CESM | WTW124 & WTW214 & minimum 40% in WTW264 | Complex Analysis | 2L, 2P |
| The complex numbers. Functions of a complex variable. Limits, continuity and differentiability. The Cauchy-Riemann equations. Power series. Analytic functions. Cauchy's theorem. Residue theory and applications. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW324 | 16 | 7 | CESM | WTW214 & minimum 40% in WTW264 | Real Analysis | 2L, 2P |
| Axiomatic construction of the real numbers. Sequences of real numbers. The Weierstrass-Bolzano theorem. Limits and continuity. The intermediate value theorem. The Riemann integral. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW334 | 16 | 7 | CESM | WTW214 & minimum 40% in WTW264 | Discrete Mathematics | 2L, 2P |
| Logic, method of proof, set theory, functions and relations, elementary number theory, induction, recursion, effectivity of algorithms. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW344 | 16 | 7 | CESM | WTW124 & WTW214 & minimum 40% in WTW264 | Algebra | 2L, 2P |
| Groups: semi groups, finite and infinite groups, subgroups, Lagrange's theorem, cosets, conjunction, homomorphisms. Rings: Polynomials, arithmetic modulo n , integral domains, fields, Euclidian domains, ideals, homomorphisms, principal ideal domains, unique factorisation domains, factorising in $\mathbb{Q}[x]$. Geometric constructions. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW364 | 16 | 7 | CESM | WTW214, WTW224 & WTW274 & minimum 40% in WTW234 | Industrial Mathematics | 2L, 2P |
| Introduction to linear programming. Actual problems from industry with the necessary mathematics to model it mathematically and solve the models. Communication of results. Project. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW374 | 16 | 7 | CESM | WTW124 & WTW254 | Industrial Mathematics | 2L, 2P |
| Non-linear equations in one variable: Iterative methods, error analysis. Polynomial interpolation: Hermite interpolation and error estimation. Numerical differentiation and integration. Initial-value problems in ordinary differential equations: Elementary theory, Runge-Kutta and multistep methods, stability. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |
| WTW384 | 16 | 7 | CESM | WTW244 | Industrial Mathematics | 2L, 2P |
| Elementary stability considerations in systems of linear first order ordinary differential equations: Chemical, medical, biological and other applications. Systems of non-linear first order ordinary differential equations. Local stability and the classification of fixed points: Applications to biological and medical models. Global stability and limit cycles: Forced non-linear oscillations. First order perturbation techniques. Applications of ordinary differential equations. | | | | | | Tutorials, tutorial/semester tests, and one three-hour paper. |

12.3.12 MATHEMATICAL STATISTICS AND ACTUARIAL SCIENCES

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| ATW164 | 16 | 5 | CESM 041003 | National Senior Certificate (NCS) Mathematics on performance Level 5 (60%) or WTW164/WTV164 or WTW184. | Introduction to Actuarial Science | 3L, 2T |
| <p>The aim of this module is to introduce the following topics to students wishing to study actuarial sciences: Professionalism in practice, actuarial control cycle, Life insurance, Life contingencies, Market value adjustment compensation, Pensions General Insurance, Investments, Health care</p> | | | | | | <p>Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): One three-hour exam paper.</p> |
| ATW216 | 24 | 7 | CESM 041003 | WKS (114 & 124) and (WTW114 & WT124) | Introductory Financial Mathematics | 3L, 2T |
| <p>The aim of the Introductory Financial Mathematics subject is to provide grounding in financial mathematics and its applications, including: introductory interest calculations, discounting and accumulating, annuities, loans, and cash flow schemes and funds.</p> | | | | | | <p>Semester mark (50%): class tests and written assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper.</p> |
| ATW226 | 24 | 7 | CESM 041003 | ATW216 | Financial Mathematics | 3L, 2T |
| <p>The aim of the advanced Financial Mathematics subject is to provide grounding in: the theory of investment instruments, the mathematics of basic fixed-interest security valuation, interest rate sensitivity analysis, forward contract valuation, and the term structure of interest rates.</p> | | | | | | <p>Semester mark (50%): class tests and written assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper.</p> |
| ATW246 | 24 | 7 | CESM 041003 | 60% in ATW216 | Advanced Financial Mathematics | 3L, 2T |
| <p>The aim of the advanced Financial Mathematics subject is to provide grounding in: the theory of investment instruments, the mathematics of basic fixed-interest security valuation, interest rate sensitivity analysis, forward contract valuation, the term structure of interest rates, and stochastic interest rate models.</p> | | | | | | <p>Semester mark (50%): class tests and written assignments (50%) two semester tests (50%), Examination mark (50%): one three-hour exam paper. Note that only the final exam mark is used for ASSA exemption purposes.</p> |
| ATW316 | 24 | 7 | CESM 041003 | ATW246 and WKS226 | Actuarial Statistical Methods | 3L, 3T |
| <p>Decision Theory, Bayesian Statistics, Loss distributions, Credibility Theory and Empirical Bayes Credibility Theory Models, Future loss estimation in the context of general insurance for the purpose of: setting premiums, calculating the probability of ruin, making reinsurance arrangements, and calculating reserves, Monte Carlo simulation</p> | | | | | | <p>Semester mark (50%): assignments and written tests, Examination mark (50%): one three-hour exam paper. Note that only the final exam mark is used for ASSA exemption purposes.</p> |
| ATW306 | 24 | 7 | CESM 041003 | ATW246 | Actuarial Models | 3L, 3T |
| <p>Principles of actuarial modelling, Introductory stochastic processes, Markov chains and processes, Survival models, lifetime distributions, and maximum likelihood estimators, Binomial model of mortality, Estimation of transition intensities.</p> | | | | | | <p>Semester mark (50%): assignments and written tests, Examination mark (50%): one three-hour exam paper. Note that only the final exam mark is used for ASSA exemption purposes.</p> |
| ATW396 | 24 | 7 | CESM 041003 | WTW214, WTW244, ATW246 | Actuarial Financial Economics | 3L, 2P |
| <p>The aim of this module is to give successful candidates the skills needed to: Value a variety of investments using a variety of financial economic models, including, mean-variance portfolio theory, single and multifactor models, pricing models (including those for options evaluation), and credit risk models. Describe the assumptions and workings of financial markets, and investigate these by utilising investment theory related to: Investment risk, the Efficient Market Hypothesis, stochastic financial models, Brownian motion, and term structure of interest rates.</p> | | | | | | <p>Semester mark (50%): assignments and written tests, Examination mark (50%): one three-hour exam paper. Note that only the final exam mark is used for ASSA exemption purposes.</p> |

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| AWT605 | 20 | 8 | CESM 041003 | 4 exemptions from Actuarial Society of South Africa subjects (one of which must be A201, a202 or A204). | Actuarial Contingencies | 3L |
| The aim of the module is to provide a grounding in the mathematical techniques which can be used to model and evaluate cash-flows dependent on death, survival, or other uncertain risks. Topics include: Life assurance, life annuity contracts, and pension funds, Life tables and commutation functions, Calculation and evaluation of premiums and reserves, With-profit policies, variable-benefit contracts, and two-life annuities, Contingent and reversionary benefits, Profit testing, Competing risks, Multiple decrement tables, Mortality selection. | | | | | Semester mark (50%): assignments (50%), semester tests (50%) Examination mark (50%): one written examination. | |
| ATW608 | 16 | 8 | CESM 041003 | 4 exemptions from Actuarial Society of South Africa subjects (one of which must be A201, a202 or A204) | Actuarial Financial Economics | 3L |
| The aim of this module is to give successful candidates the skills needed to: Value a variety of investments using a variety of financial economic models, including: Mean-variance portfolio theory, Single and multifactor models, Pricing models (including those for options evaluation), and Credit risk models, Describe the assumptions and workings of financial markets, and investigate these by utilising investment theory related to: Investment risk, The Efficient Market Hypothesis, Stochastic financial models, Brownian motion, Term structure of interest rates. | | | | | Semester mark (50%): assignments (50%), semester tests (50%) Examination mark (50%): one written examination. | |
| ATW611 | 60 | 8 | CESM 041003 | 5 exemptions from Actuarial Society of South Africa subjects | Actuarial Asset and Liability Management | 3L |
| The aim of this module is to examine the following actuarial science topics in detail: The actuarial control cycle, actuarial advice for clients, Cashflow recognition and appropriate investment, Financial risks and credit ratings, actuarial regulatory environment, Capital investing, Financial planning. | | | | | Semester mark (50%): assignments (50%), semester tests (50%) Examination mark (50%): one written examination. | |
| ATW692 | 30 | 8 | CESM 041003 | | Actuarial Modelling and Literature Study | 10L per year |
| Topic is chosen in consultation with the supervisor and department. | | | | | Semester mark (50%): short research essay, regular attendance of research seminars and workshops, two presentations made during the year. Examination mark (50%): the external moderator assessment of the short research essay. | |
| ATW711 | 60 | 9 | CESM 041003 | 5 exemptions from Actuarial Society of South Africa subjects | Actuarial Asset and Liability Management | 3L |
| The aim of this module is to examine the following actuarial science topics in detail: The actuarial control cycle: Actuarial advice for clients: Cashflow recognition and appropriate investment: Financial risks and credit ratings: Actuarial regulatory environment: Capital investing: Financial planning. | | | | | Semester mark (50%): assignments (50%), semester tests (50%) Examination mark (50%): one written examination. | |
| ATW790 | 120 | 9 | CESM 041003 | | Extended Dissertation | |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |
| ATW791 | 60 | 9 | CESM 041003 | | Short Dissertation | |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |
| ATW900 | 360 | 10 | CESM 041003 | | Thesis | |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |

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| BMT124 | 16 | 5 | CESM 150301 | Equivalent modules: STK124, EBCS52405 | Introductory Biostatistics | 3L, 3T |
| Descriptive biometry, Probability models, Biometrical inference, Linear regression and correlation, Contingency tables, analysis of variance. | | | | | | Semester mark (50%): Assignments (50%), two semester tests (50%), Examination mark (50%): One three-hour exam paper. |
| FBS114 | 16 | 5 | CESM 040601 | National Senior Certificate (NCS) Mathematics on performance Level 5 (60%) or WTW164/WTV164 or WTW184. | Actuarial Financial Management | 3L, 2T |
| The aim of this module is to introduce the following topics to students wishing to study actuarial science: The key principles of finance, Company ownership, Taxation, Financial instruments, Use of derivatives, Issue of shares, Introduction to accounts, the main accounts, Group accounts and insurance company accounts, Interpretation of accounts, Limitations of accounts, Financial institutions, Capital Asset Pricing Model (CAPM) | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| FBS122 | 8 | 5 | CESM 040203 | National Senior Certificate (NCS) Mathematics on performance Level 5 (60%) or WTW164/WTV164 or WTW184. | Actuarial financial reporting | 2L, 1T |
| The aim of this module is to introduce the following topics to students wishing to study actuarial science: Generating accounts, Depreciation and reserves, Weighted average cost of capital, Capital structure and dividend policy, Capital project appraisal | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| ISC164 | 16 | 5 | CESM 040605 | National Senior Certificate (NCS) Mathematics on performance Level 5 (60%) or WTW164/WTV164 or WTW184. | Introduction to Investment Science | 3L, 2T |
| The aim of this module is two-fold: to introduce many basic concepts used in investment science, namely, the time value of money, the workings of financial markets, interest rate risk, risk and return, and security valuation assumptions and procedures, and to introduce the research process for students | | | | | | This is a promotion module (75%), Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| ISC354 | 16 | 7 | CESM 040605 | ISC164 and (ATW226 or ATW246) | Investment Science | 2L |
| This module expands on the contents of ATW2 by covering the following topics: Professional code and ethics, and standards of practice, investment valuation practices, complex investment valuation models, portfolio management procedures, introduction to alternative investments, and valuation of alternative investments and inclusion in an investment portfolio. | | | | | | Semester mark (50%): assignments (50%), semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK114 | 16 | 5 | CESM 041002 | Equivalent modules: EBCS51405 | Introduction to Statistics (I) | 3L, 3T |
| Elementary calculations, Interest calculations, Index numbers, Time series, Introduction to statistics, and, collection of data | | | | | | This is a promotion module (70%), Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK124 | 16 | 5 | CESM 150301 | Equivalent module: BMT124, EBCS52405 | Introduction to Statistics (II) | 3L, 3T |
| The organising, graphical presentation and description of data, Elementary principles of probability, Confidence intervals and hypothesis testing, Correlation and regression, Contingency tables, analysis of variance | | | | | | This is a promotion module (70%), Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK216 | 24 | 6 | CESM 150301 | Prerequisite: EBCS52405, or STK124, or BMT124 | Multiple Regression Analysis | 3L, 3T |
| Simple linear regression and correlation, Matrix notation and matrix calculations, Multiple regression, multiple coefficient of determination, nested models, and stepwise regression, PRESS and Mallows' C_p -statistic, Model building with quantitative and qualitative independent variables. | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |

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| STK226 | 24 | 6 | CESM 150301 | | Multiple Regression: Variance and Time Series Analysis | 3L, 3T |
| Tests for influential observations and outliers, Multicollinearity, data transformations, and residual analysis, Time series analysis and forecasting, Autoregression models, Two-factor factorial experiments and more complex factorial designs | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK316 | 24 | 7 | CESM 150301 | STK124 and (WTW114 or WTW134) | Probability (I) | 3L, 3T |
| Introduction to probability, probability distributions and probability densities. Mathematical expectation and special probability distributions. | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK326 | 24 | 7 | CESM 150301 | Prerequisite: STK316 | Probability (II) | 3L, 3T |
| Probability densities, Functions of random variables, Sampling distributions, Estimation theory | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK332 | 8 | 7 | CESM 150301 | Prerequisite: STK326 | Applied Statistics I | 2L |
| The aim of this module is to give successful candidates the skills needed to: Be proficient in the use of statistical programming packages such as SAS and R, Program, apply, and evaluate basic statistical methods within a data analysis procedure. | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STK342 | 8 | 7 | CESM 150301 | Prerequisite: STK326 | Applied Statistics II | 2L |
| The aim of this module is to give successful candidates the skills needed to: Be proficient in the use of statistical programming packages such as SAS and R, Program, apply, and evaluate both basic and more advanced statistical methods within a data analysis procedure, Create detailed data analysis reports. | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STS611 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Bayes Analysis | 2L |
| In this course the Bayesian paradigm is studied: Bayesian analysis in simple and multiple regression, Derivation of probability-matching and reference priors, Derivation of posterior distributions and predictive densities in regression analysis, Monte Carlo simulations and Gibbs sampling, Credibility theory used in Actuarial Science, Derivation of the posterior distributions in the case of the Bühlman-Straub model, Jewell's hierarchical model, Cross-classification models, De Vylders IBNR model and Hachemeister's regression model | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STS612 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Regression Analysis | 2L |
| Review of simple regression, multiple regression and matrix algebra, analysis of variance and quadratic development. Theoretical aspects of multiple regression and model building. Variable selection, polynomial regression, influential observations, outliers and residual analysis. | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |
| STS613 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Stochastic Processes | 3L |
| This course deals with the theory and applications of stochastic processes. The main topics that are covered are: Preliminaries and necessary facts from probability theory, Poisson processes, Generalisations of Poisson processes, Renewal processes, Discrete and continuous Markov chains, Brownian motion and other processes with independent increments, Martingales, Stochastic ordering. The main applications and examples are from reliability and electrical engineering, demography and actuarial science. | | | | | | Semester mark (50%): assignments (50%), two semester tests (50%), Examination mark (50%): one three-hour exam paper. |

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| STS614 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Stochastic Simulation | 2L |
| Introduction to stochastic simulation, Inverse theorem for continuous and discrete cases, Simulating from discrete distributions, Simulating from continuous distributions, Goodness of fit criteria, acceptance-rejection method, Other Monte Carlo methods especially in the Bayesian field | | | | | Semester mark (40%): two semester tests. Examination mark (60%): one written examination. | |
| STS615 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Financial Time Series | 2L |
| Autocorrelation: The nature and detection of autocorrelation, estimation in the presence of autocorrelation. Remedial measures in regression problems. Dynamic Models: Autoregressive and Distributed-Lag Models – The role and reasons for lags in Economics, estimation of Distributed-Lag Models, <i>ad hoc</i> estimation, the Koyck and the Almon approach, causality, Stationarity, Unit Roots and Cointegration: Stationary Stochastic Processes, White Noise, Linear Time Series, Unit Root tests and random walks. Tests based on the correlogram: Cointegration and the Engle-Granger test. Forecasting with ARIMA and VAR models: Approaches to forecasting. AR, MA, aRMA and ARIMA models and the Box-Jenkins Methodology. Conditional heteroscedastic models: Financial time series and their characteristics, aRCH and GARCH Models, Integrated and Exponential Garch Models, Garch-M and Stochastic Volatility Models. | | | | | Semester mark (50%): two semester tests. Examination mark (50%): one written examination. | |
| STS616 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Multivariate Methods | 2L |
| This module aims to provide students with a grounding in several multivariate analysis methods, with a focus on the interpretation of analysis results. Methods include: Summarising multivariate data, Testing for univariate and multivariate Normality, Mean and covariance testing, including profile analysis and growth curve analysis, Discriminant analysis and classification, Cluster analysis, Canonical correlation analysis, principal component analysis and factor analysis, Multidimensional scaling, correspondence analysis and multiple correspondence analysis | | | | | Semester mark (50%): weekly computer-based assignments, comprising the entire semester mark, and one or more written tests. Examination mark (50%): one written examination. | |
| STS618 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Categorical Data Analysis | 2L |
| Categorical data, Statistical inference for a single proportion, 2x2 tables: Stratified 2x2 tables, Stratified 2xr and sx2 tables, Stratified srx tables | | | | | Semester mark (50%): three semester tests. Examination mark (50%): one written examination. | |
| STS619 | 20 | 8 | CESM 150399 | As per selected module | Capita Selecta | |
| STS621 | 20 | 8 | CESM 041003 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Risk Analysis | 2L |
| An introduction to risk analysis, an overview of financial risks, an in-depth look into the statistical tools needed to apply risk analysis in the banking, investment and insurance industries, including: Frequency functions, Loss distributions, alpha-stable distributions, Extreme value theory, Value-at-Risk, Robust statistics | | | | | Semester mark (50%): two semester tests. Examination mark (50%): one written examination. | |
| STS622 | 20 | 8 | CESM150302 | STS613 | Reliability and Survival Analysis | 3L |
| This course deals with applications of stochastic processes to reliability and survival analysis. It is a continuation of the Stochastic Processes module and focuses on more specific stochastic models. The main topics that are covered are: Failure rates for lifetime distributions, the shape of the failure rate, Demographic and reliability applications, the mean remaining lifetime basics, Exponential representation for univariate and bivariate absolutely continuous distribution functions, Mixture failure rate, Limiting behaviour of mixture failure rates, advanced renewal processes theory. The main applications and examples are from reliability and electrical engineering, demography and actuarial science. | | | | | Semester mark (50%): two detailed assignments during four weeks in a distance-learning capacity, Examination mark (50%): one written examination. | |

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| STS623 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Econometrics | 2L |
| Principles of Bayesian Analysis with Selected Applications, Basic ideas and principles of Bayesian analysis, point estimation, some large sample properties, the Univariate Normal Linear Regression Model, Simple and multiple regression, posterior and predictive density functions with diffuse and proper priors, Special Problems in Regression Analysis, autocorrelation errors, unequal variances and regression with data from more than one source. Analysis of Single Equation Nonlinear Models: The Box-Cox family of transformations, Constant Elasticity of Substitution and Generalised Production Functions, Time Series Models: Some Selected Examples, First and second order normal autoregressive processes, Distributed Lag Models and the application to consumption functions. | | | | | Semester mark (50%): two semester tests. Examination mark (50%): one written examination. | |
| STS624 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Generalised Linear Models | 2L |
| Generalising the linear model, Estimation, Inference, Binary data and logistic regression, Poisson regression and log-linear models, Data with constant coefficient of variation | | | | | Semester mark (50%): three semester tests. Examination mark (50%): one written examination. | |
| STS625 | 20 | 8 | CESM 150399 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) and (WTW254 or STS614) | Statistical Programming | 2L |
| Importing and exporting of data, Data preparation and cleaning using Microsoft Excel and VBA, SAS IML (Integrated Matrix Language). MATLAB Statistics Toolbox, R (Open Source) Statistical programming. | | | | | Semester mark (50%): computer-based assignments. Examination mark (50%): one computer-based examination . | |
| STS626 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344). STS614 is recommended, but not compulsory | Modelling Extreme Events | 2L |
| Introduction on Extremes, Tools for analysing data containing Extremes, Tail estimation under Pareto type models, Tail estimation for all maximal domains of attraction, Bayesian prediction on high quintiles | | | | | Semester mark (40%): two written assignments. Examination mark (60%): one written examination. | |
| STS627 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Mixed Linear Models | 2L |
| Normal Mixed Models: Basics, definition, estimation, significance tests and confidence intervals, Multi-centre trials: Introduction, implications of different analysis models, practical application and interpretation, meta-analysis, Repeated measures data: Introduction, covariance pattern models, random coefficients models | | | | | Semester mark (50%): Three written semester tests, Examination mark (50%): One written examination | |
| STS628 | 20 | 8 | CESM150302 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Data Mining | 2L |
| This module encompasses the basic data mining techniques incorporated into SAS Enterprise Miner, accessing and assaying prepared data, Decision trees, Regressions, Neural Networks, Model Assessment, Model Implementation | | | | | Semester mark (40%): a written test (60%) and a SAS-based project (40%). Examination mark (60%): one written examination . | |
| STS629 | 20 | 8 | CESM 150399 | As per selected module | Capita Selecta | |
| <i>As per selected module.</i> | | | | | <i>As per selected module.</i> | |

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| STS641 | 20 | 8 | CESM 150301 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Sampling Techniques | 2L |
| This course deals with the theory and applications of sampling. The main topics that are covered are: Probability sampling techniques: simple random, stratified, systematic, cluster and complex: Sample size and designing a sample: Estimation of means, totals, proportions and their variances: Weighting of survey data: Dealing with non-response: Statistical inference for survey data. | | | | | Semester mark (30%): regular written assignments. Examination mark (70%): one written examination. | |
| STS692 | 30 | 8 | CESM 150399 | WTW114 and WTW124, as well as a minimum average mark of 65% in (STK216+226+316+326) or 60% in (WKS314+324+334+344) | Statistical Modelling and Literature Study | 10L per year |
| Topic is chosen in consultation with the supervisor and department. | | | | | Semester mark (50%): short research essay, regular attendance of research seminars and workshops, two presentations made during the year. Examination mark (50%): the external moderator assessment of the short research essay. | |
| STS700 | 180 | 9 | CESM 150399 | | Extended Dissertation | 2L |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |
| STS711 | 30 | 9 | CESM150302 | This module may not be registered if STS611 has already been completed. | Bayes Analysis | 2L |
| In this course the Bayesian paradigm is studied: Bayesian analysis in simple and multiple regression, Derivation of probability-matching and reference priors, Derivation of posterior distributions and predictive densities in regression analysis, Monte Carlo simulations and Gibbs sampling, Credibility theory used in Actuarial Science, Derivation of the posterior distributions in the case of the Bühlman-Straub model, Jewell's hierarchical model, Cross-classification models, De Vylders IBNR model and Hachemeister's regression model, Capability analysis | | | | | Semester mark (50%): assignments (10%), three semester tests (90%). Examination mark (50%): one written examination | |
| STS713 | 30 | 9 | CESM150302 | This module may not be registered if STS613 has already been completed. | Stochastic Processes | 3L |
| This course deals with the theory and applications of stochastic processes. The main topics that are covered are: Preliminaries and necessary facts from probability theory, Poisson processes, Generalisations of Poisson processes, Renewal processes, Discrete and continuous Markov chains, Brownian motion and other processes with independent increments, Martingales, Stochastic ordering. The main applications and examples are from reliability and electrical engineering, demography and actuarial science. | | | | | Semester mark (50%): two written semester tests and one assignment. Examination mark (50%): one written examination | |
| STS714 | 30 | 9 | CESM150302 | This module may not be registered if STS613 has already been completed. | Stochastic Simulation | 3L |
| Introduction to stochastic simulation, Inverse theorem for continuous and discrete cases, Simulating from discrete distributions, Simulating from continuous distributions, Goodness of fit criteria, acceptance-rejection method, Other Monte Carlo methods especially in the Bayesian field | | | | | Semester mark (40%): two written assignments. Examination mark (60%): one written examination | |
| STS715 | 30 | 9 | CESM150302 | This module may not be registered if STS615 has already been completed. | Financial Time Series | 2L |
| Autocorrelation: The nature and detection of autocorrelation, estimation in the presence of autocorrelation. Remedial measures in regression problems. Dynamic Models: Autoregressive and Distributed-Lag Models – The role and reasons for lags in Economics, estimation of Distributed-Lag Models, <i>ad hoc</i> estimation, the Koyck and the Almon approach, causality, Stationarity, Unit Roots and Cointegration: Stationary Stochastic Processes, White Noise, Linear Time Series, Unit Root tests and random walks. Tests based on the correlogram: Cointegration and the Engle-Granger test. Forecasting with ARIMA and VAR models: Approaches to forecasting. AR, MA, aRMA and ARIMA models and the Box-Jenkins Methodology. Conditional heteroscedastic models: Financial time series and their characteristics, aRCH and GARCH Models, Integrated and Exponential GARCH Models, GARCH-M and Stochastic Volatility Models. | | | | | Semester mark (50%): two written semester tests. Examination mark (50%): one written examination | |

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| STS716 | 30 | 9 | CESM150302 | This module may not be registered if STS616 has already been completed. | Multivariate Methods | 2L |
| This module aims to provide students with a grounding in several multivariate analysis methods, with a focus on the interpretation of analysis results. Methods include: Summarising multivariate data, Testing for univariate and multivariate Normality, Mean and covariance testing, including profile analysis and growth curve analysis, Discriminant analysis and classification, Cluster analysis, Canonical correlation analysis, principal component analysis and factor analysis, Multidimensional scaling, correspondence analysis and multiple correspondence analysis | | | | | Semester mark (50%): weekly computer-based assignments, comprising the entire semester mark, and one or more written tests. Examination mark (50%): one written examination. | |
| STS718 | 30 | 9 | CESM150302 | This module may not be registered if STS618 has already been completed | Categorical Data Analysis | 2L |
| Categorical data, Statistical inference for a single proportion, 2x2 tables: Stratified 2x2 tables, Stratified 2xr and sx2 tables, Stratified srx tables. | | | | | Semester mark (50%): three semester tests. Examination mark (50%): one written examination . | |
| STS719 | 20 | 9 | CESM150399 | As per selected module | Capita Selecta | |
| As per selected module. | | | | | As per selected module. | |
| STS721 | 30 | 9 | CESM 041003 | This module may not be registered if STS621 has already been completed | Risk Analysis | 2L |
| An introduction to risk analysis, an overview of financial risks, an in-depth look into the statistical tools needed to apply risk analysis in the banking, investment and insurance industries, including: Frequency functions, Loss distributions, alpha-stable distributions, Extreme value theory, Value-at-Risk, Robust statistics, Dependence modelling. | | | | | Semester mark (50%): two semester tests. Examination mark (50%): one written examination. | |
| STS722 | 30 | 9 | CESM150302 | STA613 or STA713 This module may not be registered if STS622 has already been completed. | Reliability and Survival Analysis | 3L for 10 Weeks |
| This course deals with applications of stochastic processes to reliability and survival analysis. It is a continuation of the Stochastic Processes module and focuses on more specific stochastic models. The main topics covered are: Failure rates for lifetime distributions, the shape of the failure rate, Demographic and reliability applications, the mean remaining lifetime basics, Exponential representation for univariate and bivariate absolutely continuous distribution functions, Mixture failure rate, Limiting behaviour of mixture failure rates, advanced renewal processes theory. The main applications and examples are from reliability and electrical engineering, demography and actuarial science. | | | | | Semester mark (50%): Two detailed assignments during four weeks in a distance-learning capacity, Examination mark (50%): One written examination. | |
| STS723 | 30 | 9 | CESM150302 | This module may not be registered if STS623 has already been completed. | Econometrics | 2L |
| Principles of Bayesian Analysis with Selected Applications: Basic ideas and principles of Bayesian analysis, point estimation, some large sample properties, the Univariate Normal Linear Regression Model, simple and multiple regression, posterior and predictive density functions with diffuse and proper priors, special problems in regression analysis, autocorrelation errors, unequal variances and regression with data from more than one source. Analysis of Single Equation Nonlinear Models: The Box-Cox family of transformations, Constant elasticity of substitution and generalised production Functions, Time Series Models: Some selected examples, first and second-order normal autoregressive processes, distributed Lag Models and the application to consumption functions. | | | | | Semester mark (50%): two semester tests. Examination mark (50%): one written examination. | |
| STS724 | 30 | 9 | CESM150302 | This module may not be registered if STS624 has already been completed. | Generalised Linear Models | 2L |
| Generalising the linear model: Estimation, inference, binary data and logistic regression, Poisson regression and log-linear models, data with constant coefficient of variation. | | | | | Semester mark (50%): three semester tests. Examination mark (50%): one written examination. | |
| STS725 | 30 | 9 | CESM150399 | WTW254 or STS614 or STS714. This module may not be registered if STS625 has already been completed. | Statistical Programming | 3L |
| Importing and exporting of data: Data preparation and cleaning using Microsoft Excel and VBA, SAS IML (Integrated Matrix Language). MATLAB Statistics Toolbox, R (Open Source) statistical programming. | | | | | Semester mark (50%): computer based assignments Examination mark (50%): one computer-based examination . | |

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| STS726 | 30 | 9 | CESM150302 | This module may not be registered if STS626 has already been completed. | Modelling extreme events | 2L |
| Introduction on extremes: Tools for analysing data containing extremes, tail estimation under Pareto type models, tail estimation for all maximal domains of attraction. Bayesian prediction on high quintiles. | | | | | Semester mark (40%): two written assignments. Examination mark (60%): one written examination . | |
| STS727 | 30 | 9 | CESM150302 | | Mixed Linear Models | 2L |
| Normal mixed models: Basics, definition, estimation, significance tests and confidence intervals. Multi-centre trials: Introduction, implications of different analysis models, practical application and interpretation, meta-analysis. Repeated measures data: Introduction, covariance pattern models, random coefficients models. | | | | | Semester mark (50%): three written semester tests. Examination mark (50%): one written examination. | |
| STS719 | 20 | 9 | CESM150399 | As per selected module | Capita Selecta | |
| <i>As per selected module.</i> | | | | | <i>As per selected module.</i> | |
| STS741 | 30 | 9 | CESM150301 | This module may not be registered if STS641 has already been completed. | Sampling Techniques | 2L |
| This course deals with the theory and applications of sampling. The main topics that are covered are: Probability sampling techniques: simple random, stratified, systematic, cluster and complex, Sample size and designing a sample, Estimation of means, totals, proportions and their variances, Weighting of survey data, Dealing with non-response, Statistical inference for survey data. | | | | | Semester mark (30%): Regular written assignments. Examination mark (70%): one written examination. | |
| STS790 | 120 | 9 | CESM150399 | | Extended Dissertation | |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |
| STS791 | 60 | 9 | CESM150399 | | Short Dissertation | |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |
| STS900 | 360 | 10 | CESM150399 | | Thesis | |
| Topic is chosen in consultation with the supervisor and department. | | | | | A single document submitted to the supervisor and external moderator. | |
| WKS114 | 16 | 5 | CESM150301 | NCS Mathematics on performance Level 6 (70%) or a minimum pass mark of at least 60% in WTW164/ WTV164 or a pass in WTW184 or WTW134 | Introductory Statistics | 3L, 3T |
| Descriptive statistics, Introduction to probability and probability distributions, Hypotheses testing. | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. | |
| WKS124 | 16 | 6 | CESM150302 | WKS114 and (WTW114 or 75% in WTW134) | Introductory Probability Theory | 3L, 3T |
| Stochastic variables, Distribution theory, Joint-, marginal- and conditional distributions, Expected values. | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. | |
| WKS216 | 24 | 6 | CESM150302 | WKS124 and (WTW134 or 40% in WTW114) | Sample Distribution Theory and Inference | 3L, 3T |
| Limit theorems, Chi-Square-, t - and F - distributions, Sampling theory, Estimation of parameters, Properties of good estimates, Basic interval estimation. | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. | |
| WKS226 | 24 | 7 | CESM150302 | | Bayesian Statistical Inference | 3L, 3T |
| Decision theory, Bayes inference, Conjugate priors and the Normal and other common distributions, Credibility intervals, Non- informative prior distributions and Bayes estimates | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. | |

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| WKS314 | 16 | 7 | CESM150302 | WKS226 | Inference | 3L, 3T |
| Theory of hypothesis testing, Derivation of tests and the properties of tests, approximate tests, Tests for categorical data, Contingency tables, Theory of confidence intervals and the properties of good confidence intervals, Pivotal quantities and the derivation of confidence intervals, approximate confidence intervals. | | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. |
| WKS324 | 16 | 7 | CESM150302 | WTW124 and WKS314 | Multivariate Analysis | 3L, 3T |
| General principles of matrix theory, Matrix differentiation: Multivariate normal distribution, Wishart distribution, Estimation of parameters, Mean vectors, Hypotheses testing about mean vectors, Multivariate correlation and regression theory. | | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. |
| WKS334 | 16 | 7 | CESM150302 | WTW124 and WKS226 | Multiple Regression | 3L, 3T |
| Parametric and Non-parametric Analysis of Variance including: The two-sample t-test, the F-test, the Kruskal-Wallis test, Friedman's test, Bonferroni's and Tukey's multiple comparison tests, Simple and Multiple Regression, Regression Diagnostics. | | | | | | Semester mark (50%): assignments, semester tests. Examination mark (50%), one three-hour exam paper. |
| WKS344 | 16 | 7 | CESM150302 | WKS314 and WKS334 | Time Series Analysis | 3L, 3T |
| Ordinary Least Squares (OLS) regression, Variable and Model Selection using Information Criterion, Generalised Linear Models (GLM) regression, Spectral Analysis of a time series, analysis of mean and variance to determine stationarity, Time series decomposition, Removal of non-stationarity through transformation, autocorrelation analyses (multiple types), Identification and fitting of Autoregressive and Moving Average time series models, Order of Integration analysis of a time series, Box-Jenkins analysis, Diagnostic analyses. | | | | | | Semester mark (50%): assignments, written and practical semester tests. Examination mark (50%): one three-hour exam paper. |

13. RULES OF PROGRESSION AND INTERIM REQUISITE BETWEEN NEW AND OLD QUALIFICATIONS

- If a student has interrupted his/her studies and the curriculum under which the student was registered has changed due to the re-curriculation his/her studies can only continue with the new curriculum, after consultation and permission from the relevant authorised personnel.
- If a student who has register for BArchStud before 2014 and has interrupted his/her studies the total credits needed to obtain the degree must be at least 400 and must be approved by the relevant authorised personnel.
- If a student has not interrupted his/her studies but has failed certain modules and the curriculum under which the student was registered has changed due to the re-curriculation his/her studies, can only continue with his/her studies with the new curriculum, after consultation and permission from the relevant authorised personnel.
- For the Bachelor Honour in Spatial and Regional Planning a selection of the following elective modules as in the 2012 and 2013 NAS Calendar will be presented in 2014 for student registering prior to 2014 to ensure sufficient credits to obtain the degree. (CSB702, CSB704, BGM752, BGR752, BVG752, CSB752, CSB762, DGP752, ENB752, GBE752, GND752, GOB752, IHB752, KIB752, LGB752, PPB752, RBT752 ,RPB752, SOB752, STO752, TVB752).
- If students registered before 2014 and the modules listed below , in column A, are included in their curriculum and they did not successfully completed the modules they need to register for the corresponding module(s) in column B:

| Column A | Column B |
|----------------------------|---------------------------------------|
| MKB 334 | One of B14, MKB 364, MKB 344, VWS 344 |
| BOC 334 | BOC 324 |
| BOC 324 | BOC 334 |
| BLG 114 | BLGY 1683 |
| BLG 144 | BLGY 1643 and BLG163 |
| BLG 124 | BLGY 1623 |
| WDK 224 | WDK 214 |
| DVL 444 | VWW 424 |
| PLK 214 or PLK 232 | PLK 216 |
| PLK 224 or PLK 262 | PLK 216 |
| LWL142 or LWL172 or LWL194 | VWW 124 or GKD 124 |
| ATW 396 | ATW 608 |

EQUIVALENT AND REPLACEMENT MODULES

The modules listed in the tables below have been replace by new modules or equivalent modules exists.

Replacement modules

| Previous course | New module |
|-----------------|------------------------------------------|
| CEM 601 | CEM614 and CEM624 (Anorganic Chemistry) |
| CEM 602 | CEM654 and CEM664 (Organic Chemistry) |
| CEM 603 | CEM634 and CEM644 (Physical Chemistry) |
| CEM 604 | CEM674 and CEM684 (Analytical Chemistry) |
| CEM 691 | Practical in CEM614 and CEM624 |
| CEM 692 | Practical in CEM654 and CEM664 |
| CEM 694 | Practical in CEM634 and CEM644 |
| GLG 683 | GLG653 |

Equivalent Modules

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|------------------------------------------------------|-------------------|
| MVL 701 | MVL720 and MVL722 |
| MVL 702 | MVL723 |
| MVL 703 | MVL770 |
| MVL 704 | MVL724 or MVL730 |
| MVL 705 | MVL731 |
| MVL 706 | MVL740 |
| MVL 707 | MVL770 |
| MVL 708 | MVL761 |
| MVL 709 | MVL750 |
| MVL 710 | MVL751 |
| MVL 711 | MVL752 |
| MVL 712 | MVL733 |
| MVL 713 | MVL721 |
| MVL 714 | MVL762 |
| MVL 791 class attendance gives recognition to MVL721 | |

| Old module | Replace by new modules |
|------------|------------------------|
| OGT106 | OGT 104 |
| OGT206 | OGT204 |
| TAR224 | TAR204 |
| TAR714 | TAR704 |
| PAK714 | PAK704 |

