2017

Acting Dean:
Prof D Brink
BScHons, MScAgric, PhD (Stell)

Faculty of AgriSciences

Academic Programmes and Faculty Information

CALENDAR PART 7

UNIVERSITEIT
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Accuracy, liability and changes

- Stellenbosch University has taken reasonable care to ensure that the information provided in the Calendar parts is as accurate and complete as possible.
- Take note, however, that the University's Council and Senate accept no liability for any incorrect information in the Calendar parts.
- The University reserves the right to change the Calendar parts at any time when necessary.

The division of the Calendar

- The Calendar is divided into 13 parts.
- Part 1, 2 and 3 of the Calendar contain general information applicable to all students. Make sure that you understand all provisions in Part 1 (General) of the Calendar that are applicable to you.
- Part 4 to 13 of the Calendar are the Faculty Calendar parts.

Part	Calendar
Part 1	General
Part 2	Bursaries and Loans
Part 3	Student Fees
Part 4	Arts and Social Sciences
Part 5	Science
Part 6	Education
Part 7	AgriSciences
Part 8	Law
Part 9	Theology
Part 10	Economic and Management Sciences
Part 11	Engineering
Part 12	Medicine and Health Sciences
Part 13	Military Science

Availability of the Calendar parts

- The printed versions of the Calendar parts are available at the University's Information Desk in the Admin A Building.
- The electronic versions of the Calendar parts are available at www.sun.ac.za/Calendar.
- There are English and Afrikaans (Part 1 to 12) copies available.

Table of Contents

How to use this Calendar Part

This section gives you guidelines for finding particular information in the different chapters in this Calendar part. Consult the table of contents for the page numbers of the chapters referred to below.

1. Where to find information

1.1 Prospective undergraduate students

- General Information chapter contains information about:
  - Communication with the Faculty and the University, which includes an explanation of the concept "student number" as well as relevant contact details where you can refer important enquiries to;
  - The University's Language Policy and Plan; and
  - The degree programmes that you can enrol for and the qualifications that you can obtain.
- Undergraduate Programmes chapter contains information about:
  - The Faculty's undergraduate study programmes;
  - The process of enrolment management, which entails selection for admission to programmes of study;
  - The minimum admission requirements for the various study programmes; and
  - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.
- Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules;
  - An explanation of the different digits used for the numbering of modules in the Undergraduate Programmes chapter; and
  - Definitions of prerequisite pass, prerequisite and corequisite modules.
- Alphabetical list of subjects is available in the back of this Calendar part.

1.2 Prospective postgraduate students

- General Information chapter contains information about:
  - Communication with the Faculty and the University, which includes an explanation of the concept "student number" as well as relevant contact details where you can refer important enquiries to; and
  - The University's Language Policy and Plan.
- Postgraduate Programmes chapter contains information about:
  - The Faculty's postgraduate study programmes;
  - The minimum admission requirements for the various study programmes;
  - Specific closing dates for applications, and other relevant information, for example selection for admission; and

- The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.

- Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules; and
  - An explanation of the different digits used for the numbering of modules in the Postgraduate Programmes chapter.
- Alphabetical list of subjects is available in the back of this Calendar part.

1.3 Registered undergraduate students

- General Information chapter contains information about;
  - Communication with the Faculty and the University with relevant contact details where you can refer important enquiries to;
  - The University's Language Policy and Plan; and
  - The granting of Dean's Concession Examinations to final-year students.
- Undergraduate Programmes chapter contains information about:
  - The Faculty's undergraduate study programmes; and
  - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.
- Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules;
  - An explanation of the different digits used for the numbering of modules in the Undergraduate Programmes chapter;
  - The abbreviations and definitions used for the teaching loads of individual modules;
  - An indication at each module of what its teaching load is;
  - Definitions of prerequisite pass, prerequisite and corequisite modules, as well as an indication at each module which of the requisites apply to it, if any; and
  - How individual modules are assessed.
- Alphabetical list of subjects is available in the back of this Calendar part.

1.4 Registered postgraduate students

- Postgraduate Programmes chapter contains information about:
  - The Faculty's postgraduate study programmes; and
  - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.
- Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules; and
  - An explanation of the different digits used for the numbering of modules in the Postgraduate Programmes chapter.
- Alphabetical list of subjects is available in the back of this Calendar part.

General Information

1. History, structure and mission of the Faculty of AgriSciences

1.1 History

When SU was officially established in 1918, Agriculture was one of the first four faculties and right from the outset it made an indelible contribution to agricultural education and research in South Africa. In 2006 the Faculties of Agriculture and Forestry merged to become the Faculty of AgriSciences.

The Faculty of AgriSciences at Stellenbosch University is held in high esteem at national and international levels for the quality of our training and research and also as consultant in the agricultural and forestry industry.

1.2 Functions

Some of the challenges facing the present-day agricultural and forestry industries are the creation of employment and entrepreneurial opportunities, the provision of sufficient high-quality food, and sufficient plant and animal fibre at affordable prices. These opportunities and challenges are further influenced by the diversity of our country's topography, soil varieties, variable climate, limited water resources and the stricter requirements that selective consumers are constantly setting for agricultural and forestry produce. Furthermore, we have to practice agriculture and forestry in harmony with nature to without exploiting natural resources. Our country has a large variety of animal and plant life that, while agricultural and forestry activities are being carried out, must be respected, protected and conserved to ensure that the quality of life of all South Africans is improved.

1.3 Structure

The Faculty consists of 11 departments, which are:

- Agricultural Economics;
- Agronomy;
- Animal Science
- Conservation Ecology and Entomology;
- Food Science;
- Forest and Wood Science;
- Genetics and the Institute of Plant Biotechnology;
- Horticultural Sciences;
- Plant Pathology;
- Soil Science; and
- Viticulture and Oenology and the Institute for Wine Biotechnology.

The two experimental farms, Welgevallen and Mariendahl, are managed by the Faculty of AgriSciences and they are mainly utilised for training at undergraduate level as well as for postgraduate projects by postgraduates and staff members.

1.4 Vision and mission

The vision of the Faculty of AgriSciences is international excellence with wide acknowledgement of the depth and relevance of our research, the exceptional quality of our education, and the usefulness of our service to agriculture and forestry.

Our mission is to be the preferred provider of world-class research, education and service to agriculture and forestry in southern Africa. We strive to use our knowledge, expertise and skills to the benefit of South Africa and the region, of its people and its industries, and of our clients in a manner that ensures the sustainable use of the region's natural, physical and social resources.

To this end:

- our research forms a seamless continuum, from pioneering fundamental investigations, through market-driven applied research, to relevant technology development and transfer aimed at practical implementation;
- we ensure, through our modern, high-quality methods of learning and teaching and inspired by our research successes, that our students are the first choice of employers, that they are known as the shapers of opinion, and that they are ready to step into leadership roles whether locally or internationally;
- we provide a one-stop service to industries and clients;
- we work together in strategic alliances; and
- every staff member is multi-skilled and of world-class standard.

2. Teaching, research and social impact

The Faculty of AgriSciences plays an important role in continuously advancing and improving agricultural and forestry productivity in South Africa while ensuring that natural resources are protected and used sustainably. We strive to supply the agricultural and forestry sectors with excellent research, top tuition and world class service. Consequently the Faculty is one of the most important institutions which addresses the growing challenges to agriculture and forestry in its fields of study and research, and tries to find solutions.

South Africa has an exceptional variety of fauna and flora which is respected, protected and conserved in all agricultural and forestry practises. Therefore it is also the Faculty's purpose to ethically and scientifically align the application and management of living organisms by means of training, research and community involvement. In doing so the quality of life of everyone in the country is improved.

2.1 Teaching

Our undergraduate and postgraduate programmes prepare students to act as competitive leaders and managers in the various sectors of both agriculture and forestry. The Faculty focuses on creating opportunities where all students can develop their full potential. This is done by researching and using the most suitable methods of teaching to encourage students to obtain all

facets of the graduate qualities. The Faculty works closely with other support divisions to ensure success on undergraduate level, including additional tutor support, integration of information and communication technologies in the teaching and learning process. Interpreting services are also offered in certain areas.

2.2 Research

Agriculture and forestry are faced with many challenges to supply the increasing world population with sufficient quality, safe food and fibre and to manage the forestry industry in a meaningful way. The Faculty of AgriSciences is fully aware of this responsibility and enthusiastically accepts these challenges. Accordingly we aspire to provide excellent research in each of our departments to ensure the agricultural industry's progress and success.

The Faculty now has four government-funded South African Research Chairs Initiative chairs (the purpose of which is to boost research and innovation capacity of universities), in post-harvest technology, plant biotechnology, meat science and wine biotechnology. In addition the accelerated outputs achieved in conservation ecology, food science, animal sciences and plant pathology are testimony to the Faculty's advances in both traditional and emerging fields of study.

This increased postgraduate emphasis has resulted in unprecedented numbers of Master's and PhD graduates.

2.3 Social impact

The Faculty of AgriSciences is committed to the burning questions and development challenges of the present time and pays much attention to community interaction initiatives. These initiatives relate to poverty alleviation, food security, biodiversity, sustainability, the rural economy, postharvest technology, pests and diseases, water management, food processing, rural development and agribusiness.

We continuously extend our global network of collaboration to more universities and research institutes in various African countries and the East, where our academic interests continue to grow.

3. How to communicate with the Faculty

3.1 Contact details of the Faculty of AgriSciences

Direct specific enquiries related to the Faculty to the following address:

The Dean
Faculty of AgriSciences
Stellenbosch University
Private Bag X1
MATIELAND
7602

3.2 Physical address and contact details of the Dean's Office

Dean's physical address

Room 1027
JS Marais building
Victoria Street
Stellenbosch

Contact persons and details

Staff	Telephone number	E-mail address
Acting Dean: Prof D Brink	021 808 4737	db@sun.ac.za
Acting Vice Dean: Prof P Gouws	021 808 2609	pgouws@sun.ac.za
Secretary: Ms K Vergeer	021 808 4792	ccav@sun.ac.za
Faculty Manager: Dr M-J Freeborough	021 808 4802	mfree@sun.ac.za
Co-ordinator: Academic and Student Affairs: Dr N Brown	021 808 2015	nbro@sun.ac.za
Recruitment: Mrs M Basson	021 808 2978	mh@sun.ac.za
Marketing and Communication: Mrs C Bruce	021 808 9047	cbruce@sun.ac.za
Blended Learning Co-ordinator: Ms K Wirth	021 808 4792	wirthk@sun.ac.za
Faculty Administrator: Mrs G Gamiet	021 808 9111	ghgamiet@sun.ac.za

For more information on the Faculty of AgriSciences, visit us at http://www.sun.ac.za/agric/

3.3 Contact details of Departments

Department	Telephone number	E-mail address	Web page
Agricultural Economics: Prof N Vink	021 808 4899	nv@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/agricultural-economics
Agronomy: Prof TN Kotze	021 808 4003	nkotze@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/agronomy
Animal Sciences: Prof K Dzama	021 808 4740	kdzama@sun.ac.za	www.sun.ac.za/english/faculty/agri/animal-science

Department	Telephone number	E-mail address	Web page
Conservation Ecology and Entomology: Prof K Esler	021 808 4005	kje@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/conservation-ecology
Food Science: Prof GO Sigge	021 808 3581	gos@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/food-science
Forest and Wood Science: Dr P Ackerman	021 808 3323	packer@sun.ac.za	www.sun.ac.za/english/faculty/agri/forestry
Genetics: Prof J Burger	021 808 5858	jtb@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/genetics
Horticultural Sciences: Dr EW Hoffman	021 808 2383	ewh@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/horticulture-sciences
Plant Pathology: Prof A Viljoen	021 808 4797	altus@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/plantpathology
Soil Science: Dr JE Hoffman	021 808 4789	ehoffman@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/soil-science
Viticulture & Oenology: Prof M du Toit	021 808 3772	mdt@sun.ac.za	www.sun.ac.za/english/faculty/agri/departments1/viticulture-oenology
Institute for Plant Biotechnology (part of Dept of Genetics): Prof JM Kossmann	021 808 3836	kossmann@sun.ac.za	www.sun.ac.za/english/faculty/agri/plant-biotech
Institute for Wine Biotechnology (part of Dept of Viticulture & Oenology): Prof M du Toit	021 808 3772	mdt@sun.ac.za	www.sun.ac.za/english/faculty/agri/institutes-centres/institute-for-wine-biotechnology

3.4 Contact details of the Society for AgriSciences students

The AgriSciences Students Association (ASA) is an association for students in agricultural or forestry sciences of Stellenbosch University. The association strives to promote both your academic and social interests. It achieves these goals by representing you on faculty and other academic bodies and committees within the University.

The ASA welcomes you to the Faculty of AgriSciences. For more information on the ASA, visit the website below or contact us electronically:

- www.sun.ac.za/english/faculty/agri/asa/Pages/default.aspx
- asa@sun.ac.za

4. How to communicate with the University

4.1 Using your student number

- The University allocates a student number to you when you apply to study at the University.
- The student number is your unique identification to simplify future communication with the University.
- Use your student number every time you communicate with the University.

4.2 Contact details of the University

You can send enquiries regarding your studies, bursaries and loans, and residence placements to the following address:

The Registrar
Stellenbosch University
Private Bag X1
MATIELAND
7602

You can send enquiries regarding finances and services, including services at University residences, to the following address:

The Chief Operating Officer
Stellenbosch University
Private Bag X1
MATIELAND
7602

Visit the University's website at http://www.sun.ac.za.

5. Language at the University

Stellenbosch University (SU) is committed to engagement with knowledge in a diverse society and through the Language Policy aims to increase equitable access to SU for all students and staff. Multilingualism is promoted as an important differentiating characteristic of SU. Afrikaans, English and isiXhosa are used in academic, administrative, professional and social contexts. Pedagogically sound teaching and learning are facilitated by means of Afrikaans and English.

More information concerning language at SU is available on the website www.sun.ac.za/language.

6. Qualifications offered in the Faculty of AgriSciences

You can obtain the following qualifications in the Faculty of AgriSciences. Consult the chapters "Undergraduate Programmes" and "Postgraduate Programmes" for more information regarding your specific programme.

6.1 Plant and Soil Sciences

Programme	Qualification
Bachelor's programme in Plant and Soil Sciences	BScAgric
Postgraduate Diploma in Agronomy	PgDip (Agronomy)
Honours programme in Applied Plant Physiology	BScHons
Honours programme in Plant Pathology	BScHons
Master's programme in Entomology, Nematology or Plant Pathology	MSc
Master's programme in Agronomy, Genetics, Horticultural Science, Soil Science or Viticulture	MScAgric
PhD programme in Agronomy, Entomology, Nematology, Genetics, Horticultural Science, Plant Pathology, Soil Science or Viticulture	PhD
DSc programme in Agronomy, Entomology, Genetics, Horticultural Science, Plant Pathology, Soil Science or Viticulture	DSc

6.2 Food Production Systems

Programmes	Qualifications
Bachelor's programme in Food Production Systems	BSc Food Sc
Master's programme in Food Production Systems	MSc Food Sc
PhD programme in Food Production Systems	PhD
DSc programme in Food Production Systems	DSc

6.3 Wine Production Systems

Programmes	Qualifications
Bachelor's programme in Wine Production Systems	BScAgric
Honours programme in Wine Production Systems	BScHons (Wine Biotechnology)
Master's programme in Wine Production Systems	MSc or MScAgric (Wine Biotechnology) or MScAgric (Oenology or Viticulture)
PhD programme in Wine Production Systems	PhD
DSc programme in Wine Production Systems	DSc

6.4 Animal Production Systems

Programmes	Qualifications
Bachelor's programme in Animal Production Systems	BScAgric
Postgraduate Diploma in Animal Sciences	PgDip (Animal Sciences)
Postgraduate Diploma in Aquaculture	PgDip (Aquaculture)
Master's programme in Animal Production Systems	MScAgric
PhD programme in Animal Production Systems	PhD
DSc programme in Animal Production Systems	DSc

6.5 Agricultural Economics and Management

Programmes	Qualifications
Bachelor's programme in Agricultural Economics and Management	BScAgric or BAgricAdmin
Honours programme in Agricultural Economics and Management	BAgricAdminHons
Master's programme in Agricultural Economics and Management	MScAgric or MAgricAdmin
PhD programme in Agricultural Economics and Management	PhD
DSc programme in Agricultural Economics and Management	DSc

6.6 Forestry and Wood Sciences

Programmes	Qualifications
Bachelor's programme in Forestry and Wood Sciences	BScFor
Postgraduate Diploma in Forestry and Wood Sciences	PgDip (Forestry and Wood Sciences)
Master's programme in Forestry and Wood Sciences	MScFor
PhD programme in Forestry and Wood Sciences	PhD (For)
DSc programme in Forestry and Wood Sciences	DScFor

6.7 Conservation Ecology

Programmes	Qualifications
Bachelor's programme in Conservation Ecology	BScConsEcol
Master's programme in Conservation Ecology	MScConsEcol

6.8 Generic PhD-programme

Programme	Qualification
PhD generic programme for: Conservation Ecology, Wine Biotechnology, specific fields of study in Agricultural Sciences, Forestry Sciences, Food Sciences	PhD

6.9 Agricultural Production and Management

Programme	Qualification
Bachelor's programme in Agricultural Production and Management	BAgric

On the basis of a co-operation agreement between Stellenbosch University and the Western Cape Provincial Government, the Bachelor's programme in Agricultural Production and Management (BAgric) is presented by the Cape Institute for Agricultural Training: Elsenburg on the Elsenburg Campus. All information about this programme is available from the Cape Institute for Agricultural Training: Elsenburg. Contact the Institute directly at 021 808 5451/3 or visit their website at www.elsenburg.com.

7. Profile of the graduates of the Faculty of AgriSciences

As one of our graduates you are a scientist who has the necessary knowledge, skills and disposition to function optimally, whether independently or in team context, in a scientific agricultural or agriculturally related environment. This means that you will be able to implement the relevant sciences sensibly in the chain to provide a variety of food and fibre products in an economical, environmentally friendly and sustainable manner so as to promote the progress and welfare of humanity.

In order to fulfil these requirements, you will display the below-mentioned professional characteristics as a graduate. It means that you:

Knowledge

- Possess the necessary knowledge of the applicable sciences, and understand the interaction between biological and abiotic factors in the environment and the basic principles of research methodology.
- Possess the ability to create new knowledge, generate ideas and act innovatively.
- Possess the ability to function efficiently in an interdisciplinary environment.
- Understand sustainable development and sustainable resource management.
- Make knowledgeable decisions on the basis of proven information.
- Follow a systems approach in the analysis of and approach to environmental problems.

Skills

- Possess the ability to gather knowledge, integrate it, interpret and apply it and to think and act in a problem-solving manner.
- Communicate effectively with role players from different environments and backgrounds.
- Possess sufficient skills to function as scientists, whether independently or in team context.
- Can interpret and utilise relevant subject literature.
- Possess the ability to efficiently utilise suitable resources and means in the working environment.

Attitude and disposition

- Show respect for the environment and those who use it.
- Acknowledge the limitations of your own knowledge and skills.
- Have a positive disposition to continuous professional development.
- Are involved in and provide a service to the broader community.
- Set a positive example with regard to social responsibilities and obligations.
- Accept and strive for the highest standards of knowledge.

8. Standing rules for Dean's Concession Examinations (DCEs)

8.1 A final-year student who, when all examinations of the current round have been taken and when all final marks are available, is less than 33 credits (with a maximum of two modules) in arrears for the degree; does not qualify for supplementary examination; has been permitted to write examinations in all modules required for the degree; and has taken the examinations in all the modules concerned, may be admitted to a Dean's Concession Examination (DCE) as a concession by the Dean, in consultation with the academic department(s) concerned.

8.2 The DCE shall be taken at a scheduled time during the last week of January or the first week of February.

8.3 These students shall be identified by the Faculty Administrator, who shall furnish the departments concerned with their names via the Dean's office. The onus shall be on the students concerned to communicate with the Faculty Administrator in good time (not later than 15 January) about possible admission to the DCE. Students who are granted a DCE shall present themselves for the examination, which shall be conducted departmentally.

8.4 DCEs in modules subject to continuous assessment shall be taken at the same time as referred to in paragraph 8.2 above, subject to the procedures laid down in paragraph 8.3 above.

8.5 Students who have been granted a DCE shall ascertain when and where the DCE in question is to be written and present themselves at such time and place.

8.6 DCEs shall be granted only with the approval of the Dean. No student shall be granted a DCE, under any circumstances, by any department. No lecturer can give a student an undertaking in this regard.

8.7 The Rules for DCEs in other faculties may differ from the Rules of the Faculty of AgriSciences. Students are required to familiarise themselves with such Rules, because it is taken into consideration together with those of the Faculty of AgriSciences.

9. Assessment

9.1 There are mainly two systems used for the determination of the final mark for every module, namely:

- continuous assessment for the determination of final marks (the rules are given in Part 1 (General) of the Calendar.); and
- examination, where the class and examination marks are used in a specific relation to determine the final mark.

9.2 You can expect the following for the determination of your class mark:

- Semester modules make use of at least three, and in the case of year modules, six assessment opportunities to determine the class mark.

- Every assessment opportunity contributes approximately an equal proportion to the class mark.

9.3 You can find the preliminary test and/or assessment dates in the study guide of a module.

9.4 You will be consulted when your test and assessment dates are finalised. If you are in a class group with diverse study programmes and it is difficult to reach consensus on test or assessment dates, assessment will take place after completion of certain parts of the module.

9.5 Tests take place during the normal lecture or practical periods. No scheduled test may take place during the last two weeks of the formal class contact time of a semester (just before the first examination opportunity).

9.6 Tests are scheduled so that they do not coincide with the mid-semester tests of other faculties.

10. Information on admission, registration, accommodation and regulations

For further information on admission and registration of students, accommodation, regulations in regard to university examinations, rules dealing with advanced degrees, and/or recognition of degrees, consult Part 1 (General) of the Calendar.

11. Agriculture and Forestry in South Africa

11.1 Agriculture

In South Africa agriculture provides in people's basic needs for food and fibre. Agriculture contributes about 4% to the gross domestic product and it is an important earner of foreign exchange. Furthermore it is a large employer; 10% of formal job opportunities. Agro-tourism is becoming increasingly important as an industry and provides recreational opportunities to many city dwellers. For every R1 million increase in the demand for agricultural produce, 83 new job opportunities are created, compared to only 29 such opportunities in the rest of the economy. It is generally acknowledged that agriculture plays an important role in poverty relief.

Soil is an important production factor in agriculture and forestry. South Africa covers 122,3 million hectares, of which approximately 102,8 million ha, about 84%, are used for agriculture and forestry. Of this, about 16 million ha are used for crop production, about 1,3 million ha are planted with trees. Natural pastures cover approximately 83 million ha, most of which is found in semi-desert areas. Soils with optimal physical and chemical conditions are scarce and localised, although there are various unique soil/climate combinations that make the provision of products for niche markets possible.

South Africa has a shortage of water. About 30% of South Africa receives less than 250 mm of rain a year, about 34% receives between 250 and 500 mm, 25% between 500 and 750 mm, and only 11% of the country has a rainfall of more than 750 mm a year. Rainfall over large parts of the country is uncertain, and periodic droughts occur regularly. Because of these and other factors, South Africa is largely dependent for its water supply on reservoirs and subterranean water sources. Slightly more than 1, 2 million ha is under irrigation. Agriculture is currently still the main user of

water, about 50%, but there is increasing pressure on agriculture to release more water for industrial and domestic use. Only 10% of agricultural land can be utilised without irrigation. The management of forestry plantations in water catchment areas has to follow strict guidelines. Water and irrigation management therefore requires particular expertise.

South Africa is still pre-eminently an agricultural country. Because of our varied climate and topography we can grow almost any crop. We are presently in the fortunate position of being self-sufficient in most primary food and fibre products for the population of the country. Types of food in which the country is at present not self-sufficient are wheat, oilseed, rice, tea and coffee. More than 33% of the total value of horticultural production is exported. Of this, pome fruit makes up the largest volume. Other examples of South African exports are subtropical fruit, maize, sugar, vegetables, wine, cut flowers, flower bulbs, mohair and karakul pelts. Eighty-one per cent of agricultural land is under natural pasture that is used mainly for extensive stock-farming. This is almost 70% of the total land surface of South Africa. Stock-farming is carried out with a variety of animals, including cattle, pigs, sheep, goats and poultry. Aquaculture is a rapidly growing industry with considerable potential.

Besides the production of fresh produce, other important value-adding activities are postharvest operations, product manufacture, food processing, storage and preservation. The quality of the product enjoyed by the consumer is dependent on sound management of soil, crops and herds. Careful and responsible pest and disease management is therefore also required.

11.2 Forestry

South Africa has beautiful forests and some of the tree species are used for timber that compares favourably with the best in the world. Unfortunately, our forests of indigenous trees are limited, and many years ago it was found necessary to plant tree species from other parts of the world. The demand for timber shows a steady increase. To meet the need for timber, and to ensure adequate timber resources for the future, production from the current 1,3 million ha of afforested area must be expanded by establishing new forests or by increasing the current level of production from existing forests.

When trees reach maturity, they must be harvested. This facet of the forestry industry is very complex, especially where trees are growing on steep mountain slopes. Road systems must be planned in detail and expensive harvesting equipment must be acquired and used efficiently.

The processing of the timber is the next step in the value chain. This can be done either at a sawmill, where it is sawn, seasoned and graded, ready to be used in building or furniture, or at a paper mill, or at some other plant for processing into chips or fibre. Forests do not only meet our timber needs. They also provide outdoor recreational facilities. The need for forests and parks is becoming increasingly important, especially with the current population growth. The majority of forestry areas are accessible to the public. The wider field of conservation ecology addresses this aspect, for example through the conservation of fauna and flora and the management of the natural environment for its esthetical and scientific importance. Trees also play an important role in rural and urban areas for the production of firewood, bark, medicine and ornaments, thereby enhancing the general quality of life.

Seen against this background, it is obvious that special knowledge, skills and management expertise are required for sustainable agricultural and forestry production. Our wide range of

teaching programmes covers, therefore, all aspects of natural resource management, plant and animal production, postharvest operations and economic management, from the basic science, through to the practical and economic aspects of the respective value chains of agriculture and forestry.

Graduates in agriculture and forestry can follow a variety of careers in plant or animal production, conservation, processing and marketing. There are, for example, careers in research, teaching, consultation, information dissemination, farm management, environment management and industrial plant management (cellars, food factories and sawmills). Professions and careers such as these are not only practised in agricultural and forestry companies, but also in associated industries, commercial enterprises and government departments. Our graduates enjoy high regard in the international labour market.

Undergraduate Programmes

1. Instructional programmes and fields of study

The Faculty's instructional programmes train you in one of six industry sectors, namely:

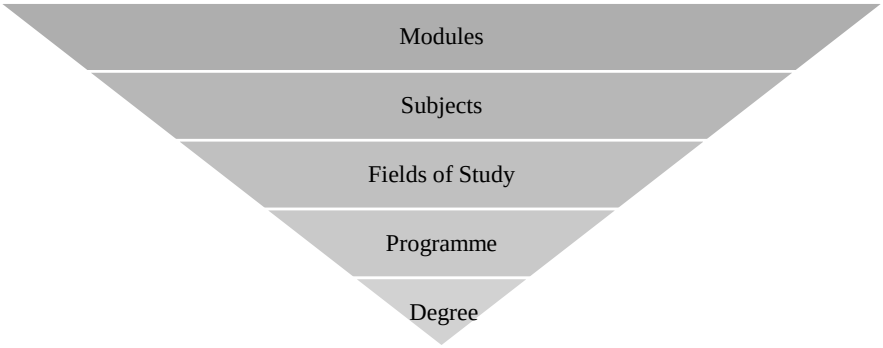
- Plant and Soil Sciences;
- Animal Production Systems;
- Food Production Systems;
- Wine Production Systems;
- Agricultural Economics and Management;
- Forestry and Wood Sciences; and
- Conservation Ecology.

You must first select one of the six abovementioned instructional programmes. Each instructional programme consists of various fields of study from which you must make a choice. Each field of study consist of a number of specific modules; a module is a predetermined study unit.

The modules in each of the instructional programmes are grouped in such a way that they contain all the information needed to ensure comprehensive training within a particular field of the selected programme. Each instructional programme consists of various fields of study which give you the opportunity to make a refined choice within the broader programme. These fields of study are related but each one forms a specialisation within the training programme as a whole.

The field of specialisation is determined by the combination of major subjects selected for each field of study. You will study basic scientific principles ever more deeply from the first year of the programme, to culminate in the final year of study into two major subjects. This provides you with some specialist training (for a specific career) within the more general training provided by the programme as a whole (for a more general career).

Thanks to the general formative nature of the instructional programme, when you obtain a bachelor's degree you are equipped to achieve success in any career relating to agriculture or forestry. The following scheme represents the hierarchy from modules to a degree:



After obtaining your bachelor's degree you can proceed with an honours, master's or doctoral degree in one of the specialisation fields of the broader instructional programmes. After obtaining these qualifications you are able to enter the labour market as a specialist in your field.

The first year of all study fields (with the exception of the BAgricAdmin degree) is taken mainly in the Faculty of Science and/or Engineering. Different combinations of the modules are required for each study field and/or programme. Your specific combination is given in you specific study programme later in this chapter.

From the second year of study you join your selected study programme offered mainly in the Faculty of AgriSciences.

In the case of the BAgricAdmin programme, you join the programme in the first year which is mainly offered in the Faculty of AgriSciences.

2. Undergraduate enrolment management

In order to meet the targets of Council with regard to the total number of students and the fields of study and diversity profile of the student body of Stellenbosch University, it is necessary to manage the undergraduate enrolments at Stellenbosch University. The University's total number of enrolments is not only managed to accommodate its available capacity but we are committed to the advancement of diversity.

The University's undergraduate enrolment is managed within the framework of the national higher-education system. We strive toward a well-grounded cohesion between national and institutional goals, respecting important principles such as institutional autonomy, academic freedom and public responsibility. The following points of departure apply:

- High academic standards are maintained for the expansion of academic excellence
- The University attempts to maintain and continuously improve high success rates.
- The University is committed to rectification, social responsibility and training future role models from all population groups.
- The University strives to expand access to higher education especially for students from educationally disadvantaged and economically needy backgrounds who possess the academic potential to successfully study at the University.

Take note that, due to the limited availability of places and the strategic and purposeful management of enrolments, you will not be automatically admitted to Stellenbosch University even if you meet the minimum requirements of your chosen programme. You can find more details about the selection procedures and admission requirements for undergraduate programmes in this chapter, on the Faculty's website at www.sun.ac.za/agric and at www.maties.com.

As a prospective undergraduate student you must write the National Benchmark Tests (NBT). Consult the NBT website at www.nbt.ac.za or the University's website at www.maties.com for more information on the National Benchmark Tests. The University can use the results of the National Benchmark Tests for the following purposes:

- To help determine whether you must be placed in an Extended Degree Programmes;
- For selection in a specific programme; and
- Curriculum development.

3. Admission requirements

3.1 School-leaving qualifications

For admission to the University you need:

- A National Senior Certificate (NSC) or school-leaving certificate from the Independent Examination Board as certified by Umalusi with admission to bachelor's (which requires that you obtain a mark of at least 4 (50-59%) in each of four designated university admission subjects); or
- A university exemption certificate issued by the South African Matriculation Board to students with other school qualifications.

3.2 Minimum admission requirements for the Faculty's degree programmes

- In addition to the abovementioned school-leaving qualifications, the **admission requirements for the programmes BScAgric, BScFor, BScConsEcol, BSc Food Sc and BAgricAdmin are as follows**:
  - An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
  - English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
  - Mathematics – 5 (60%); and
  - Physical Sciences (Physics and Chemistry) – 4 (50%).

Take note that the following admission requirements are applicable to the below-mentioned fields of study:

- Admission requirements for the fields of study BScAgric with Soil Science and Chemistry as major subjects:
  - An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
  - English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
  - Mathematics – 6 (70%); and
  - Physical Sciences (Physics and Chemistry) – 4 (50%).
- Admission requirements for the field of study Wood and Wood Products Science:
  - An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
  - English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
  - Mathematics – 6 (70%); and
  - Physical Sciences (Physics and Chemistry) – 5 (60%).
- Admission requirements for the field of study BAgric (Elsenburg):

In addition to the general admission requirements of Stellenbosch University, admission to the programme leading to BAgric (Elsenburg) requires at minimum:

- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 4 (50%) OR Mathematical Literacy – 5 (60%);
- Physical Sciences (Physics and Chemistry) – 4 (50%); OR
- Life Sciences – 4 (50%); OR
- Agricultural Sciences – 4 (50%).

As a prospective student you must also write the National Benchmark Tests (NBT). You must write the Academic and Quantitative Literacy test (AQL). If you take Mathematics as a subject you also have to write the Mathematics (MAT) test. However, if you are taking Mathematical Literacy as a subject and you are applying for the BAgric programme at Elsenburg then you do not need to write the Mathematics test.

3.3 Admission to the Extended Degree Programme (EDP)

Background

The Extended Degree Programme (EDP) was introduced to assist students with proven potential but without adequate schooling in mastering their degree programmes. An additional year of study is added to a mainstream degree programme to form an EDP. During this extra year you will receive additional academic support as preparation for specific mainstream subjects and for university studies in general.

In all fields of study in the Faculty of AgriSciences except *Agribusiness Management* and *Agricultural Economic Analysis and Management*, the EDP includes an additional year of study before you start the first year of study of your chosen mainstream degree programme. The curriculum of this additional year is specifically designed to provide you with additional academic support and to facilitate the transition between school and university. You must pass all the modules of this year to gain admission to the first year of the mainstream programme.

For the EDP in the fields of study *Agribusiness Management* and *Agricultural Economic Analysis and Management* the first year of the mainstream degree programme is spread over two years. You must pass all prescribed modules for these two years to gain admission to the second year of the mainstream programme.

Even if you have been admitted to a mainstream programme you can apply for admission to your programme's EDP. Based on your school results and/or the results of any assessment or test, including the NBTs, prescribed by the University, you may be advised or compelled by the Faculty to follow the EDP route.

Minimum admission requirements for the EDP in BScAgric, BScFor, BScConsEcol, BSc Food Sc and BAgricAdmin

- The minimum admission requirements for the EDP in the programmes BScAgric, BScFor (Forestry and Natural Resource Management), BScConsEcol, BSc Food Sc and BAgricAdmin:
  - An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;

- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 4 (between 55% and 59,9%);
- Physical Sciences (Physics and Chemistry) – 3 (between 45% and 49,5%); and
- National Benchmark Tests between 33% and 47%

Take note that the following admission requirements apply to the two fields of study below:

- Minimum admission requirements for the EDP in BScAgric with Soil Science and Chemistry as major subjects:
  - An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
  - English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
  - Mathematics – 5 (between 60% and 69,9%);
  - Physical Sciences (Physics and Chemistry) – 3 (between 45% and 49,5%); and
  - National Benchmark Tests between 33% and 47%.
- Minimum admission requirements for the EDP in BScFor (Wood and Wood Products Sciences):
  - An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
  - English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
  - Mathematics – 5 (between 60% and 69,9%);
  - Physical Sciences (Physics and Chemistry) – 4 (between 55% and 59,9%); and
  - National Benchmark Tests between 33% and 47%.

All necessary information on the structure and curriculum of the EDP will be supplied to you if you want to or are required to register for the EDP. You can also obtain the information from the Faculty Administrator at 021 808 9111.

4. Compulsory practical work

If you are taking the BScAgric degree programme with one or more majors in Animal Science, Oenology, Soil Science or Viticulture you must, before completion of the fourth year of study of the programme, undertake practical work to the satisfaction of the Department during your summer and/or winter vacation at an approved agricultural institution (the period for Soil Science and Animal Science is two months and for Viticulture and Oenology a minimum of six months):

- You must choose the institution where you will do the practical work in consultation with the department(s) of your major(s). Your chosen institution must be approved by the chair(s) of the departments(s) concerned before you start with the practical work.
- You must write a satisfactory report on your practical work and it must be submitted on the dates specified by the department(s) concerned.

- Partial or full exemption from the above-mentioned rules may be granted at the discretion of the department concerned if your circumstances justify such exemption.
- If you have Animal Science as a major and you are planning to submit a report on your practical work to the Department of Animal Sciences you must spend a minimum of four weeks of your two-month practical working at the University's experimental farms. You must do the practical work during the vacations of the second year of study. You will not be paid for this work. You must also undertake the compulsory Southern Cape tour in the beginning of your final year, which forms part of Animal Science 442.

Consult your specific programme to see if you must do any practical work in addition to your modules.

5. Compulsory module for first year students

As first year student you must register for the Lab Online short course and complete it to the satisfaction of the Faculty before your degree can be awarded.

6. Bachelor's programmes

6.1 Plant and Soil Sciences

More information is available on the following websites:

- http://www.sun.ac.za/agron/ (Department of Agronomy)
- http://www.sun.ac.za/horticulture/ (Department of Horticultural Science)
- http://www.sun.ac.za/plantpath/ (Department of Plant Pathology)
- http://www.sun.ac.za/english/faculty/agri/soil-science/ (Department of Soil Science)

Programme description and outcomes

The bachelor's programme in Plant and Soil Sciences leads to the qualification BScAgric. The programme covers training in the production of agricultural crops, pasture crops, vegetable crops, deciduous fruit, citrus and vines. For each crop, various subjects, such as Crop Production, Biochemistry, Soil Science, Agricultural Water Science, Agricultural Economics, Genetics, Entomology, Nematology, Plant Pathology and Biometry, are integrated into a meaningful whole.

Within this whole, you follow a combination of modules on ecology, development, physiology, production, breeding, nutrition, soil and water management, as well as harmful plant pathogens, insects, nematodes and their control in an environmentally friendly, sustainable and economically acceptable way.

There are three fields of study within the programme. These fields of study with the applicable majors are:

- **Crop Production** – Agronomy, Horticultural Science or Viticulture in combination with Entomology, Plant Pathology, Genetics or Agricultural Economics or Agricultural Economics in combination with Animal Science and Agronomy;
- **Crop Protection and Breeding** – Plant Pathology and Entomology or Genetics; and

- **Soil and Water Management** – Soil Science and one of Agronomy, Horticultural Science, Plant Pathology, Chemistry or Viticulture.

In Crop Production you will be trained as a crop production manager for, amongst others, agronomy, deciduous fruit, citrus and vines. In Crop Protection and Breeding you will be trained to become specialists in crop protection (the control of entomological and nematological pests and plant diseases) and genetic crop improvement. In Soil and Water Management you will be trained to become a specialist who understand the nature, importance and management of soil, soil fertility and water in crop production.

After successful completion of this programme you will be able to:

- formulate, analyse, evaluate and solve general terms, concepts, principles, theories and problems relating to relevant topics, singly or in combination, of crop production, crop protection and breeding, and soil and water management;
- identify and by critical and creative input solve production and management problems relating to soil or crop matters. Solutions will be scientifically founded and based on theory-driven arguments, enabling decisions to be taken in a responsible manner. In the Crop Production field of study problems of crops are addressed. In the Crop Protection and Breeding field of study problems dealing with plant health (plant pathological or entomological in nature) or improved breeding (genetics) are dealt with. In the Soil and Water Management field of study the responsible management of soil regarding the genesis, both physical and chemical properties, and water is addressed;
- effectively liaise, communicate and work together in group association. The programme covers participation with group work, group activities (for example farm planning task in Soil Science and orchard management plan in Horticulture) and evaluation in group association;
- organise and manage, singly or in group association, in a responsible and effective manner;
- learn to independently extract scientific information, to analyse, combine and critically evaluate and to apply same in specialised subjects for example pedology and land evaluation, soilless cultivation of crops, cultivation of deciduous fruit or fynbos, selection of wine cultivars on specific soils and terrains ("terroir"), detection and identification of pest organisms in the vine and fruit industries;
- effectively communicate with peers, supervisors and subordinates by the use of information technology as support for oral or written discussions and presentation of reports and submissions;
- use applicable scientific and statistical methods and evaluations for decision-making in regard to soil, botanical, plant health and plant breeding aspects; and
- understand and appreciate in the chosen field of study the complex and interdisciplinary interactions and have a holistic approach to these and similar fields of study.

The prescribed modules and elective modules of the various years of study for each field are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents"

of this Calendar part. For compulsory practical work in Soil Science and Viticulture see section 4 in this chapter. You can find information on practical training in Soil Science and Viticulture at the relevant field of study.

6.1.1 Bachelor's programme in Plant and Soil Sciences (BScAgric): Crop Productions with Agronomy, Horticultural Science or Viticulture in combination with Entomology, Plant Pathology, Genetics or Agricultural Economics

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (124 credits)

Compulsory Modules

If you are taking Agricultural Economics:

- you must take Economics 114 and 144, and Oenology 142; otherwise
- you must take Physics (Bio) 134 and 154.

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Crop Production	152(8)
Mathematics (Bio)	124(16)
AND	
Physics (Bio)	134(16), 154(16)
OR	
Economics	114(12), 144(12) and
Oenology	142(8)

Second Year (144 credits)

Compulsory Modules

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Crop Protection	244(16)
Soil Science	214(16), 244(16)

Genetics	214(16), 244(16) or
Agricultural Economics	234(16), 242(8), 262(8)
AND	
Crop Production	214(16) or
OR	
Viticulture	214(16) (If you are taking Viticulture as major you must take Viticulture 214.)

Third Year (136 or 144 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the modules Soil Science 314 and 344. Such organised excursion and/or assignment must take place for a period of time as determined by the Departments of Agronomy, Horticulture Sciences, Viticulture and Oenology or Forest and Wood Sciences. This necessary practical experience must be done during the relevant semesters of the abovementioned modules. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Biometry	312(8), 342(8) (You take Biometry 312 and 342 only if you follow Genetics as major. These modules are taken instead of Agronomy 312, Horticultural Science 352 and Viticulture 322 mentioned below.)
Soil Science	314(16), 344(16)
AND	
Viticulture	314(16), 322(8), 344(16)
OR	
Agronomy	312(8), 362(8)
Horticultural Science	352(8)
AND	
Agronomy	322(8), 332(8), 342(8) (You must take these modules if you are following Agronomy as major.)
OR	
Horticultural Science	314(16), 342(8) (You must take these modules if you are following Horticultural Science as major.)
and two of:	
Agricultural Economics	314(16), 364(16) ***
AND/OR	

Entomology	314(16) ***
Nematology	344(16) ***
AND/OR	
Genetics	314(16), 344(16)
AND/OR	
Plant Pathology	314(16), 344(16)

Elective Modules

Choose any two from the following four choices. Entomology 314(16) and Nematology 344(16) cannot be taking with Agricultural Economics 314(16) and 364(16).

Entomology	314(16)
Nematology	344(16)
OR	
Agricultural Economics	314(16), 364(16)
AND/OR	
Genetics	314(16), 344(16)
AND/OR	
Plant Pathology	314(16), 344(16)

Fourth Year (128 credits)

Compulsory Modules

- If you are taking Agronomy as major subject you must take the modules Agronomy 424 and 454.
- However, if you are taking Horticultural Science as major subject you must take the modules Horticultural Science 434 and 444.

Viticulture	444(16), 454(16), 478(32)
OR	
Applied Plant Physiology	414(16), 464(16) and
Agronomy	424(16), 454(16) or
Horticultural Science	434(16), 444(16)

Elective Modules

Choose one from the following subjects. You must take all modules of your chosen subject.

Entomology	418(32), 454(16), 464(16)
Genetics	324(16), 354(16), 414(16), 444(16)
Agricultural Economics	414(16), 424(16), 444(16), 454(16)
Plant Pathology	414(16), 444(16), 478(32)

6.1.2 Bachelor's programme in Plant and Soil Sciences (BScAgric): Crop Production Systems with Agronomy, Agricultural Economics and Animal Science

If you follow this programme successfully you will able to register as an agricultural scientist with The South African Council for Natural Scientific Professions (SACNASP). You will, however, not be able to register as an animal scientist.

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (130 credits)

Compulsory Modules

Animal Science	144 (16)
Biology	124(16), 144 (16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Economics	114(12), 144(12)
Mathematics (Bio)	124(16)
Theory of Interest	152 (6)

Second Year (120 credits)

Compulsory Modules

Agricultural Economics	242(8)
Animal Anatomy and Physiology	214 (16)
Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Introduction to Animal Nutrition	244(16)
Soil Science	214(16), 244(16)

Third Year (144 credits)

Compulsory Modules

Agricultural Economics	314(16), 364(16)
Agronomy	322(8), 342(8)
Animal Nutrition Science	324(16),344(16)
Animal Physiology	324(12), 344(12)
Soil Science	314(16), 344(16)

Fourth Year (144 credits)

Compulsory Modules

Agricultural Economics	334(16), 478(32)
Agronomy	424(16), 454(16)
Animal Nutrition Science	414(16), 444(16)
Animal Management Science	434(16), 464(16)

6.1.3 Bachelor's programme in Plant and Soil Sciences (BScAgric): Crop Protection and Breeding, with Plant Pathology and Entomology or Genetics

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (124 credits)

Compulsory Modules

If you are taking Agricultural Economics:

- you must take Economics 114 and 144 and Oenology 142; otherwise
- you must take Physics (Bio) 134 and 154.

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Crop Production	152(8)
Mathematics (Bio)	124(16)
AND	
Physics (Bio)	134(16), 154(16)
OR	
Economics	114(12), 144(12) and
Oenology	142(8)

Second Year (144 credits)

Compulsory Modules

If you are taking Viticulture as major then you must take Viticulture 214.

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Genetics	214(16), 244(16) or

Agricultural Economics	234(16), 242(8), 262(8)
Soil Science	214(16), 244(16)
Crop Protection	244(16)
AND	
Crop Production	214(16)
OR	
Viticulture	214(16)

Third Year (144 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the modules Soil Science 314 and 344. Such organised excursion and/or assignment must take place for a period of time as determined by the Departments of Agronomy, Horticulture Sciences, Viticulture and Oenology or Forest and Wood Sciences. This necessary practical experience must be done during the relevant semesters of the abovementioned modules. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Biometry	312(8), 342(8) (You only take Biometry 312 and 342 if you are taking Genetics as major subject. These modules are taken instead of Agronomy 312, Horticultural Science 352 and Viticulture 322 mentioned below.)
Entomology	314(16)
Nematology	344(16)
Plant Pathology	314(16), 344(16)
Genetics	314(16), 344(16) or
Soil Science	314(16), 344(16)
AND	
Viticulture	314(16), 322(8), 344(16)
OR	
Agronomy	312(8), 362(8)
Horticultural Science	352(8) and
Agronomy	322(8), 332(8), 342(8) or
Horticultural Science	314(16), 342(8)

Fourth Year (128 credits)

Compulsory Modules

Plant Pathology	414(16), 444(16), 478(32)
AND	
Entomology	418(32), 454(16), 464(16)

OR	
Genetics	324(16), 354(16), 414(16), 444(16)

6.1.4 Bachelor's programme in Plant and Soil Sciences (BScAgric): Soil and Water Management, with Soil Science and one of Agronomy, Horticultural Science, Plant Pathology, Chemistry or Viticulture

Specific Admission Requirements

Without Chemistry as major subject:

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

With Chemistry as major subject:

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 6 (70%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (124 or 140 credits)

Compulsory Modules

If you are taking Agricultural Economics:

- you must take Economics 114 and 144 and Oenology 142; otherwise
- you must take Physics (Bio) 134 and 154.

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Crop Production	152(8)
AND	
Physics (Bio)	134(16), 154(16)
OR	
Economics	114(12), 144(12) and
Oenology	142(8)
AND	
Mathematics (Bio)	124(16)
OR	

Mathematics	114(16), 144(16) (You must take Mathematics 114 and 144 only if you are doing Soil and Water Management and you are taking Soil Science and Chemistry as majors.)

Second Year (128 or 144 credits)

Compulsory Modules

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Chemistry	214(16), 264(16) (You must take Chemistry 264 only if you are taking Chemistry and Soil Science as majors.)
Crop Protection	244(16)
Soil Science	214(16), 244(16)
AND	
Crop Production	214(16)
OR	
Viticulture	214(16) (If you want to continue with Viticulture you must take Viticulture 214.)

Third Year (128 or 136 or 144 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the modules Soil Science 314 and 344. Such organised excursion and/or assignment must take place for a period of time as determined by the Departments of Agronomy, Horticulture Sciences, Viticulture and Oenology or Forest and Wood Sciences. This necessary practical experience must be done during the relevant semesters of the abovementioned modules. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Chemistry	234(16), 254(16) (You must take Chemistry 254 only if you are taking Chemistry and Soil Science as majors.)
Plant Pathology	314(16), 344(16)
Soil Science	314(16), 344(16)
Agronomy	312(8), 362(8)
Horticultural Science	352(8)
AND	

Agronomy	322(8), 332(8), 342(8) (You must take these modules if you are taking Agronomy as a major.)
OR	
Horticultural Science	314(16), 342(8) (You must take these modules if you are taking Horticultural Science as a major.)
OR	
Viticulture	314(16), 322(8), 344(16) (You must take these modules if you are taking Viticulture as a major.)

Fourth Year (128 or 136 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the modules Soil Science 414, 424, 444 and 454. Such organised excursion and/or assignment must take place for a period of time as determined by the Departments of Agronomy, Horticulture Sciences, Viticulture and Oenology or Forest and Wood Sciences. This necessary practical experience must be done during the relevant semesters of the abovementioned modules. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Soil Science	414(16), 424(16), 444(16), 454(16)
AND	
Chemistry	314(16), 324(16), 344(16), 364(16)
OR	
Plant Pathology	414(16), 444(16), 478(32) (The major combination of Plant Pathology and Soil Science will only be offered if it can be scheduled on the timetable.)
OR	
Viticulture	444(16), 454(16), 478(32)
OR	
Applied Plant Physiology	414(16), 464(16) and
Agronomy	424(16), 454(16) (You must take these modules if you are taking Agronomy as major.)
Horticultural Science	434(16), 444(16) (You must take these modules if you are taking Horticultural Science as major.)

6.2 Food Production Systems

More information is available on the following website:

- http://www.sun.ac.za/foodsci

Programme description and outcomes

The bachelor's programme in Food Production Systems leads to the qualification BSc Food Sc.

Food Science covers the interactions between food ingredients, the food environment, development of new products, the investigation of food structures, sensory and nutritional properties, the postharvest handling and preservation of food in an environmentally and economically acceptable manner, as well as the commercialisation of traditional food products for prospective low-income entrepreneurs.

After successful completion of this programme you will be able to:

- understand the terms, concepts, principles and theories regarding food science;
- identify and solve production and management problems within the food industry using critical and creative thinking to formulate well thought through solutions and theoretical arguments;
- work effectively within a team;
- organise and manage group and individual activities responsibly and effectively by setting and successfully meeting deadlines;
- obtain, analyse, compile and critically evaluate scientific information and apply this information independently;
- communicate information effectively using the latest technology;
- apply scientific methodology, procedures, and techniques; and
- demonstrate a holistic approach and understanding of the respective areas of food science.

Industry training in Food Production Systems

If you are following the programme BSc Food Sc you must carry out practical work to the satisfaction of the University in approved food installations or food research institutions for at least eight weeks of you summer and/or winter vacations. You must submit a satisfactory report in you final year to the Department before the degree can be awarded. This report must be according to the instructions of the Department of Food Science.

Please note: The University is not liable for any injury that you may sustain during industry training or for any claims that may result from such injury.

The prescribed modules of the various years of study of this programme are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents" of this Calendar part.

6.2.1 Bachelor's programme in Food Production Systems (BSc Food Sc)

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Food Science	144(16)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)

Second Year (128 credits)

Compulsory Modules

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Chemistry	214(16), 264(16)
Food Science	214(16), 244(16)
Microbiology	214(16)

Third Year (128 credits)

Selection process for Biochemistry 365

Only a limited number of Food Science students will be allowed to register for Biochemistry 365 annually. Selection will be done in consultation with the Department of Food Science, based on your performance in Biochemistry 315. This selection process replaces the prerequisite of Biochemistry 324 for Biochemistry 365. If you are not selected for Biochemistry 365 you will have to register for Biochemistry 345.

Compulsory Modules

Biochemistry	315(16), 345(16) of 365(16)
OR	
Chemistry	314(16), 344(16)
AND	
Food Science	314(16), 324(16), 333(16), 344(16), 354(16)
Microbiology	244(16)

Fourth Year (126 credits)

Compulsory Modules

Food Factory Machinery	414(15), 444(15)
Food Science	454(16), 478(48), 488(32)

6.3 Wine Production Systems

More information is available on the following websites:

- http://www.sun.ac.za/viti_oenol/ (Department of Viticulture and Oenology)
- http://www.sun.ac.za/wine_biotechnology/ (Institute for Wine Biotechnology)

Programme description and outcomes

The bachelor's programme in Wine Production Systems leads to the qualification BScAgric. In this programme students focus on Wine Production Systems.

Wine Production Systems covers the vine and its organs and integrates this knowledge in the scientific manipulation of the plant for the creation, in harmony with the environment, of sustainable product types which can be used to produce unique wines. Furthermore, it deals with the integration of a thorough understanding of the chemical and biological processes involved in the making of wine and brandy products in order to ensure the sustainability of the natural resources. In this field you will be prepared for a career in the grape and wine industries.

The fields of study of this programme are:

- Viticulture and Oenology (General); and
- Oenology (Specialised).

After successful completion of this programme you will be able to:

- understand the terms, concepts, principles and theories within the fields of oenology, viticulture or grape and wine biotechnology;
- identify and solve unfamiliar production and management problems within the grape and wine industries using evidence-based solutions and theory-driven arguments, using critical and creative thinking;
- interact effectively within a team;
- organise and manage individual and group activities responsibly and effectively by successfully meeting regular deadlines for projects, reports and tests;
- retrieve, analyse, compile and critically evaluate scientific information, and apply this information independently;
- communicate information effectively by applying scientific methodology, procedures, operations and techniques, including the use of experimental controls and relevant statistical methods and the effective evaluation of it; and
- demonstrate a holistic view and understanding of the complex nature and interdisciplinary relationships of the applied fields of wine production systems.

Industry training in Wine Production Systems

If you are following the BScAgric programme with Viticulture and Oenology as majors you must complete compulsory practical work in both major subjects. Practical work in Viticulture and Oenology entails mainly practical work from the end of the third year to the middle of the fourth year in grape vineyards and pertains to pruning during winter, canopy management during summer and working in a commercial wine cellar. The Department of Viticulture and Oenology will provide specific minimum qualifications pertaining to the number of weeks you must spent on these aspects. These work programmes are cleared in consultation with lecturers in the Department of Viticulture and Oenology and you must pass both modules (Viticulture and Oenology 478) associated with the internship in order to qualify for the degree BScAgric.

To enable you to perform practical work during the harvest season, as a final-year student, you will be excused from lectures until the second semester.

Please note: The University is not liable for any injury that you may sustain during industry training or for any claims that may result from such injury.

The prescribed modules of the various years of study for each field are set out below. The module contents are given in the chapter "Subjects, Modules and Module Content" of this Calendar part.

6.3.1 Bachelor's programme in Wine Production Systems (BScAgric): Viticulture and Oenology (General)

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Crop Production	152(8)
Mathematics (Bio)	124(16)
Oenology	142(8)
Physics (Bio)	134(16), 154(16)

Second Year (144 credits)

Compulsory Modules

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)

Crop Protection	244(16)
Oenology	214(16), 244(16)
Soil Science	214(16), 244(16)
Viticulture	214(16)

Third Year (144 credits)

Compulsory Modules

Oenology	314(16), 342(8), 344(16)
Viticulture	314(16), 322(8), 344(16)

plus

Elective Modules

Choose, with consideration of prerequisites, four of the following six modules.

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the modules Soil Science 314 and 344. Such organised excursion and/or assignment must take place for a period of time as determined by the Departments of Agronomy, Horticulture Sciences, Viticulture and Oenology or Forest and Wood Sciences. This necessary practical experience must be done during the relevant semesters of the abovementioned modules. You are responsible for the travel and accommodation costs involved.

Entomology	314(16)
Nematology	344(16)
Plant Pathology	314(16), 344(16)
Soil Science	314(16), 344(16)

Fourth Year (128 credits)

Compulsory Modules

Oenology	444(16), 454(16), 478(32)
Viticulture	444(16), 454(16), 478(32)

6.3.2 Bachelor's programme in Wine Production Systems (BScAgric): Oenology (Specialised)

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Crop Production	152(8)
Mathematics (Bio)	124(16)
Oenology	142(8)
Physics (Bio)	134(16), 154(16)

Second Year (144 credits)

Compulsory Modules

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Chemistry	214(16), 264(16)
Oenology	214(16), 244(16)
Soil Science	214(16)
Viticulture	214(16)

Third Year (128 credits)

Compulsory Modules

Chemistry	234(16), 314(16), 344(16)
Oenology	314(16), 342(8), 344(16)
Viticulture	314(16), 322(8), 344(16)

Fourth Year (128 credits)

Compulsory Modules

Oenology	444(16), 454(16), 478(32)
Viticulture	444(16), 454(16), 478(32)

6.4 Animal Production Systems

More information is available on the following website:

- http://www.sun.ac.za/animal (Department of Animal Sciences)

Programme description and outcomes

The bachelor's programme in Animal Production Systems leads to the qualification BScAgric. The programme covers the integration of knowledge of ecology, biochemistry, physiology, nutrition, breeding, production and product quality, as well as the management of animal production systems for increased production and production efficiency in an environmentally friendly and economically efficient manner.

The programme makes provision for five fields of study. Below are the fields of study with their majors:

- **Animal Sciences** – Animal Science;
- **Animal Sciences with Agronomy** – Animal Science;
- **Animal Sciences with Conservation Ecology** – Animal Science;
- **Agricultural Economics with Animal Sciences** – Agricultural Economics; and
- **Animal Science with Aquaculture** – Aquaculture.

After the successful completion of this programme you will be able to:

- know and understand terminology, concepts, theory and principles of animal physiology, animal breeding and nutrition;
- create the awareness and understanding that the different disciplines describe different dimensions of a complex animal production system as well as their interaction with one another;
- apply analytical and practical skills in the extensive and intensive animal industry, laboratories, in the field and by computer;
- identify, analyse and propose solutions to industry-related problems in an independent manner;
- make responsible decisions using critical and creative thought processes;
- function in a multidisciplinary environment;
- register as a candidate Natural Scientist, qualified as an animal scientist, with the South African Council of Natural Scientists;
- demonstrate a positive attitude, not only towards the animal industry, but also towards the broader community by means of continuous service and professional development; and
- study towards obtaining postgraduate qualifications at numerous national and international bodies.

Practical training in Animal Sciences (Performance testing of sheep and wool classing)

All third year students who are taking Animal Science as a major must attend a course on wool classification. The course is presented during the week before the start of the academic year. If you are taking Animal Science as a major then you must also attend training in performance testing in your final year. It is a five-day course that is presented during the June vacation.

The prescribed modules of the various years of study for each field are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents" of this Calendar part. For compulsory practical work for Animal Science also see section 4 of this chapter.

6.4.1 Bachelor's programme in Animal Production Systems (BScAgric) Animal Science

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;

- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Animal Science	144(16)
Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)

Second Year (144 credits)

Compulsory Modules

Animal Science	244(16)
Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Genetics	214(16), 244(16)
Microbiology	214(16)
Physiology	214(16)
AND	
Microbiology	244(16)
OR	
Physiology	244(16)

Third Year (120 credits)

Compulsory Modules

Animal Nutrition Science	324(16), 344(16)
Animal Product Science	352(8)
Animal Physiology	324(16), 344(16)
Biometry	312(8), 342(8)
Genetics	324(16), 354(16)

Fourth Year (136 credits)

Compulsory Modules

Agronomy	324(16)
Animal Breeding Science	424(16), 454(16)
Animal Management Science	434(16), 464(16)
Animal Nutrition Science	414(16), 444(16)

Animal Product Science	334(16)
Animal Science	442(8)

6.4.2 Bachelor's programme in Animal Production Systems (BScAgric) Animal Science with Agronomy

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Physics (Bio)	134(16), 154(16)
Computer Skills	171(4)
Mathematics (Bio)	124(16)
AND	
Animal Science	144(16)
OR	
Biology	144(16)

Second Year (144 credits)

Compulsory Modules

Animal Science	244(16)
Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Crop Production	214(16)
Genetics	214(16), 244(16)
Physiology	214(16), 244(16)

Third Year (136 credits)

Compulsory Modules

Agronomy	322(8), 332(8)
Animal Nutrition Science	324(16), 344(16)
Animal Physiology	324(16), 344(16)

Animal Product Science	352(8)
Biometry	312(8), 342(8)
Genetics	324(16), 354(16)

Fourth Year (136 credits)

Compulsory Modules

Agronomy	424(16), 454(16)
Animal Breeding Science	424(16), 454(16)
Animal Nutrition Science	414(16), 444(16)
Animal Management Science	464(16)
Animal Product Science	334(16)
Animal Science	442(8)

6.4.3 Bachelor's programme in Animal Production Systems (BScAgric) Animal Science with Conservation Ecology

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Biology	124(16), 144(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)

Second Year (144 credits)

Compulsory Modules

Animal Science	244(16)
Biochemistry	214(16), 244(16)
Biodiversity and Ecology	214(16)
Biometry	212(8), 242(8)
Genetics	214(16), 244(16)
Physiology	214(16), 244(16)

Third Year (144 credits)

Compulsory Modules

Animal Nutrition Science	324(16), 344(16)
Animal Physiology	324(16), 344(16)
Biometry	312(8), 342(8)
Conservation Ecology	314(16), 344(16)
Genetics	324(16), 354(16)

Fourth Year (120 or 128 credits)

Compulsory Modules

Animal Breeding Science	424(16), 454(16)
Animal Nutrition Science	414(16), 444(16)
Animal Product Science	334(16)
AND	
Conservation Ecology	448(32) or
Animal Management Science	464(16) and
Animal Science	442(8)
AND	
Agronomy	424(16) or
Conservation Ecology	414(16)

6.4.4 Bachelor's programme in Animal Production Systems (BScAgric) Agricultural Economics with Animal Science

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (124 credits)

Compulsory Modules

Animal Science	144(16)
Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Economics	114(12), 144(12)
Mathematics (Bio)	124(16)

Second Year (128 credits)

Compulsory Modules

Agricultural Economics	234(16), 242(8), 262(8)
Animal Science	244(16)
Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Physiology	214(16), 244(16)

Third Year (104 credits)

Compulsory Modules

Agricultural Economics	314(16), 364(16)
Animal Nutrition Science	324(16), 344(16)
Animal Product Science	352(8)
Animal Physiology	324(16), 344(16)

Fourth Year (128 credits)

Compulsory Modules

Agricultural Economics	414(16), 424(16), 444(16), 454(16)
Animal Nutrition Science	414(16), 444(16)
Animal Management Science	434(16), 464(16)

6.4.5 Bachelor's programme in Animal Production Systems (BScAgric) Animal Science with Aquaculture

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Animal Science	144(16)
Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)

Second Year (144 credits)

Compulsory Modules

Animal Science	244(16)
Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Genetics	214(16), 244(16)
Microbiology	214(16)
Physiology	214(16)
AND	
Microbiology	244(16)
OR	
Physiology	244(16)

Third Year (144 credits)

Compulsory Modules

Animal Nutrition Science	324(16), 344(16)
Animal Physiology	324(16), 344(16)
Aquaculture	314(16), 344(16)
Biometry	312(8), 342(8)
Genetics	324(16), 354(16)

Fourth Year (128 credits)

Compulsory Modules

Animal Breeding Science	424(16)
Animal Nutrition Science	414(16), 444(16)
Aquaculture	414(16), 444(16), 478(32)
Conservation Ecology	424(16)

6.5 Agricultural Economics and Management

More information is available on the following website:

- http://www.sun.ac.za/agric_econ/ (Department of Agricultural Economics)

Programme description and outcomes

The bachelor's programme in Agricultural Economics and Management leads to one of the following qualifications: BScAgric or BAgricAdmin. The aim of the programme is to develop skilled agricultural economists and agricultural managers for the public and private sectors who have a thorough understanding of agricultural economics and agricultural management techniques. In order to satisfy all the agricultural economics and agricultural management requirements of the target markets, the programme consists of five related fields of study with corresponding degree qualifications:

- Agricultural Economic Analysis (BScAgric);

- Agricultural Economic Analysis and Management (BScAgric);
- Agricultural Economic Analysis and Management with Food Science (BScAgric);
- Agricultural Economics with Food Science (BScAgric); and
- Agribusiness Management (BAgricAdmin).

Students also have the option to switch, after the first two years of study for BAgricAdmin (Agribusiness Management), to BScAgric (Agricultural Economic Analysis and Management).

After successful completion of the programme you will be able to:

- access a wide variety of professions in and outside agriculture and be able to switch professions with greater ease in our rapidly changing environment, because the training spans the physical, biological and social sciences;
- understand the integrated nature of the physical, biological and social aspects of a farming enterprise in order to manage it better;
- plan and manage the processing of farming commodities in order to add value;
- manage agribusinesses that supply farming requisites such as seed, pesticides and herbicides and finance to farmers;
- manage agribusinesses that process and market farm products. The combination of Food Science with commerce subjects, for example, provides an excellent background to prospective managers of food manufacturers;
- analyse agricultural and broader economic policy and take part in policy recommendations;
- provide management advice to farmers and other agribusinesses as professional consultants;
- manage the logistical aspects of the provision of farm requisites and farm products, as well as non-agricultural products;
- conduct in-depth and professional research and find solutions to complex problems that arise in the management of farms and other agribusinesses and in the agricultural economy generally;
- understand the process of planning and executing the concepts of pricing, promotion and the distribution of ideas, products and services in agricultural markets;
- understand agricultural market institutions, market processes and issues of organisation, control and public policy; and
- apply fundamental analytical tools to various marketing problems in agricultural food markets.

The prescribed modules of the various years of study for each field are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents" of this Calendar part.

For the degree BCom with Agricultural Economics see the Faculty of Economic and Management Sciences' Calendar Part 10.

6.5.1 Bachelor's programme in Agricultural Economics and Management (BAgricAdmin) Agribusiness Management

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (122 credits)

Compulsory Modules

Animal Production Physiology	112(8)
Business Management	113(12), 142(6)
Computer Skills	171(4)
Crop Production	152(8)
Economics	114(12), 144(12)
Introduction to Transport and Logistics Systems	144(12)
Soil Science	114(16), 142(8)
Statistical Methods	176(18)
Theory of Interest	152(6)

Second Year (136 credits)

Compulsory Modules

Agricultural Economics	234(16), 242(8), 262(8)
Financial Accounting	188(24)
and one of the following two groups with the value of 48 credits	
Financial Management	214(16)
Marketing Management	214(16)
Financial Management	244(16) or
Investment Management	254(16) or
Marketing management	244(16)
OR	
Financial Management	214(16)
Logistics Management	214(16), 244(16)
and one of the following two groups with the value of 32 credits	
Agronomy	212(8)
Horticultural Science	222(8)
Viticulture	244(16)
OR	

Animal Production	214(16)
Animal Science	244(16)

Third Year (128 credits)

Compulsory Modules

Agricultural Economics	314(16), 334(16), 354(16), 364(16)
Agronomy	324(16)

plus

Elective Modules

Choose modules to the value of 48 credits from the table below as allowed by the timetable.

Financial Management	314(12), 332(12), 352(12), 354(12)
Logistics Management	314(12), 324(12), 344(12), 354(12)
Marketing Management	314(12), 324(12), 344(12), 354(12)
Strategic Management	344(12)

6.5.2 Bachelor's programme in Agricultural Economics and Management (BScAgric) Agricultural Economic Analysis

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (124 credits)

Compulsory Modules

Biology	124(16), 144(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Economics	114(12), 144(12)
Mathematics (Bio)	124(16)

Second Year (138 credits)

Compulsory Modules

Agricultural Economics	234(16), 242(8), 262(8)
Animal Production Physiology	112(8)
Business Management	113(12), 142(6)
Crop Production	152(8)
Financial Accounting	188(24)

Soil Science	114(16), 142(8)
Statistical Methods	176(18)
Theory of Interest	152(6)

Third Year (128 credits)

Compulsory Modules

Agricultural Economics	314(16), 364(16)
Economics	214(16), 244(16)
AND	
Financial Accounting	288(32)
OR	
Statistics	214(16), 244(16)

plus

Elective Modules

Choose one of the groups to the value of 32 credits from the table below.

Agronomy	212(8)
Horticultural Science	222(8)
Viticulture	244(16)
OR	
Animal Production	214(16)
Animal Science	244(16)
OR	
Aquaculture	314(16), 344(16)

Fourth Year (144 credits)

Compulsory Modules

Agricultural Economics	414(16), 424(16), 444(16), 454(16), 478(32)
Economics	318(24) and 348(24) or 388(24)

6.5.3 Bachelor's programme in Agricultural Economics and Management (BScAgric) Agricultural Economic Analysis and Management

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (126 credits)

Compulsory Modules

Animal Production Physiology	112(8)
Business Management	113(12), 142(6)
Crop Production	152(8)
Computer Skills	171(4)
Economics	114(12), 144(12)
Mathematics (Bio)	124(16)
Soil Science	114(16), 142(8)
Statistical Methods	176(18)
Theory of Interest	152(6)

Second Year (136 credits)

Compulsory Modules

Agricultural Economics	234(16), 242(8), 262(8)
Financial Accounting	188(24)
AND	
Agronomy	212(8)
Horticultural Science	222(8)
Viticulture	244(16)
OR	
Animal Production	214(16) and
Animal Science	244(16)

plus

Elective Modules

Choose modules to a minimum value of 48 credits from one of the groups below.

Financial Management	214(16), 244(16)
Investment Management	254(16)
Marketing Management	214(16), 244(16)
OR	
Entrepreneurship and Innovation Management	214(16), 244(16)
Financial Management	214(16), 244(16)
Investment Management	254(16)
OR	
Financial Management	214(16), 244(16)
Investment Management	254(16)
Logistics Management	214(16), 244(16)
OR	
Logistics Management	214(16), 244(16)

Marketing Management	214(16), 244(16)
OR	
Entrepreneurship and Innovation Management	214(16), 244(16)
Logistics Management	214(16), 244(16)

Third Year (136 credits)

Compulsory Modules

Agricultural Economics	314(16), 364(16)
Crop Protection	244(16)

plus

Elective Modules

Choose modules to a minimum value of 88 credits from one of the groups below. You can only take your chosen group of modules if the class, test and exam timetables allow the specific combination of modules.

Economics	214(16), 244(16)
Entrepreneurship and Innovation Management	318(24)
Financial Accounting	288(32)
Financial Management	314(12), 332(12), 352(12), 354(12)
Logistics Management	314(12), 324(12), 344(12), 354(12)
Statistics	214(16), 244(16)
Strategic Management	344(12)
OR	
Economics	214(16), 244(16)
Entrepreneurship and Innovation Management	318(24)
Financial Accounting	288(32)
Logistics Management	314(12), 324(12), 344(12), 354(12)
Marketing Management	314(12), 324(12), 344(12)
Statistics	214(16), 244(16)
Strategic Management	344(12)
OR	
Economics	214(16), 244(16)
Financial Accounting	288(32)
Financial Management	314(12), 332(12), 352(12), 354(12)
Logistics Management	314(12), 324(12), 344(12), 354(12)
Statistics	214(16), 244(16)
Strategic Management	344(12)
Transport Economics	214(16)

OR	
Economics	214(16), 244(16)
Financial Accounting	288(32)
Financial Management	314(12), 332(12), 352(12), 354(12)
Logistics Management	314(12), 324(12), 344(12), 354(12)
Marketing Management	314(12), 324(12), 344(12)
Statistics	214(16), 244(16)
Strategic Management	344(12)

Fourth Year (144 credits)

Compulsory Modules

Agricultural Economics	414(16), 424(16), 444(16), 454(16), 478(32)

plus

Elective Modules

Choose modules to a minimum value of 48 credits from one of the groups below. You can only take your chosen group of modules if the class, test and exam timetables allow the specific combination of modules.

Economics	318(24), 348(24), 388(24)
Financial Accounting	389(48)
Financial Management	314(12), 332(12), 352(12), 354(12)
Investment Management	314(12), 324(12), 344(12), 348(12)
Strategic Management	344(12)
OR	
Economics	318(24), 348(24), 388(24)
Financial Accounting	389(48)
Investment Management	314(12), 324(12), 344(12), 348(12)
Logistics Management	314(12), 324(12), 344(12), 354(12)
Strategic Management	344(12)

6.5.4 Bachelor's programme in Agricultural Economics and Management (BScAgric) Agricultural Economic Analysis and Management with Food Science

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (142 credits)

Compulsory Modules

Animal Production Physiology	112(8)
Business Management	113(12), 142(6)
Computer Skills	171(4)
Crop Production	152(8)
Economics	114(12), 144(12)
Food Science	144(16)
Mathematics (Bio)	124(16)
Soil Science	114(16), 142(8)
Statistical Methods	176(18)
Theory of Interest	152(6)

Second Year (136 credits)

Compulsory Modules

Agricultural Economics	234(16), 242(8), 262(8)
Financial Accounting	188(24)
Food Science	214(16), 244(16)
AND	
Agronomy	212(8)
Horticultural Science	222(8)
Viticulture	244(16)
OR	
Animal Production	214(16) and
Animal Science	244(16)

plus

Elective Modules

Choose one module from the table below.

Entrepreneurship and Innovation Management	214(16), 244(16)
Marketing Management	214(16), 244(16)

Third Year (128 credits)

Compulsory Modules

Agricultural Economics	314(16), 364(16)
Crop Protection	244(16)
Financial Management	214(16)
Food Science	314(16), 344(16)

plus

Elective Modules

Choose modules to a minimum value of 32 credits from the table below. You can only take your chosen group of modules if the class, test and exam timetables allow the specific combination of modules.

Economics	214(16), 244(16)
Financial Accounting	288(32)
Financial Management	244(16)
Investment Management	254(16)
Logistics Management	214(16), 244(16)
Marketing Management	314(12), 324(12), 344(12)
Strategic Management	344(12)

Fourth Year (144 credits)

Compulsory Modules

Agricultural Economics	414(16), 424(16), 444(16), 454(16)
Food Science	333(16), 454(16)

plus

Elective Modules

Choose modules to a minimum value of 48 credits from the table below. You can only take your chosen group of modules if the class, test and exam timetables allow the specific combination of modules.

Economics	318(24), 348(24), 388(24)
Financial Accounting	389(48)
Financial Management	314(12), 332(12), 352(12), 354(12)
Food Factory Machinery	414(15), 444(15)
Logistics Management	314(12), 324(12), 344(12), 354(12)

6.5.5 Bachelor's programme in Agricultural Economics and Management (BScAgric) Agricultural Economics with Food Science

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (130 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Economics	114(12), 144(12)
Food Science	144(16)
Mathematics (Bio)	124(16)
Theory of Interest	152(6)

Second Year (136 credits)

Compulsory Modules

Agricultural Economics	234(16), 242(8), 262(8)
Financial Accounting	188(24)
Food Science	214(16), 244(16)
Microbiology	214(16)
AND	
Agronomy	212(8)
Horticultural Science	222(8)
Viticulture	244(16)
OR	
Animal Production	214(16) and
Animal Science	244(16)

Third Year (128 credits)

Compulsory Modules

Agricultural Economics	314(16), 364(16)
Crop Protection	244(16)
Food Science	314(16), 344(16)

plus

Elective Modules

Choose modules to a minimum value of 48 credits from the table below.

Financial Accounting	288(32)
Financial Management	214(16), 244(16)
Logistics Management	214(16), 244(16)
Transport Economics	214(16)

Fourth Year (144 credits)

Compulsory Modules

Agricultural Economics	414(16), 424(16), 444(16), 454(16)
Food Science	333(16), 454(16)

plus

Elective Modules

Choose modules to a minimum value of 48 credits from the table below.

Financial Accounting	389(48)
Financial Management	314(12), 332(12), 352(12), 354(12)
Food Factory Machinery	414(15), 444(15)
Logistics Management	314(12), 324(12), 344(12), 354(12)

6.6 Forestry and Wood Sciences

More information is available on the following website:

http://www.sun.ac.za/english/faculty/agri/forestry (Department of Forest and Wood Science)

Programme description and outcomes

This bachelor's programme leads to the Bachelor of Science in Forestry and Wood Sciences (BScFor) degree. Within the programme there are two fields of study, namely:

- Forestry and Natural Resource Sciences; and
- Wood and Wood Products Sciences.

A brief description of the two fields of study including the required practical work is giving below.

Forestry and Natural Resource Sciences

The first year of study in Forestry and Natural Resource Sciences consists of one Forestry module plus the first year of study in the Biological Sciences programme in the Faculty of Science. The second year of study consists of a study of the basic applied sciences such as Soil Science and Biometry, and students start to specialise in forestry disciplines. An integrated approach is taken with emphasis on Forest Management, Silviculture, Forest Engineering and Forestry Development. You have to participate in practical work during vacations from your first to your final year of study.

After successful completion of the programme in *Forestry and Natural Resource Sciences* you will be able to:

- employ and convey the knowledge required to safeguard and utilise, in a sustainable way, natural resource ecosystems, with particular reference to native forests and artificial plantations;
- provide solutions to concrete and abstract problems affecting the management or conservation of forests and plantations, based on solid evidence and theoretical arguments, using creative and critical thinking;
- work effectively in teams of peers to efficiently produce solutions to problems in the spheres of forestry and natural resource sciences;
- organise and manage time effectively, individually and in groups, in order to successfully meet deadlines associated with reports and submissions;
- effectively collect or retrieve and then process and critically analyse data in the specialised forestry domain in order to satisfy the demands of forest management or

further the requirements of forestry research by presenting results in a usable format;

- communicate effectively with peers, superiors and subordinates, using information-technology support for oral or written discourse and the presentation of reports and submissions;
- apply scientific research methodology and state-of-the-art technology in order to effectively undertake a research project investigating any facet of the forestry domain;
- demonstrate a holistic view of the complex of forest ecotypes covering the globe and the interdisciplinary interactions between the biotic and abiotic components thereof; and
- apply professional training and social life skills within the context of forest conservation, management and sustainable utilisation for the benefit of humankind.

Wood and Wood Products Sciences

For the field of study in Wood and Wood Products Sciences you take modules in the Faculties of AgriSciences, Science and Engineering from the first year of study. The Wood and Wood Products Sciences field of study includes a variety of modules concerned not only with the properties of wood as a material, but also with sawmilling, veneer manufacture, industrial furniture production and the construction and design of wood products. Wood and Wood Products Sciences modules are complemented by a series of engineering-based modules such as Industrial Ergonomics, Engineering Drawing, Engineering Mathematics, Industrial Management, Engineering Economics and Quality Assurance. You have to participate in practical work during vacations from your first to your final year of study.

After successful completion of the field of study in *Wood and Wood Products Sciences* you will be able to:

- apply and convey the knowledge required to utilise the products emanating from natural resource ecosystems in a sustainable manner and process and reconstitute these into products useful to humanity;
- provide solutions based on solid experimental evidence and theoretical arguments, using creative and critical thinking, to concrete and abstract problems affecting production in sawmills, board mills, furniture factories, wood preservation plants, wood construction plants, lamination plants and other wood processing industries;
- work effectively in teams of peers to efficiently produce solutions to problems in the spheres of wood products science and technology;
- organise and manage time effectively, individually and in groups, in order to successfully meet deadlines associated with reports and submissions and manufacturing processes;
- effectively collect or retrieve and then process and critically analyse data in the specialised forest products domain in order to satisfy the demands of processing plant management or to further the requirements of forest product research by presenting results in a usable format;
- communicate effectively with peers, superiors and subordinates, using information-

technology support for oral or written discourse and the presentation of reports and submissions;

- apply scientific research methodology and state-of-the-art technology in order to effectively undertake a research project into facets of the forest products domain;
- demonstrate a holistic view of the complex of forest products being produced around the world and the interdisciplinary interactions between the international role players in the field of forest products; and
- apply professional training and social life skills within the context of forest products production and the utilisation of forest resources for the benefit of humankind.

Practical work in Forest and Wood Sciences

- You must do compulsory practical work in your first three years of study:
  - In your first year the practical work takes place during the June or September vacation. If you completed your first year of study at another university and you are enrolling into the second year, you must do the practical work from the first year.
  - During your second and third years of study you must do one week of prescribed practical work. This one week of practical work can also be done before the beginning of the academic year.
- You must submit reports of all your practical work to the satisfaction of your lecturers.
- You are responsible for all costs regarding demonstrations and practical work.
- It can be expected of you to do practical work during other vacations in addition to the ones already mentioned.
- In your final year you must:
  - undertake a study tour of approximately two weeks during the winter vacation to the forest regions of South Africa.
  - submit a complete report at the beginning of the second semester as prescribed by the tour leader.
  - collect data during vacations for your management plan or project.
  - complete a comprehensive management plan or project during the second semester that is based on the data you collected during the winter vacation (or an earlier extended vacation).
  - hand in the completed project or management plan before 1 November of the year in which you want to graduate.
  - obtain a final mark of at least 50 to pass the project or management plan.
    - If you obtain a final mark of 40 to 49 in November you can submit a modified project or management plan before the January examinations of the following year. That would allow you to receive your degree during the supplementary graduation ceremony in March.
    - If you obtain a final mark of less than 40 in November or you fail to obtain a final mark of at least 50 in January you must repeat the practical work for the project or management plan.

- *Please note:* The University is not liable for any injury that you may sustain during practical work or tours or for any claims that may result from such injury.

The prescribed modules and elective modules of the various years of study for each field are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents" of this Calendar part.

6.6.1 Bachelor's programme in Forestry and Wood Sciences (BScFor) Forestry and Natural Resources Sciences

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (124 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Forest Science	171(24)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16)

Second Year (125 credits)

Compulsory Modules

Biometry	212(8), 242(8)
Computer Skills	272(5)
Forest Science	212(8), 254(16)
Geography and Environmental Studies	214(16)
Soil Science	214(16)
Wood Product Science	224(16), 244(16), 264(16)

Third Year (120 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the module Soil Science 314. Such organised excursion and/or assignment must take place for a period of time as determined by the Department of Soil Science in cooperation with the lecturers of the Department Forest and Wood Science. This

necessary practical experience must be done during the relevant semester of the abovementioned module. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Biometry	312(8)
Forest Science	334(16), 355(16), 356(16), 364(16)
Genetics	214(16)
Soil Science	314(16)
Wood Product Science	335(16)

Fourth Year (121 credits)

Compulsory Modules

Forest Science	414(8), 424(16), 434(16), 435(8), 442(1), 468(32)
Industrial Psychology (Special)	354(12)
Wood Product Science	414(16), 444(12)

6.6.2 Bachelor's programme in Forestry and Wood Sciences (BScFor) Wood and Wood Products Sciences

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 6 (70%); and
- Physical Sciences (Physics and Chemistry) – 5 (60%).

First Year (123 credits)

Compulsory Modules

Applied Mathematics B	124(15)
Computer Programming	143(12)
Engineering Chemistry	123(15)
Engineering Drawings	123(15)
Engineering Mathematics	115(15), 145(15)
Forest Science	171(24)
Strength of Materials	143(12)

Second Year (126 credits)

Compulsory Modules

Engineering Mathematics	214(15)
Forest Science	254(16)

Industrial Programming	244(15)
Production Management	212(8)
Professional Communication	113(8)
Wood Product Science	224(16), 234(16), 244(16), 264(16)

Third Year (124 credits)

Compulsory Modules

Engineering Statistics	314(15)
Forest Science	334(16), 355(16), 356(16)
Industrial Management	354(15)
Operations Research (Eng)	345(15)
Quality Assurance	344(15)
Wood Product Science	335(16)

Fourth Year (122 credits)

Compulsory Modules

Forest Science	442(1), 468(32)
Industrial Ergonomics	414(15)
Operations Research (Eng)	415(15)
Quality Management	444(15)
Wood Product Science	414(16), 434(16), 444(12)

6.7 Conservation Ecology

More information is available on the following website:

- http://sun.ac.za/consent (Department of Conservation Ecology and Entomology)

Programme description and outcomes

This bachelor's programme leads to the qualification BSc in Conservation Ecology. The programme is a collection of modules that will produce a general outcome, allowing you to choose from a broad range of careers in conservation ecology. Some of the most popular careers in this field of study are:

1. Environmental impact assessment (terrestrial and freshwater).
2. Restoration ecology (employment in mining and agriculture, as well as peri-urban organisations for the rehabilitation of soil to its original, natural condition).
3. Conservation biology (suited to jobs in academia, national and provincial parks boards, urban parks and private nature reserves).
4. Game reserve and nature reserve management.
5. Ecotourism (you can follow careers in various conservation-related fields of ecotourism).

6. Community-based natural resource management (dealing with rural communities and the sustainable use of their natural resources). If you are interested in a career in community-based natural resource management you will be best served by the Forestry and Natural Resource Sciences programme, which includes Conservation Ecology modules.

7. Environmentally conscious (sustainable) agricultural and forestry production (including organic farm management). The environmental agricultural production outcome is best obtained by following a programme in either Crop Production, Animal Science or Forest Science, with Conservation Ecology modules as minor subjects.

This programme focuses on outcomes 1-5 above.

If you want to focus on nature preservation with greater emphasis on animal sciences (e.g. management of mixed livestock-game ranches) you should take Animal Science programmes with Conservation Ecology as field of study.

Practical work

You must take part in practicals in each of the four years of study. Additionally you must attend a one-week field trip in your fourth year. An integral part of this programme is a comprehensive research project that you must complete and submit in your fourth year.

The prescribed modules of the various years of study in this programme are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents" of this Calendar part.

6.7.1 Bachelor's programme (BSc) in Conservation Ecology

Specific Admission Requirements

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

First Year (132 credits)

Compulsory Modules

Biology	124(16), 144(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Geo Environmental Science	124(16), 154(16)
Mathematics (Bio)	124(16)

Second Year (141 credits)

Compulsory Modules

Biodiversity and Ecology	212(16), 214(16), 224(16), 254(16), 264(16)
Computer Skills	272(5)
Conservation Ecology	212(8), 244(16)
Geography and Environmental Studies	214(16)
Microbiology	244(16)

Third Year (140 credits)

Compulsory Modules

Biodiversity and Ecology	324(16), 334(16), 364(16)
Biometry	212(8), 242(8)
Conservation Ecology	314(16), 344(16)
Industrial Psychology (Special)	354(12)

plus

Elective Modules

Choose two of the five modules below that fit into your class, test and examination timetables. Acceptance to the module Biodiversity and Ecology 315 is limited and you have to apply for acceptance. The module Biodiversity and Ecology 315 is presented outside formal semester times.

Biodiversity and Ecology	315(16)
Biodiversity and Ecology	345(16)
Genetics	214(16)
Geographical Information Technology	241(16)
Soil Science	214(16)

Fourth Year (136 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the module Soil Science 314. Such organised excursion and/or assignment must take place for a period of time as determined by the Department of Soil Science in cooperation with the lecturers of the Departments of Agronomy and Entomology. This necessary practical experience must be done during the relevant semester of the abovementioned module. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Agricultural Economics	262(8)
Agronomy	424(16)
Conservation Ecology	414(16), 424(16), 448(32)
Entomology	464(16)

plus

Elective Modules

Choose module(s) to the value of 32 credits from the modules below that fit into your class, test and examination timetables.

Entomology	418(32), 454(16)
Geographical Information Technology	312(16)
Soil Science	314(16)

6.8 Agricultural Production and Management (Elsenburg)

6.8.1 Bachelor's programme in Agricultural Production and Management

By virtue of a co-operation agreement between Stellenbosch University and the Western Cape Provincial Government, the Bachelor's programme in Agricultural Production and Management (BAgric) is presented by the Cape Institute for Agricultural Training: Elsenburg on the Elsenburg Campus.

Specific Admission Requirements

In addition to the general admission requirements of the University, admission to the programme leading to BAgric (Elsenburg) requires at minimum:

- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 4 (50%) OR Mathematical Literacy – 5 (60%);
- Physical Sciences (Physics and Chemistry) – 4 (50%); OR
- Life Sciences – 4 (50%); OR
- Agricultural Sciences – 4 (50%).

You specialise in one of the fields of study below by choosing two subjects.

Field of Study	Major Subjects
Plant Production	Agronomy, Vegetable Production, Horticultural Science, Viticulture
Animal Production	Agronomy, Large Stock, Small Stock
Extension & Plant Production	Extension, Vegetable Production, Horticulture, Viticulture
Extension & Animal Production	Extension, Large Stock, Small Stock

Consult the website www.elsenburg.com or contact us at 021 808 5451 for more information about this programme.

Postgraduate Programmes

For more information on the Faculty's postgraduate programmes, consult the University's Postgraduate Prospectus or the departmental websites.

1. Summary of postgraduate programmes

The undergraduate programmes offered in the Faculty of AgriSciences lead to the following postgraduate programmes:

Broad Instructional Programmes	Postgraduate Programmes
Plant and Soil Sciences	PgDip (Agronomy); BScHons in Plant Pathology (BSc degree with Biotechnology, Botany, Genetics or Microbiology as major is a requirement); BScHons in Applied Plant Physiology (BSc degree with Biochemistry, Biotechnology, Botany, Genetics or Plant Biotechnology as major is a requirement); MSc; MScAgric; PhD; DSc
Animal Production Systems	PgDip (Aquaculture and Animal Sciences); MScAgric; PhD; DSc
Food Production Systems	MSc Food Sc; PhD; DSc
Wine Production Systems	BScHons (Wine Biotechnology); MSc or MScAgric (Wine Biotechnology); MScAgric (Viticulture or Oenology); PhD; DSc
Agricultural Economics and Management	BAgricAdminHons; MScAgric; MAgricAdmin; PhD; DSc
Forestry and Wood Sciences	PgDip (Forestry and Wood Sciences); MScFor; PhD; DSc
Conservation Ecology	MScConsEcol; PhD

2. General information on the postgraduate programmes

2.1 Postgraduate diploma programmes

a) You follow a prescribed course for at least a year after obtaining an applicable bachelor's degree or an equivalent qualification that Senate has approved for this purpose.

b) Admission requirements are determined according to your specific programme.

c) Consult the rest of this chapter for more information regarding the admission requirements and programme content of your specific postgraduate diploma.

d) Consult the section "Postgraduate Qualifications" in Part 1 (General) of the University's Calendar for other regulations.

2.2 Honours programmes

a) You follow a prescribed course for at least a year after obtaining an applicable bachelor's degree.

b) You must follow the honours degree programme in one of the majors of your bachelor's degree.

c) You will be admitted to the honours degree programme if –

- you are in possession of a bachelor's degree that Senate has approved for this purpose;
- the subject of your honours programme was passed as a major in the preceding bachelor's degree; and
- you obtained an average final mark of at least 60 – 65% in the major.

d) To pass the honours degree programme you must obtain a final mark of at least 50 (out of 100) for each module.

e) Consult the rest of this chapter for more information regarding the admission requirements and programme content of your specific honours degree programme.

f) Consult the section "Postgraduate Qualifications" in Part 1 (General) of the University's Calendar for other regulations.

2.3 Master's programmes

a) Master's programmes are taken in a particular major of the preceding bachelor's or honours degree.

b) The MSc, MScAgric, MScFor, MSc Food Sc, MScConsEcol or MAgricAdmin can be awarded to you if you –

- have an applicable bachelor's degree of this University or a bachelor's degree approved for this purpose by Senate, and on written application have been admitted by Senate to the particular programme with a minimum study period of one year, or hold an applicable honours degree of this University or a similar honours degree approved for this purpose by Senate, and on written application have been admitted by Senate to the particular programme with a minimum study period of one year;
- have followed an approved curriculum of advanced study and/or research, which may include a period of study or research at some other place recognised by Senate;
- have passed the prescribed examination(s);
- have submitted a complete and well-written thesis or assignment which shows that you have performed independent scientific and technical investigations and interpreted the results satisfactorily;
- included a statement in the thesis or assignment that the thesis or assignment has not been submitted to another university in order to obtain a degree and that it is your own work; and

- have satisfactorily taken an oral examination. In certain instances supplementary study may be required of you.

c) You must also satisfy all other regulations regarding theses or assignments for master's degrees. See Higher Degrees in Part 1 (General) of the University's Calendar.

2.4 PhD degree

a) The degree PhD can be awarded to you if you –

- have the degree MSc, MScAgric, MScConsEcol, MScFor, MSc Food Sc, MAgricAdmin or MPhil of this University, or another university's degree approved by Senate for this purpose;
- after Senate's approval of your proposed research project, have carried out and completed, to the satisfaction of the University, original research under supervision of a supervisor for at least two years after obtaining the said master's degree at Stellenbosch University or at another place approved by the University;
- have completed any supplementary study as may be required by Senate to the satisfaction of the University;
- have submitted a complete and well-written dissertation which shows that you have made a particular contribution to the enrichment of knowledge in the chosen field, with proof of independent critical judgement and accompanied by a declaration that the dissertation has not been submitted to another university in order to obtain a degree and that it is your own work; and
- have taken an oral examination to the satisfaction of the University, provided that, subject to approval by Senate, exemption from this examination may be granted in special cases.
- In addition, examiners may require a written examination.

b) As a candidate for the PhD degree you must be enrolled for at least two academic years before the degree can be awarded to you.

c) Your application for admission must include particulars of qualifications (accompanied by certified copies of certificates if the qualifications were not awarded by Stellenbosch University), the location and extent of the research, and the subject of the dissertation.

d) The supervisor will be appointed once your application has been approved.

Please note: As to the date of submission of the dissertation, the number of copies to be submitted, as well as other requirements which need to be satisfied before the degree can be awarded, the general rules and regulations as given in the section Higher Degrees in Part 1 (General) of the University's Calendar apply.

2.5 DSc degree

a) The degree DSc can be awarded to you if you –

- have held, for at least five years, a PhD of this University or another qualification considered suitable in the opinion of Senate; or

- have held, for at least seven years, the MAgricAdmin, MSc, MScAgric, MScConsEcol, MScFor, or MSc Food Sc degree of this University or another qualification considered suitable in the opinion of Senate;
- have carried out advanced original research and/or creative work to the satisfaction of the University;
- have submitted an original and high-quality published work(s)* that convinces Senate that you have made a real and influential contribution to the enrichment of knowledge in the field of agricultural or forestry sciences or food science; and
- have taken an oral examination, if required by the examiners, to the satisfaction of the University.

b) As a candidate for the DSc degree you must –

- have been enrolled for at least one academic year at this University before the degree can be awarded;
- give the Registrar written notice of at least one year of your intention to present yourself as a candidate for the degree and include in the notification the title(s) and extent of the proposed work(s). If Senate accepts the application, a supervisor and examiners will be appointed.

c) You must provide before 1 September, for graduation in December, or before 1 December of the previous year, for graduation in March, four copies of the work(s) which you want to submit to the University, accompanied by a declaration that it is your own work and that it has not been submitted to another university in order to obtain a degree. Where a considerable part of the work(s) submitted has not been published only in your name, you must provide satisfactory evidence that shows which part of the work is your own. Furthermore, you must state who conceived the work, under whose guidance it took place and who executed, processed and put it in writing. You must also indicate which part of the work, if any, you, or a co-author, have already submitted to this or any other university in order to obtain a degree.

d) The general rules for doctoral degrees concerning the appointment of examiners, as given under Higher Degrees in Part 1 (General) of the University's Calendar, also apply to the DSc degree.

* The term 'published work' refers to work that has been published in a scientific journal, a magazine, pamphlet or book freely available to the public, either in libraries or from some retail outlet. The reason why publication is required is to ensure that the work submitted is available for criticism by experts in the subject concerned. Examiners have the discretion to disregard a submitted work if, in their opinion, it was not readily available for criticism because it was:

  - hard to come by, or
  - submitted for the degree too soon after publication.

You may also submit your other publications with little or no connection with the particular subject in which the main study has been performed in support of your application.

3. Postgraduate programmes per department

3.1 Department of Agricultural Economics

3.1.1 BAgricAdminHons in Agricultural Economics and Management

Programme Code
2771001

Specific Admission Requirements

- The three year BAgricAdmin degree, an applicable three year degree, as well as other qualifications that Senate has approved for this purpose.
- An average final mark of 60% for the major subject.

Closing Date for Applications
Apply by 14 September of the previous year.

Duration of Programme
This programme extends over one year.

Programme Content
The programme is designed to equip prospective expert agricultural managers and agricultural economists with high level skills in the use of agricultural economics and agricultural management techniques, including the analysis of the limitations and potential of the agricultural sector. After the successful completion of the programme you will be able to analyse more complex problem situations and to create more sophisticated farming or agribusiness systems and/or make sophisticated agricultural policy recommendations. This expertise is necessary in order to ensure the international competitiveness of South African agriculture and related industries, and also to enable South Africa to play its rightful role in the agricultural sector in Africa.

Agricultural Economics forms the central component of the programme. The programme focuses on the management of agriculture-related enterprises.

Compulsory Module

15504 : Agricultural Economics	781(30): Research assignment: Agricultural Economics

plus

Elective Modules
Choose modules to the value of at least 90 credits from the table below. You can choose from the honours modules following the 300-level of your other major subject(s) up to a maximum of 32 credits, subject to the approval of the relevant department, to contribute to a minimum of 120 credits.

15504 : Agricultural Economics	771(20): Farm management
15504 : Agricultural Economics	772(20): Topical issues in agricultural policy
15504 : Agricultural Economics	773(20): Wine marketing
15504 : Agricultural Economics	775(20): Agricultural production and resource management

15504 : Agricultural Economics	776(20): International trade and marketing
15504 : Agricultural Economics	780(20): Rural development
15504 : Agricultural Economics	782(16): National and international market analysis
15504 : Agricultural Economics	783(16): Foundations of Agricultural Economics: an institutional approach
15504 : Agricultural Economics	784(16): Environmental policy
15504 : Agricultural Economics	785(16): Agricultural policy in the South African context

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries

Prof N Vink

Tel: 021 808 4899

E-mail: nv@sun.ac.za

The master's programme in Agricultural Economics and Management leads to one of the following qualifications: MScAgric (Agricultural Economics) or MAgricAdmin (Agricultural Economics).

3.1.2 MAgricAdmin in Agricultural Economics and Management

Programme Code

2781011

Specific Admission Requirements

- The one year BAgricAdminHons degree, as well as other qualifications that Senate has approved for this purpose.
- An average final mark of 60% for the major subject.

Programme Description

After completion of the degree BAgricAdminHons you can apply for admission to the degree MAgricAdmin (Agricultural Economics). The programme consists of a research component and is designed to develop your ability to undertake independent research in terms of problem-solving, multidisciplinary approaches and scientific scholarship. After completion of the programme you will be able to carry out independent investigations in selected aspects of the agricultural and related sectors. The research component focuses on the management of agriculture-related industries and agricultural economic analysis. Independent research must be carried out on a suitable topic within the broad framework of agricultural potential assessment, international competitiveness or structural changes in agriculture.

Programme Content

Compulsory Module

15504 : Agricultural Economics	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof N Vink

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E-mail: nv@sun.ac.za

3.1.3 MScAgric (Agricultural Economics)

Programme Code

2731011

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the major subject.

Programme Description

After completion of the BScAgric degree in Agricultural Economics and Management you will be able to apply for admission to the degree MScAgric (Agricultural Economics). The programme consists of a research component and is designed to develop your ability to undertake independent research in terms of problem-solving, multidisciplinary approaches and scientific scholarship. After completion of the programme you will be able to carry out independent investigations in selected aspects of the agricultural and related sectors. The research component focuses on the management of agriculture-related industries and agricultural economic analysis. You must carry out independent research on a suitable topic within the broad framework of agricultural potential assessment, international competitiveness or structural changes in agriculture. Advanced coursework, preceding the thesis, is required.

Programme Content

Compulsory Module

15504 : Agricultural Economics	873(120): MScAgric (Agricultural Economics and Management)

First Year (60 credits)

Elective Modules

Choose modules to the value of at least 60 credits from the table below.

15504 : Agricultural Economics	884(15): Rural development
15504 : Agricultural Economics	885(15): Applied SAM based modelling

15504 : Agricultural Economics	891(15): Strategic farm management
15504 : Agricultural Economics	892(15): Agricultural policy analysis
15504 : Agricultural Economics	893(15): Strategic marketing of wine
15504 : Agricultural Economics	894(15): Topical issues in agricultural resource use
15504 : Agricultural Economics	895(15): Agricultural production economics and decision analysis
15504 : Agricultural Economics	896(15): International trade and marketing strategies

Second Year (120 credits)

Compulsory Module

15504 : Agricultural Economics	873(120): Master's thesis

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof N Vink

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3.1.4 PhD in Agricultural Economics and Management

Programme Code

5471001

Programme Description

The programme focuses strongly on research and is designed to develop high-level skills in the use of Agricultural Economic and Agricultural Management techniques, including the analysis of the limitations and potential of the agricultural sector, in students who wish to become agricultural economists or management experts in the private or public sector. This expertise is necessary to ensure the international competitiveness of South African agricultural and related industries, and to enable South Africa to play its rightful role in the development of the agricultural sector in Africa. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

15504 : Agricultural Economics	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries

Prof N Vink

Tel: 021 808 4899

E-mail: nv@sun.ac.za

3.1.5 DSc in Agricultural Economics and Management

Programme Code

6001001

Programme Description

For the DSc degree a number of advanced original research and/or creative work in Agricultural Economics and Management is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Agricultural Economics and Management. An oral examination may be required of you. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

15504 : Agricultural Economics	998(360): DSc research collection

3.2 Department of Agronomy

3.2.1 Postgraduate Diploma in Agronomy

Programme Code

6431001

Specific Admission Requirements

- Three year BSc degrees, BTech degrees as well as other qualifications that Senate has approved for this purpose.

Closing Date for Applications

Apply by 14 September of the previous year.

Programme Structure

The PGDip programme consists of an approved curriculum which lays the foundation for specialisation in Agronomy. The postgraduate diploma does not allow automatic access to the programme MScAgric in Agronomy. In extraordinary cases where you show sufficient potential according to the Department, you may apply for access to the programme MScAgric in Agronomy.

Duration of Programme

This programme extends over one year full time and two years part time.

Programme Content

Compulsory Modules

13327 : Crops for extensive production systems	711(18): Crops for extensive production systems
13328 : Physiological and ecological principles of natural pasture management	712(18): Physiological and ecological principles of natural pasture management
13329 : Weed Management	741(18): Weed management
13336 : Production physiology and technology for annual agron crops	742(18): Production physiology and technology for annual agronomical crops
13334 : Intensive crop production systems	771(18): Intensive crop production systems
13335 : Agronomy Science Project	772(30): Agronomy Science Project

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries

Dr TN Kotzé

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E-mail: nkotze@sun.ac.za

3.2.2 MScAgric in Agronomy

Programme Code

2731011

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the major subject.

Duration of Programme

This programme extends over a minimum of one year but may take longer to complete.

Programme Content

Research on a particular aspect of tillage, weed control, crop production, stress physiology, vegetable production or pasture management is undertaken. The modular component of the programme is aimed at the acquisition of generic research skills to support the research component of the programme. A further objective is the deepening of subject knowledge on general crop physiology through self-study.

Compulsory Module

55565 : Agronomy	818(180): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Dr TN Kotzé

Tel: 021 808 4803

E-mail: nkotze@sun.ac.za

3.2.3 PhD in Agronomy

Programme Code
5471001

Programme Description
You must carry out a relevant and practically oriented research project in Agronomy, leading to innovation or problem-solving through high-level research in Agronomy and in the industry concerned. This will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

55565 : Agronomy	978(360): Doctoral dissertation

Assessment and Examination
After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Dr TN Kotzé

Tel: 021 808 4803

E-mail: nkotze@sun.ac.za

3.2.4 DSc in Agronomy

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Agronomy is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Agronomy. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

55565 : Agronomy	998(360): DSc research collection

3.3 Department of Animal Sciences

3.3.1 Postgraduate Diploma in Animal Science

Programme Code

6011001

Specific Admission Requirements

- An applicable three year BSc degree.
- An average final mark of 60% for the major subject.
- A high level of theoretical engagement will be expected of you to increase your competency to the level of a four year bachelor's (Agric) degree (NQF level 8).

Closing Date for Applications

Apply by 14 September of the previous year.

Duration of Programme

This programme extends over one year.

Programme Content

The postgraduate diploma in Animal Sciences is designed to expand and strengthen your knowledge in the discipline of Animal Sciences. In addition, you will be introduced to research methodology and your writing and presentation skills will be developed.

Compulsory Modules

56901 : Animal Breeding Science	741(16): Animal breeding and genetics
54801 : Animal Management Science	711(16): Intensive management systems
54801 : Animal Management Science	741(16): Extensive management systems
54801 : Animal Management Science	712(16): Wildlife management
56898 : Animal Nutrition Science	711(16): Advanced ruminant nutrition
56898 : Animal Nutrition Science	741(16): Advanced monogastric nutrition
20826 : Animal Science	772(24): Scientific skills in Animal Science

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries

Prof K Dzama

Tel: 021 808 4740

E-mail: kdzama@sun.ac.za

3.3.2 Postgraduate Diploma in Aquaculture

Programme Code
6021001

Specific Admission Requirements

- An applicable three year BSc degree.
- An average final mark of 60% for the major subject.
- A high level of theoretical engagement will be expected of you to increase your competency to the level of a four year bachelor's (Agric) degree (NQF level 8).

Closing Date for Applications
Apply by 14 September of the previous year.

Duration of Programme
This programme extends over one year.

Programme Content
The postgraduate diploma in Aquaculture is designed to expand and strengthen your knowledge in the discipline of Aquaculture. In addition, you will be introduced to research methodology and your writing and presentation skills will be developed.

Compulsory Modules

46213 : Aquaculture	711(16): Aquaculture production and management systems I
46213 : Aquaculture	741(16): Aquaculture production and management systems II
12910 : Aquaculture Management Science	724(16): Aquaculture review, assessment and project development I
12910 : Aquaculture Management Science	754(16): Aquaculture review, assessment and project development II
20826 : Animal Science	772(24): Scientific skills in Animal Science

plus

Elective Modules
Choose two of the modules below.

46213 : Aquaculture	712(16): Aquaculture products
46213 : Aquaculture	742(16): Aquaculture ecology
46213 : Aquaculture	743(16): Aquaculture nutrition

Assessment and Examination
Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries
Prof K Dzama

Tel: 021 808 4740

E-mail: kdzama@sun.ac.za

3.3.3 MScAgric in Animal Science

Programme Code
2731011

Specific Admission Requirements

- The BScAgric degree with an average final mark of at least 60% for the third and fourth year modules.
- The Department can expect you to take an admissions examination.

You can apply for the master's programme if you have obtained the Postgraduate Diploma in Animal Science with an average final mark of at least 60%. Your application is subject to approval by the Department of Animal Sciences.

Programme Content
The master's programme consists of a research component of 100% (180 credits) but you could, in consultation with your supervisor, be requested to follow additional modules, including Biometry 881 (Postgraduate Biometry).

Research is possible in the following fields:

- increase in the effectiveness of animal production and animal products;
- the improvement of product quality in the farming of large and small livestock, and poultry; and
- intensive and extensive aquaculture systems, feeding and breeding.

Programme Outcomes
After successful completion of the theoretical modules, you will be able to:

- analyse, consequent to the bachelor's programme, more complex problem situations and create and/or make suggestions towards increasingly sophisticated stock farming or intensive animal production systems;
- combine integrated knowledge in the fields of specialisation animal breeding, animal nutrition, animal physiology and animal products to enable problem-solving;
- plan, execute, analyse data and report research projects in a scientific manner;
- generate new knowledge using fundamental animal husbandry and scientific principles; and
- obtain further postgraduate qualifications at various national and international institutions.

Compulsory Module

20826 : Animal Science	818(180): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Prof K Dzama

Tel: 021 808 4740

E-mail: kdzama@sun.ac.za

3.3.4 MScAgric in Aquaculture

Programme Code
2731011

Specific Admission Requirements

- The BScAgric degree with an average final mark of at least 60% for the third and fourth year modules.
- The Department can expect you to take an admissions examination.

You can apply for the master's programme if you have obtained the Postgraduate Diploma in Aquaculture with an average final mark of at least 60%. Your application is subject to approval by the Department of Animal Sciences.

Programme Content
The master's programme consists of a research component of 100% (180 credits) but you could, in consultation with your supervisor, be requested to follow additional modules, including Biometry 881 (Postgraduate Biometry).

Research is possible in the following fields:

- increase in the effectiveness of animal production and animal products;
- the improvement of product quality in the farming of large and small livestock, and poultry; and
- intensive and extensive aquaculture systems, feeding and breeding.

Programme Outcomes
After successful completion of the theoretical modules, you will be able to:

- analyse, consequent to the bachelor's programme, more complex problem situations and create and/or make suggestions towards increasingly sophisticated stock farming or intensive animal production systems;
- combine integrated knowledge in the fields of specialisation animal breeding, animal nutrition, animal physiology and animal products to enable problem-solving;
- plan, execute, analyse data and report research projects in a scientific manner;
- generate new knowledge using fundamental animal husbandry and scientific principles; and
- obtain further postgraduate qualifications at various national and international institutions.

Compulsory Module

46213 : Aquaculture	818(180): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Prof K Dzama

Tel: 021 808 4740

E-mail: kdzama@sun.ac.za

3.3.5 PhD in Animal Production Systems

Programme Code
5471001

Programme Description
The programme focuses strongly on research and aims to discover new insights and knowledge in the field of Animal Production Systems. This knowledge increases your general intellectual and professional skills and promotes your adaptability to carry out advanced research in a specific field of study that links up with other fields of study. The programme will equip you at the highest academic level for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

20826 : Animal Science	978(360): Doctoral dissertation

Assessment and Examination
After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Prof K Dzama

Tel: 021 808 4740

E-mail: kdzama@sun.ac.za

3.3.6 DSc in Animal Production Systems

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Animal Production Systems is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Animal Production Systems. An oral examination may also be required. See section 2.5 in this chapter for general information on the DSc degree in the Faculty

of AgriSciences.

Programme Content

Compulsory Module

20826 : Animal Science	998(360): DSc research collection

3.4 Department of Conservation Ecology and Entomology

3.4.1 Programmes in Conservation Ecology

3.4.1.1 MSc in Conservation Ecology

Programme Code
5461021

Specific Admission Requirements

- An applicable BScHons degree, BScAgric degree or BScConsEcol degree.
- An average final mark of 60% for the major subject.

Programme Content
The research component (minimum time span six months, 180 credits at NQF level 8a) entails independent research on an approved topic in Conservation Ecology that you conduct under a supervisor. As part of the process, you must present a seminar to the Department of Conservation Ecology and Entomology on your proposed thesis. On completion of the research you must write up your results and submit them in the format of a thesis. The thesis must meet the requirements for a master's thesis as prescribed by the Department of Conservation Ecology and Entomology and Stellenbosch University.

Compulsory Module

55638 : Conservation Ecology	818(180): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Prof KJ Esler

Tel: 021 808 4005

E-mail: kje@sun.ac.za

3.4.1.2 PhD with specialisation in Conservation Ecology

Programme Code
5471001

Programme Description
You must carry out a relevant and practically oriented research project in Conservation Ecology, leading to innovation or problem-solving through high-level research in Conservation Ecology and

in the industry concerned. This will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

55638 : Conservation Ecology	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries

Prof KJ Esler

Tel: 021 808 4005

E-mail: kje@sun.ac.za

3.4.2 Programmes in Entomology

3.4.2.1 MSc in Entomology

Programme Code

5981001

Specific Admission Requirements

- The BScAgric degree or a BScHons in a suitable subject field.
- An average final mark of 60% for the major subject.

Duration of Programme

This programme extends over a minimum of one year but may take longer to complete.

Programme Content

You determine your topic for the master's degree in consultation with the lecturer concerned. You can select a topic from fields which include morphology and systematics, insect conservation ecology and integrated pest management of insects.

Compulsory Module

34576 : Entomology	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof KJ Esler

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E-mail: kje@sun.ac.za

3.4.2.2 PhD in Entomology

Programme Code
5471001

Programme Description
You must carry out a relevant and practically oriented research project in Entomology, leading to innovation or problem-solving through high-level research in Entomology and in the industry concerned. This will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

34576 : Entomology	978(360): Doctoral dissertation

Assessment and Examination
After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Prof KJ Esler

Tel: 021 808 4005

E-mail: kje@sun.ac.za

3.4.2.3 DSc in Entomology

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Entomology is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Entomology. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

34576 : Entomology	998(360): DSc research collection

3.4.3 Programmes in Sustainable Agriculture

3.4.3.1 MSc (Sustainable Agriculture)

Programme Code
5981001

Specific Admission Requirements

- A suitable four year bachelor's (Agric) degree (NQF level 8), or a three year bachelor's degree (NQF level 7) and an applicable postgraduate qualification (e.g. BScHons or a postgraduate diploma) in any of the major subjects that are accompanied by agriculture.
- An average final mark of 60% or higher.
- Proficiency in English.
- You must submit a written motivation for admission to the course.

Programme Content
The purpose of this programme is to train you as researcher in understanding and working within sustainable agriculture. This will be achieved by adopting a systems approach to agriculture as a point of departure. The programme comprises modules that actively seek to integrate scientific methods across disciplines to advance sustainability in spheres where agriculture interacts with natural, social and economic factors.

The programme will start with a module entitled Introduction to Systems Thinking. This is followed by teaching concepts in sectoral sustainable agriculture e.g. sustainable animal production, sustainable plant production and livelihood perspectives. To generate and integrate knowledge in sustainable agriculture, modules like Systems Analysis and Simulation, QUALUS (Quantitative Land Use Analysis) and Biometry will help improve your quantitative and analytical skills. A work-integrated learning opportunity where students are linked to organisations in the industry will give you real-life perspective and ensure that you are ready for the job market.

Compulsory Modules

13341 : Introduction to systems thinking	870(6): Introduction to systems thinking
13340 : Sustainable soil management	871(8): Sustainable soil management
13342 : Plant production and plant protection	872(8): Plant production and plant protection
13343 : Sustainable animal production	873(8): Sustainable animal production
11490 : Biodiversity and Ecosystem Services	874(6): Biodiversity and ecosystem services
13344 : Sociology of sustainable agriculture	875(6): Sociology of sustainable agriculture
13345 : Economics of sustainable agriculture	876(8): Economics of sustainable agriculture (including farm management)
13346 : Systems analysis and simulation	880(6): Systems analysis and simulation
13347 : Quantitative analysis of land use systems	881(8): Quantitative Analysis of Land Use Systems
13348 : Work-integrated learning	882(20): Work-integrated learning

13349 : Research thesis (Sustainable Agriculture)	883(90): Research thesis
11061: Biometry	881(8): Biometry

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof K Dzama

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3.5 Department of Food Science

3.5.1 MSc in Food Science

Programme Code

2841011

Specific Admission Requirements

- A four year BSc in Food Science degree, a three year BSc Food Science degree with a BScHons in Food Science, or a three year BSc with Chemistry or Biochemistry on final year level with an honours degree.
- Supplementary Food Science modules, as prescribed by the Department of Food Science, must be taken if you only qualify for the three year BSc with Chemistry or Biochemistry on final year level with an honours degree.
- An average final mark of 60% for the final year modules.

Duration of Programme

This programme extends over a minimum of one year but may take longer to complete.

Programme Content

You choose your research project for the master's programme in consultation with your supervisor.

Compulsory Module

21210 : Food Science	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof GO Sigge

Tel: 021 808 3581

E-mail: gos@sun.ac.za

3.5.2 MSc in Food and Nutrition Security

Programme Code
6591001

Specific Admission Requirements

- An applicable BSc degree in the Natural Sciences (3 years) and an honours degree, or a four year BSc in Food Science degree, a three year BSc Food Science degree with a BScHons in Food Science, or a four year degree in the Health Sciences with a minimum final mark of 60%; or
- A bachelor's or honours degree that Senate has approved and that is on NQF level 8 with a minimum final mark of 60%.

Please note: Only a certain number of students are selected each year.

Duration of Programme
This programme extends over a minimum of two years.

Programme Content
This structured programme is presented mainly by means of technology-mediated teaching and learning, in combination with courses presented on campus. This programme comprises twelve theoretical modules and a research assignment (33% of the total credits). If the academic year extends over 40 weeks, it is expected of the student to utilise 22,5 notional hours per week to complete the programme.

First Year

Compulsory Modules

13255: Conceptualising food systems	811(10): Conceptualising food systems
13256: Food safety, hazards & risks	812(10): Food safety, hazards & risks
13257: Human economic development	813(10): Human economic development
13258: Agriculture-nutrition linkages	814(10): Agriculture-nutrition linkages
13259: Food processing & preservation	815(10): Food processing & preservation
13261: Introduction to epidemiology	841(10): Introduction to epidemiology
13262: Macro- & micronutrients & health	842(10 Macro- & micronutrients & health
13263: Functional foods & GMO's	843(10): Functional foods & GMO's
13264: Food chains and consumers	844(10): Food chains and consumers

Second Year

Compulsory Modules

13265: Assessing food security	821(10): Assessing food security
13266: Food security project analysis	822(10): Food security project analysis
13267: Food & nutrition policies	823(10): Food & nutrition policies
13533: Research assignment (Human Nutrition) or	841(60): Research assignment (Human Nutrition) or

13534: Research assignment (Agricultural Economics) or	842(60): Research assignment (Agricultural Economics) or
13535: Research assignment (Food Science)	843(60 Research assignment (Food Science)

Assessment and Examination

Final marks for the theoretical modules will consist of a class mark (35% – SUNLearn discussions, assignments, tasks) and a written examination (65%). You must obtain a minimum of 50% to pass all individual modules.

The final mark for the research assignment will consist of the following:

- 10% protocol;
- 70% research assignment; and
- 20% oral examination/presentation of results.

The final mark for the degree consists of 67% course work and 33% research assignment.

Enquiries

Client Services

Tel: 021 808 9111

E-mail: info@sun.ac.za

3.5.3 PhD in Food Production Systems

Programme Code

5471001

Programme Description

The doctoral programme in Food Production Systems is at least two years, but depending on the field of study could take longer to complete. You choose a relevant research project in consultation with your supervisor. The programme contributes at a high level to the Faculty of AgriSciences' research profile and delivers professional individuals who can play an important role in teams with regards to research, teaching and policy-making in the speciality areas of sustainable food and nutrition security in an environmentally-friendly manner. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

21210 : Food Science	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries

Prof GO Sigge

Tel: 021 808 3581

E-mail: gos@sun.ac.za

3.5.4 DSc in Food Production Systems

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Food Science is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Food Science. An oral examination may also be required. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

21210 : Food Science	998(360): DSc research collection

3.6 Department of Forest and Wood Science

3.6.1 Postgraduate Diploma in Forestry and Wood Sciences

Programme Code
6031001

Specific Admission Requirements

- Appropriate three year BSc degrees, BTech degrees as well as other qualifications that Senate has approved for this purpose.
- A minimum final mark of 60% in all modules or in the major module that is applicable to the postgraduate field of study. The Department can decide to deviate from this requirement.

Closing Date for Applications
Apply by 14 September of the previous year.

Duration of Programme
This programme extends over one year.

Programme Content
The programme consists of an approved curriculum which lays the foundation for specialisation in forestry and wood sciences disciplines. The postgraduate diploma may allow access to the MScFor programme.

Compulsory Modules
Choose one of the compulsory modules.

11290 : Forest Science	780(24): Forest science project
57584 : Wood Product Science	784(24): Wood products science project

plus

Elective Modules

Choose elective modules to the value of 96 credits of which 32 credits must be from the field Wood Product Science or Forest Science.

11290 : Forest Science	724(32): Tree propagation
11290 : Forest Science	766(16): Geo-information science for resource managers
11290 : Forest Science	772(32): Silviculture
11290 : Forest Science	773(32): Timber harvesting and transport logistics
11290 : Forest Science	774(32): Forest inventory and yield prediction
11290 : Forest Science	775(32): Forest management
11290 : Forest Science	776(32): Tree improvement
11290 : Forest Science	785(32): Forestry development
57584 : Wood Product Science	414(16): Wood products manufacturing I
57584 : Wood Product Science	781(32): Wood properties and quality
57584 : Wood Product Science	782(32): Primary wood processing
57584 : Wood Product Science	783(32): Bio-energy

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests as well as flexible assessment.

Enquiries

Dr P Ackerman

Tel: 021 808 3323

E-mail: packer@sun.ac.za

3.6.2 Programmes in Forestry and Wood Sciences

3.6.2.1 MScFor in Forestry and Natural Resource Sciences or Wood and Wood Products Sciences

Programme Code

6221001

Specific Admission Requirements

- The four year BScFor degree, the postgraduate diploma in Forestry and Wood Sciences, an applicable honours degree, as well as other qualifications that Senate has approved for this purpose.

Duration of Programme

This programme extends over one year after the four year BScFor degree.

Programme Content

The master's programme consists of a 100% research component (180 credits) but you could, in consultation with your supervisor, be requested to follow additional modules, including Biometry 881 (Postgraduate Biometry).

Compulsory Modules

Choose one of the modules below.

11290 : Forest Science	818(180): Master's thesis
57584 : Wood Product Science	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Dr P Ackerman

Tel: 021 808 3323

E-mail: packer@sun.ac.za

3.6.2.2 PhD in Forestry and Wood Sciences

Programme Code

5471001

Programme Description

This programme leads to the qualification PhD (For) in Forestry and Natural Resource Sciences or Wood and Wood Products Sciences. The programme focuses on research in various specialist fields of forestry and ensures that students become specialists in these fields.

You must carry out a relevant and practically oriented research project in Forestry and Natural Resource Sciences, leading to innovation or problem-solving through high-level research in Forestry and Natural Resource Sciences and in the industry concerned. The research project will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

11290 : Forest Science	978(360): Doctoral dissertation
57584 : Wood Product Science	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Dr P Ackerman

Tel: 021 808 3323

E-mail: packer@sun.ac.za

3.6.2.3 DSc in Forestry and Wood Sciences

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Forestry and Natural Resource Sciences or Wood and Wood Products Sciences is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Forestry and Natural Resource Sciences or Wood and Wood Products Sciences. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

11290 : Forest Science	998(360): DSc research collection
57584: Wood Product Science	998(360): DSc research collection

3.7 Department of Genetics

3.7.1 MScAgric in Genetics

Programme Code
2731011

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the major subject.

Duration of Programme
This programme extends over a minimum of one year but may take longer to complete.

Programme Content
Research projects cover different aspects of plant breeding such as:

- biometrical applications in data analysis;
- genotype-environment interactions;
- the application or modification of conventional plant breeding methodology;
- the application of cytogenetic procedures;
- biochemical and molecular markers for the location, mapping and tagging of useful genes;

- genotyping and marker-assisted selection;
- transfer of genes from wild related species to cultivated cereals employing wide crossings; and
- cytogenetic manipulations or direct gene transfer by means of genetic engineering.

Compulsory Module

13285 : Genetics	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof J Burger

Tel: 021 808 5858

E-mail: jtb@sun.ac.za

3.7.2 PhD in Genetics

Programme Code

5471001

Programme Description

You must carry out a relevant and practically oriented research project in Genetics, leading to innovation or problem-solving through high-level research in Genetics and in the industry concerned. The research project will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

13285 : Genetics	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries

Prof J Burger

Tel: 021 808 5858

E-mail: jtb@sun.ac.za

3.7.3 DSc in Genetics

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Genetics is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Genetics. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

13285 : Genetics	998(360): DSc research collection

3.8 Department of Horticultural Science

3.8.1 BScHons in Applied Plant PhysiologyError! Bookmark not defined.

Programme Code
5971001

Specific Admission Requirements

- An applicable BSc degree with Botany, Biochemistry, Genetics or Plant Biotechnology as major subject in which an average final mark of 60% was obtained.
- Supplementary study may be required.

Closing Date for Applications
Apply by 14 September of the previous year.

Duration of Programme
This programme extends over one year after an applicable three year BSc degree.

Programme Content
The Honours programme in Applied Plant Physiology is designed to strengthen your knowledge and competencies in the discipline of Horticultural Sciences, with emphasis on plant physiological, biochemical and molecular mechanisms, which is relevant to production and quality systems within horticultural crops. You will also be equipped in research methodology, whilst your writing and presentation skills will also be developed. These skills will enable you to apply for further postgraduate studies offered in Horticulture (MScAgric).

Compulsory Modules

12487 : Applied Plant Physiology	714(16): Ecophysiology of horticultural and agronomical crops
12487 : Applied Plant Physiology	734(13): Applied plant physiology and tree architecture

12487 : Applied Plant Physiology	744(13): Postharvest physiology and technology of horticultural and agronomical crops
12487 : Applied Plant Physiology	764(16): Nutrition of horticultural and agronomical crops
12487 : Applied Plant Physiology	773(30): Research project

plus

Elective Modules

Choose one of the groupings below.

39632 : Horticultural Science	714(16): Deciduous fruit production
OR	
55565 : Agronomy	712(8): Greenhouse production techniques
AND	
55565 : Agronomy	732(8): Cultivation of future crops
OR	
13537 : Plant genetics and crop improvement	722(8): Plant Genetics and Crop Improvement
AND	
11061 : Biometry	771(8) Postgraduate Biometry

plus

Choose two of the four modules below. Agronomy 752 and Horticultural Science 742 cannot be taken together.

55565 : Agronomy	752(8): Weed management
55565 : Agronomy	762(8): Vegetable crops for intensive production
39362 : Horticultural Science	742(8): Citrus physiology and technology
39632 : Horticultural Science	752(8): Ornamental and foliage plant production

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries

Dr EW Hoffman

Tel: 021 808 2383

E-mail: ewh@sun.ac.za

3.8.2 MScAgric in Horticultural Science

Programme Code
2731001

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the major subject.

Duration of Programme
This programme extends over a minimum of one year but may take longer to complete.

Programme Content
This programme consists of a research and a modular component. The research topic can be chosen from the following themes:

- growth and development strategies for deciduous fruit, citrus and fynbos plants that limit production and/or quality such as fruit set, fruit size, colour development, tree architecture and light interception;
- flower initiation, dormancy and stress conditions, for example sun scorch in fruit, postharvest physiology including controlled atmospheric storage requirements for deciduous fruit, citrus and cut flowers; or
- physiological abnormalities such as gel decline in plums, surface scorch marks on apples, blackening of protea foliage.

The modular component of the programme is aimed at the acquisition of generic research competencies to support the research part of the programme. You must also deepen your subject knowledge on general plant physiology through self-study.

Compulsory Modules

11061 : Biometry	881(8): Postgraduate biometry
39632 : Horticultural Science	871(172): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Dr EW Hoffman

Tel: 021 808 2383

E-mail: ewh@sun.ac.za

3.8.3 PhD in Horticultural Science

Programme Code
5471001

Programme Description
You must carry out a relevant and practically oriented research project in Horticultural Science, leading to innovation or problem-solving through high-level research in Horticultural Science and

in the industry concerned. The research project will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory module

39632 : Horticultural Science	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries

Dr EW Hoffman

Tel: 021 808 2383

E-mail: ewh@sun.ac.za

3.8.4 DSc in Horticultural Science

Programme Code

6001001

Programme Description

For the DSc degree a number of advanced original research and/or creative work in Horticultural Science is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Horticultural Science. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

39632 : Horticultural Science	998(360): DSc research collection

3.9 Department of Plant Pathology

3.9.1 BScHons in Plant Pathology

Programme Code

5971001

Specific Admission Requirements

- A BSc degree with Microbiology, Genetics, Botany or Biotechnology as major with an average final mark of 60% for the major.
- Supplementary study may be required.

Closing Date for Applications
Apply by 14 September of the previous year.

Duration of Programme
This programme extends over one year.

Programme Content
The programme consists of further specialised study in Plant Pathology. The modules and study tasks add greater depth of learning, building further on a bachelor's programme with Microbiology, Genetics, Botany or Biotechnology as major subject. The programme is research and career oriented and is based on modern technology and the most recently available research in Plant Pathology. It links up with research projects carried out in the Department.

Compulsory Modules

32891 : Plant Pathology	771(16): Advanced plant disease dynamics
32891 : Plant Pathology	772(16): Advanced disease management
32891 : Plant Pathology	773(10): Research methodology
32891 : Plant Pathology	774(60): Project management and presentation
32891 : Plant Pathology	775(18): Advanced topics in plant pathology

Assessment and Examination
Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries
Prof A Viljoen

Tel: 021 808 4797

E-mail: altus@sun.ac.za

3.9.2 MSc in Plant Pathology

Programme Code
5981001

Specific Admission Requirements

- The BScAgric degree or a BScHons in a suitable subject field.
- An average final mark of 60% for the major subject.

Duration of Programme
This programme extends over a minimum of one year but may take longer to complete.

Programme Content
Research projects can be selected from one of the following themes:

- fungal taxonomy (description and reclassification of known and new fungi by the application of various methods, such as molecular technology);

- applied molecular plant pathology, including the use of molecular-based techniques for the detection, diagnosis and characterisation of plant pathogenic populations of vines, deciduous fruit, citrus and agronomic crops;
- pre- and postharvest pathology in deciduous fruit, vines and citrus (status and behaviour of inocula on fruit surfaces, infection processes and plant resistance reactions);
- stem diseases in vines (etiology, diagnosis, epidemiology and integrated management);
- use of fungicides (spray technology) and fungal resistance (sensitivity in wild populations and disruption after fungicide exposure, management of fungicide resistance in fruit orchards, vineyards and agronomic crops); or
- integrated management (chemical, biological and alternative compounds) of diseases in deciduous fruit, vines, citrus and agronomic crops.

New or existing disease epidemics of economic importance are also researched.

Compulsory Module

32891 : Plant Pathology	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof A Viljoen

Tel: 021 808 4797

E-mail: altus@sun.ac.za

3.9.3 PhD in Plant Pathology

Programme Code

5471001

Programme Description

You must carry out a relevant and practically oriented research project in Plant Pathology, leading to innovation or problem-solving through high-level research in Plant Pathology and in the industry concerned. The research project will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

32891 : Plant Pathology	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Prof A Viljoen

Tel: 021 808 4797

E-mail: altus@sun.ac.za

3.9.4 DSc in Plant Pathology

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Plant Pathology is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Plant Pathology. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

32891 : Plant Pathology	998(360): DSc research collection

3.10 Department of Soil Science

3.10.1 MScAgric in Soil Science

Programme Code
2731011

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the major subject.

Duration of Programme
This programme extends over a minimum of one year but may take longer to complete.

Programme Content
You select a topics for the research project from one of the following specialisation fields:

- soil genesis and classification;
- weathering and clay mineral synthesis;
- plant nutrition and fertilisation;
- irrigation and soil-plant-water management including salinity control and management;
- resource (soil, land and water evaluation and management systems such as, amongst others, erosion control); or
- rhizosphere and pedosphere organisms and interactions.

The project may consist of either soil science only or soil science integrated with a crop (plant), climate and/or terrain study. You will be guided towards project planning for problem solving by research within general guidelines and an overall picture of sustainable resource use through environmentally friendly, economical soil, water and plant management. You must be able to show that you have the ability to deal analytically and systematically with problems relating to the soil, plant, water and atmosphere continuum, and to identify possible solutions and formulate guidelines for the environmentally friendly management of natural resources.

Compulsory Module

14176 : Soil Science	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Dr E Hoffman

Tel: 021 808 4789

E-mail: ehoffman@sun.ac.za

3.10.2 PhD in Soil Science

Programme Code

5471001

Programme Description

You must carry out a relevant and practically oriented research project in Soil Science, leading to innovation or problem-solving through high-level research in Soil Science and in the industry concerned. The research project will equip you at the highest academic level with the knowledge and expertise you need for entering the research industry or professional field. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

14176 : Soil Science	978(360): Doctoral dissertation

Assessment and Examination

After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries

Dr E Hoffman

Tel: 021 808 4789

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3.10.3 DSc in Soil Science Error! Bookmark not defined.

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Soil Science is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Soil Science. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

14176 : Soil Science	998(360): DSc research collection

3.11 Department of Viticulture and Oenology

3.11.1 Programmes in Oenology

3.11.1.1 MScAgric in Oenology

Programme Code
2731011

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the final year modules.

Duration of Programme
This programme extends over two years.

Programme Content
You determine your topic for the master's degree in consultation with your supervisor. A research topic can be selected from one of the following themes:

- wine microbiology;
- wine chemistry;
- analytical method development, and
- sensory methodology and analyses.

A further objective is the deepening of subject knowledge through self-study.

Compulsory Module

33103 : Oenology	818(180): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Prof M du Toit

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E-mail: mdt@sun.ac.za

3.11.1.2 PhD in Oenology

Programme Code
5471001

Programme Description
The programmes focus strongly on research in the specialist field of Oenology. You choose a relevant and practically oriented research project which puts you in contact with the industry, leading to problem-solving in the industry concerned, and also prepares you to enter the research or professional market. The programme contributes at a high level to the Faculty of AgriSciences' research profile and delivers professional individuals who can play, either as a team member or individually, a meaningful role in national or international research, teaching and policy-making in specialist fields concerned with sustainable and environmentally friendly grape and wine industries. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

33103 : Oenology	978(360): Doctoral dissertation

Assessment and Examination
After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Prof M du Toit

Tel: 021 808 3772

E-mail: mdt@sun.ac.za

3.11.1.3 DSc in Oenology

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Wine Production Systems is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Wine Production Systems. An oral examination may also be

required. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

33103 : Oenology	998(360): DSc research collection

3.11.2 Programme in Viticulture

3.11.2.1 MScAgric in Viticulture

Programme Code
2731011

Specific Admission Requirements

- An applicable BScAgric degree.
- An average final mark of 60% for the final year modules.

Duration of Programme
This programme extends over two years.

Programme Content
You determine your topic for the master's degree in consultation with your supervisor. A research topic can be selected from one of the following themes:

- molecular aspects of key processes in grapevines;
- advanced grapevine physiology;
- climate change;
- analysis of spatial patterns; and
- berry ripening and table grapes.

A further objective is the deepening of subject knowledge through self-study.

Compulsory Module

33081 : Viticulture	818(180): Master's thesis

Assessment and Examination
After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries
Prof M du Toit

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E-mail: mdt@sun.ac.za

3.11.2.2 PhD in Viticulture

Programme Code
5471001

Programme Description
The programmes focus strongly on research in the specialist field of Viticulture. You choose a relevant and practically oriented research project which puts you in contact with the industry, leading to problem-solving in the industry concerned, and also prepares you to enter the research or professional market. The programme contributes at a high level to the Faculty of AgriSciences' research profile and delivers professional individuals who can play, either as a team member or individually, a meaningful role in national or international research, teaching and policy-making in specialist fields concerned with sustainable and environmentally friendly grape and wine industries. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

33081 : Viticulture	978(360): Doctoral dissertation

Assessment and Examination
After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Prof M du Toit

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E-mail: mdt@sun.ac.za

3.11.2.3 DSc in Viticulture

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Wine Production Systems is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Wine Production Systems. An oral examination may also be required. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

33081 : Viticulture	998(360): DSc research collection

3.11.3 Programme in Wine Biotechnology

3.11.3.1 BScHons in Wine Biotechnology

Programme Code
5971001

Specific Admission Requirements

- A suitable degree (e.g. BSc, BScAgric or BEng) with any applicable discipline as major.
- An average final mark of 60% for the major subject.

Closing Date for Applications
Apply by 14 September of the previous year.

Duration of Programme
This programme extends over one year.

Programme Content
The honours programme consists of further study in one of the majors for the degree BScAgric, BSc or BEng; supplementary study is sometimes required. The modules and study assignments add depth to the study and form a continuation of the bachelor's programme. The programme is research and career oriented and is based on modern technology and the most recently available research in the field of wine production systems.

The programme comprises formal lectures, as well as seminars, self-study and experimental work in Wine Biotechnology. The following topics are covered:

- genetic properties and improvement of wine yeasts;
- grape-based beverages;
- alcoholic fermentation;
- chemical compounds of grapes and wine;
- techniques in wine and grapevine biotechnology;
- malolactic fermentation and microbial spoilage;
- enzymes in preparation of wine;
- grapevine structure and functions; and
- grapevine improvement with the aid of biotechnology.

You must carry out self-study on the South African wine industry as well as independent research in grapevine and wine biotechnology.

Compulsory Modules

50997 : Wine Biotechnology	714(5): Chemical components of grapes and wine
50997 : Wine Biotechnology	771(40): Research methodology for grapevine and wine biotechnology
50997 : Wine Biotechnology	772(25): Techniques in grapevine and wine biotechnology

50997 : Wine Biotechnology	773(30): Biotechnology of wine-related microbes
50997 : Wine Biotechnology	774(20): Vine structure and functioning and grapevine improvement

Assessment and Examination

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November.

Enquiries

Prof M du Toit

Tel: 021 808 3772

E-mail: mdt@sun.ac.za

3.11.3.2 MScAgric or MSc in Wine Biotechnology

Programme Code

2731011 or 5981001

Specific Admission Requirements

- An applicable BScAgric, BEng or BScHons degree.
- An average final mark of 60% for the major subject.

Duration of Programme

This programme extends over two years.

Programme Content

You determine your topic for the master's degree in consultation with your supervisor. A research topic can be selected from one of the following themes:

- the selection and genetic improvement of wine yeasts and bacteria for the improvement of wine fermentation and processing, and for the improvement of the quality and sensory properties of wine and other grape-based beverages;
- the metabolic reprogramming of yeasts;
- the role of transcription factors and signal transduction in cell differentiation; and
- genetic improvement of wine grape cultivars with regard to disease and stress resistance.

Compulsory Module

50997 : Wine Biotechnology	818(180): Master's thesis

Assessment and Examination

After completion of the research you must submit a thesis to the satisfaction of the examiners and present a seminar. You will be expected to defend your thesis during this seminar.

Enquiries

Prof M du Toit

Tel: 021 808 3772

E-mail: mdt@sun.ac.za

3.11.3.3 PhD in Wine Biotechnology

Programme Code
5471001

Programme Description
The programmes focus strongly on research in the specialist field of Grape or Wine Biotechnology. You choose a relevant and practically oriented research project which puts you in contact with the industry, leading to problem-solving in the industry concerned, and also prepares you to enter the research or professional market. The programme contributes at a high level to the Faculty of AgriSciences' research profile and delivers professional individuals who can play, either as a team member or individually, a meaningful role in national or international research, teaching and policy-making in specialist fields concerned with sustainable and environmentally friendly grape and wine industries. See section 2.4 in this chapter for general information on the PhD degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

50997 : Wine Biotechnology	978(360): Doctoral dissertation

Assessment and Examination
After completion of the research you must submit a dissertation to the satisfaction of the examiners and present a seminar. You will be expected to defend your dissertation during this seminar.

Enquiries
Prof M du Toit

Tel: 021 808 3772

E-mail: mdt@sun.ac.za

3.11.3.4 DSc in Wine Biotechnology

Programme Code
6001001

Programme Description
For the DSc degree a number of advanced original research and/or creative work in Wine Production Systems is required. Additionally original and previously published work(s) of a high standard are required that show that you have made a real and exceptional contribution to the enrichment of the knowledge base in Wine Production Systems. An oral examination may also be required. See section 2.5 in this chapter for general information on the DSc degree in the Faculty of AgriSciences.

Programme Content

Compulsory Module

50997 : Wine Biotechnology	998(360): DSc research collection

Subjects, Modules and Module Contents

1. Definitions and explanations of important terms

It is important that you take note of the definitions of a few terms in order to understand and use this chapter fully. The example below shows how these terms will appear in the tables that are offered later in this chapter.

Example:

55565 Agronomy
212 (8) Agronomical crop production (1.5L, 1.5P)

1.1 Explanation of the abovementioned terms

- *Five-digit subject number* – **55565 Agronomy**

  Each subject is identified by this five digit-subject number. The subject number "55565" refers to the subject Agronomy.

- *Subject name* – **55565 Agronomy**

  The specific name of the subject is presented directly after the five-digit subject number before the various modules of the subject are offered. Normally the subject name is followed by the module code and the credit value of the specific module, for example in this case: Agronomy 324 (16).

- *Module code* – **212 (8) Agronomical crop production (1.5L, 1.5P)**

  The module code consists of a three-digit number that is unique to the specific module. The abovementioned module code "212" has the following meaning:

  The first digit "3" refers to the year of study in which the module is presented, for example:

  Year 1: ***1***14
  Year 2: ***2***14
  Year 3: **3**14

  The second digit "1" refers to the semester that the module will be presented in and also serves as a number to distinguish between various modules offered within the same specific year of study. The University uses different numbers to indicate the particular semester of a module, either the first or the second semester or modules that are presented in both semesters (which are year modules). The numbers that indicate semesters are as follows:

- **1**, **2** or **3**– modules are presented in the first semester.
  *Semester 1: 2**1**4, 3**2**4, 3**3**4*
- **4**, **5** or **6** – modules are presented in the second semester.
  *Semester 2: 3**4**2, 3**5**4, 3**6**4*
- **7**, **8** or **9** – modules are presented in both semesters, which are year modules.
  *Year module (both semesters): 2**7**8, 2**8**8, 3**9**1*

The third digit "2" of the module code  serves as a distinguishing digit between various modules of the same subject in a particular year of study.

- *Credit value* – 
  The number in the second block of the table indicates the credit value of the particular module, for example Agronomical crop production 212 (8).

- *Module subject* – 
  This indicates the subject that will be dealt with in this specific module.

- *Teaching load* – The teaching load of a module is indicated in the block following the module subject. It gives you both the teaching load and the type of teaching per week that you can expect in this particular module. For the module Agronomical crop production 212 (8) you can expect one and half lectures and one and a half practical periods each week for the duration of the module. The following abbreviations are used for the teaching load:

  L – Lecture lasting 50 minutes, for example 1L
  P – Practical period lasting 50 minutes, for example 1P, 2P, 3P
  S – Seminar lasting 50 minutes, for example 1S
  T – Tutorial lasting 50 minutes, for example 1T, 2T

2. Prerequisite pass, prerequisite and corequisite modules

After the description of the content of the module, the following prerequisite pass, prerequisite and corequisite modules, where applicable, are given for that module:

- Prerequisite pass module
  A prerequisite pass module is a module that you must pass before you can take the module(s) for which it is a prerequisite pass module.

- Prerequisite module
  A prerequisite module is a module in which you must obtain a class mark of at least 40, or a final mark of at least 40 in the case of a module subject to flexible assessment, before you can take the module for which it is a prerequisite module.

- Corequisite module
  A corequisite module is a module that you must take in the same academic year as the module for which it is a corequisite, or in an earlier academic year.

2.1 Condition for the granting of a qualification or degree

The Faculty will only award a qualification if you have passed all the relevant prerequisite and corequisite modules of the specific degree programme.

3. Subjects, modules and module contents

Subjects with their accompanying modules, credits, module subjects, teaching loads, language specifications and module contents are presented below in alphabetical order.

AGRISCIENCES

15504 Agricultural Economics

234 (16) South African agriculture (6L)

An overview of the structure of the agricultural sector with regard to production and resource use; analysing the roles of agriculture, the institutional framework for agriculture, and the international context. History of agricultural policy; marketing and prices.

Home department: Agricultural Economics

242 (8) Agricultural production economics and methods of financial analysis (2L, 1T)

Production relations; optimising in factor-product, factor-factor, and product-product relations; cost relations; income, costs and margins in farming; cost accounting; economic and financial criteria; budgets.

Prerequisite module: Economics 114

Home department: Agricultural Economics

262 (8) The economics of agricultural resources (3L)

Basic concepts; determinants of the demand, supply and value of natural resources; resources and technology; the influence of location on land use; industry-specific factors.

Home Department: Agricultural Economics

314 (16) Farm management (4L, 2T)

Approaches to management; entrepreneurship; strategic and operational decision-making; management functions; management information and systems; capital requirements of a farming operation and credit sources; financing policy. Analysis of problems in respect of estate planning, inheritance and taxation (capital transfer tax and income tax) in agriculture. The communication process, communication channels.

Prerequisite module: Agricultural Economics 242

Home department: Agricultural Economics

334 (16) Agricultural and food marketing (3L, 3P)

This module is designed to introduce a comprehensive and balanced treatment of food marketing systems. It blends marketing and economic theory with real-world analytical tools in order to assist students in better understanding the food system and making profitable marketing decisions.

Home department: Agricultural Economics

354 (16) Agricultural policy in the South African context (3L)

Investigation of priority policy issues in South African agriculture; the influence on South Africa of the Agreement on Agriculture and subsequent attempts to order international trade in agricultural products; changes in the structure of food supply chains and the globalisation of food trade; BEE and transformation in South African agriculture; the linkages of agriculture to the rest of the economy.

Home department: Agricultural Economics

364 (16) Farm planning and decision-making (4L, 2T)

Creative problem-solving; framework for analysing farm decision-making; information processing and human judgement; approaches to decision making under conditions of risk and uncertainty; tools and techniques for farm planning and decision-making; linear programming applications; deficiencies in the linear programming algorithm and the introduction of alternative programming techniques; case studies.

Prerequisite module: Agricultural Economics 242

Home department: Agricultural Economics

414 (16) Techniques for national and international market analysis (3L)

The determinants of demand and supply as well as elasticities and impact indicators in national and international markets. Introduction to econometric techniques.

Prerequisite module:

- *Biometry 212, 242 or*
- *Statistics 186 or*
- *Statistical Methods 176*

Home department: Agricultural Economics

424 (16) Foundations of agricultural economics: an institutional approach (3L)

This module is designed to introduce a range of problems, decision-making situations and institutional settings relevant to the study of agriculture and resource economics.

Home department: Agricultural Economics

444 Environmental policy (3L)

Different standards of environmental protection; the use of market instruments vs. command and

control policy instruments to limit environmental damage; support for environmentally friendly technology; cost benefit analysis; quantification of environmental impacts; international environmental treaties; the theory of environmental auditing.

Prerequisite modules: Economics 114, 144

Home department: Agricultural Economics

454 (16) Agricultural policy analysis (3L)

The theoretical base of economic policy in agriculture; analysis of the 'farm problem' in historical and contemporary context; the management of market failures in agriculture: South and Southern Africa; international trade policy.

Home department: Agricultural Economics

478 (32) Agricultural economics research project (1L)

An assignment that encompasses problem identification, information gathering, analysis and synthesis and that provides students with the opportunity to integrate agricultural economics knowledge in a systems approach.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

771 (20) Farm management

Strategic planning and decision-making focused on environmental scanning; concepts and tools of futures research as tools for strategic management; analysis and planning of the farm system; long-term investment decision-making, planning and control of financial goals.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

772 (20) Topical issues in agricultural policy

The mechanisms of policy implementation; the policy analysis matrix; in-depth study of agricultural policy issues in South Africa; the management of policy processes.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

773 (20) Wine marketing

Structure, conduct and performance of the South African wine industry; design and report on a marketing strategy and marketing plan for a specific wine brand.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

775 (20) Agricultural production and resource management

Theory and practice of agricultural production and resource management; analysis of various production systems and relationships; incorporation of risk and uncertainty in decision-making and planning; problems, challenges and issues regarding land, water, capital, technology and human

resources.

Home department: Agricultural Economics

776 (20) International trade and marketing

International trade theory and trade policy, international marketing and marketing strategies for the export market in general and for South Africa.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

780 (20) Rural development

Historical overview of rural-development conceptual frameworks; the contribution of agriculture to rural development; two-sector models; modern growth models; integrated rural development; project analysis, practical experience with rural-development projects.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

781 (30) Research assignment: Agricultural economics

An assignment that encompasses problem identification, information gathering, analysis and synthesis and that provides students with the opportunity to integrate agricultural economics knowledge in a systems approach.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

782 (16) National and international market analysis

The determinants of demand and supply as well as elasticities and impact indicators in national and international markets. Empirical estimation in the form of econometric models.

Prerequisite modules:

- *Biometry 212, 242 or*
- *Statistics 186*
- *Statistical Methods 176*

Home department: Agricultural Economics

783 (16) Foundations of agricultural economics: an institutional approach

This module is designed to introduce a range of problems, decision-making situations and institutional settings relevant to the study of agricultural and resource economics.

Home department: Agricultural Economics

784 (16) Environmental policy

Different standards of environmental protection; the use of market instruments vs. command and control policy instruments to limit environmental damage; support for environmentally friendly technology; cost-benefit analysis; quantification of environmental impacts; international environmental treaties; the theory of environmental auditing.

Prerequisite modules: Economics 114, 144

Home department: Agricultural Economics

785 (16) Agricultural policy in the South African context

The theoretical base of economic policy in agriculture; analysis of the 'farm problem' in historical and contemporary context; the management of market failures in agriculture: South and Southern Africa; international trade policy.

Home department: Agricultural Economics

873 (180) MScAgric thesis

Home department: Agricultural Economics

884 (15) Rural development

Overview of rural-development frameworks; the contribution of agriculture to rural development; rural-analysis development project.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

885 (15) Applied SAM based modelling

Introduction to input-output tables, social accounting matrices (SAMs), multiplier and computable general equilibrium models and their application.

Method of assessment: Flexible assessments

Prerequisite modules: Economics, 214, 244, 281 or 288

Home department: Agricultural Economics

891 (15) Strategic farm management

Systems philosophy and the systems approach to strategic planning and decision-making on sector level; environmental scanning, planning and management of the strategic management process; analysis and planning of the farm system; long-term investment decision-making, planning and control of financial goals.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

892 (15) Agricultural policy analysis

The theoretical structure of agricultural policy analysis; in-depth study of agricultural policy issues in a global context; the management of policy processes.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

893 (15) Strategic marketing of wine

Environmental scanning strategy determination in wine marketing.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

894 (15) Topical issues in agricultural resource use

Assignments on themes like the development of an inventory of bottom quality and quantity, the interdependency of the demand for food, fibre and bio-energy, application of systems thinking in the determination of sustainable resource development strategies; planning assistance that can be used in environmental systems analysis.

Home department: Agricultural Economics

895 (15) Agricultural production economics and decision analysis

Sustainable production systems; modelling, simulation and programming techniques; orientation to problem-solving; decision analysis; problems, challenges and issues regarding agricultural production; case studies.

Home department: Agricultural Economics

896 (15) International trade and marketing strategies

International economics: international trade theory and policy, and marketing strategies.

Method of assessment: Flexible assessment.

Home department: Agricultural Economics

13258 Agriculture-Nutrition Linkages

814 (10) Agriculture-nutrition linkages

This theme focuses on the challenges of reducing food insecurity in South Africa, arguing that these are different today from what they were in the past, as they are across Africa, requiring innovative responses and solutions that fundamentally reconsider the underpinnings of food insecurity and how to respond.

Home division: Human Nutrition

55565 Agronomy

212 (8) Agronomical crop production (1.5L, 1.5P)

Economic importance of crops; relationship between soil, climate and production capacity; cultivation practices such as tillage, crop rotation and weed control.

Prerequisite module:

- *Crop Production 152 or*
- *Biology 154*

Home department: Agronomy

312 (8) Greenhouse production techniques (1.5L, 1.5P)

Soilless production techniques (hydroponics) for seedlings and crops; effect of different growth mediums; different types of climate control; optimum concentrations of nutrient solutions for different crops.

Home department: Agronomy

322 (8) Cultivation of annual agronomical crops (1.5L, 1.5P)

Introduction to the morphology and development of important annual agronomical crops for the winter rainfall region; identification and production of these crops; soil and climatic requirements of these crops, as well as their utilisation and economic importance.

Home department: Agronomy

324 (16) Management of veld and planted pastures (3L, 3P)

Development and ecology of South African veld types; morphology and physiology of pasture plants and their reaction to defoliation; pasture management principles of grazing management in veld and planted pastures; determination of veld condition methods to evaluate the condition of veld and planted pastures.

Home department: Agronomy

332 (8) Cultivation of future crops (1.5L, 1.5P)

Identification, morphology and growth requirements of new potentially important food, fibre, medicinal and industrial crops; morphology and growth requirements of selected crops; management practices for sustainable maximal production of these crops.

Home department: Agronomy

342 (8) Weed management (1.5L, 1.5P)

Characteristics of weeds; methods of weed control; principles of weed management programmes; mechanisms of chemical herbicide action.

Home department: Agronomy

362 (8) Vegetable crops for intensive production systems (1.5L, 1.5P)

Identification of the most important vegetable crops that are cultivated in intensive production systems; morphology and physiology of these crops; production techniques in intensive plant production systems for these crops.

Home department: Agronomy

424 (16) Physiological and ecological principles of natural pasture management (3L, 3P)

Development and ecology of South African veld types; morphology and physiology of pasture plants; physiology of defoliation and plant response; physiological principles of veld management; determination of veld condition, veld burning, bush encroachment, veld management on game farms; causes and control of erosion.

Method of assessment: Flexible assessment.

Prerequisite module:

- *Agronomy 322 or*
- *Conservation Ecology 314 or*
- *Crop Production 214*

Home department: Agronomy

454 (16) Production physiology and technology for annual agronomical crops (3L, 3P)

Physiological processes involved in yield increase in cool-weather crops; crop rotations and biological management for sustainable production; quality requirements and utilisation of crops.

Prerequisite module: Agronomy 322

Home department: Agronomy

712 (8) Greenhouse production systems (1.5L, 1.5P)

Managing different soilless (hydroponic) plant production units in terms of the growing system, growth mediums, irrigation and fertigation scheduling and climate control options.

Home department: Agronomy

732 (8) Cultivation of future crops (1.5L, 1.5P)

Investigating a range of alternative crops for their potential as valuable future crops in terms of source of food, fibre, medicine and for industrial use. Considering the most sustainable production practices for these crops under different growing conditions.

Home department: Agronomy

752 (8) Weed management (1.5L, 1.5P)

Evaluation of the characteristics of a range of weeds as well as approaches to control these weeds. Formulating appropriate weed management practises and developing Integrated Weed Management programs.

Home department: Agronomy

762 (8) Vegetable crops for intensive production systems (1.5L, 1.5P)

Assessing production practices of the most important vegetable crops cultivated in intensive production systems. Relating the morphology and physiology of these crops, to their production techniques and examining alternative, more sustainable practises.

Home department: Agronomy

13335 Agronomy Science Project

772 (30) Agronomy science project (1L)

Identification, planning, execution, evaluation and reporting of a selected appropriate research project.

Method of assessment: Final report is assessed.

Home department: Agronomy

13505 Animal Anatomy and Physiology

214 (16) Animal anatomy and physiology (3L, 3P)

Introduction to animal anatomy and physiology. Discussion of the anatomy of the various organ systems, as well as function and endocrine regulation thereof to ensure homeostasis and optimal production and reproduction. Thermoregulation and homeostasis are also discussed in detail. Comparisons are made between mammals, birds and fish.

Home department: Animal Sciences

56901 Animal Breeding Science

424 (16) Production traits improvement (3L, 3P)

Influence of single and major genes on production traits and their transmission to successive generations; inherited disorders in livestock; breeding and selection for the improvement of economically important production traits; reproduction growth and growth efficiency; milk production; fibre production; egg production; carcass quality; correlated responses in performance traits; interpretation and application of BLUP of breeding values in selection; selection progress and progress determination.

Method of assessment: Flexible assessment

Prerequisite module: Genetics 354

Home department: Animal Sciences

454 (16) Applied breeding plans (3L, 3P)

Species-specific breeding systems and how they are influenced by the different production systems; animal performance components (direct additive, direct maternal, heterosis) and their estimation and application in breeding systems; breed characterisation in respect of production traits and applied cross-breeding systems; the Livestock Improvement Act; Intergis; breeder associations; group breeding schemes; veld bull and veld ram evaluations and the functioning of the National Livestock Improvement Schemes for all livestock species.

Method of assessment: Flexible assessment.

Prerequisite module: Genetics 354

Home department: Animal Sciences

741 (16) Animal breeding and genetics

Principles of animal genetics as they apply to livestock improvement and animal production. Development and evaluation of breeding programmes and familiarisation with the animal breeding industry.

Home department: Animal Sciences

54801 Animal Management Science

434 (16) Intensive management systems (3L, 3P)

Development of modern lines of pigs and poultry for commercial production systems. Housing and ventilation requirements regarding pig and poultry production as influenced by the various growth and development phases. Health management programmes for pig and poultry.

Pig production: management of breeding animals, weaners and growers.

Poultry production: management of broiler breeders, layers, broilers and hatcheries.

Method of assessment: Flexible assessment.
Prerequisite modules:

- *Animal Science 244*
- *Physiology 214*

Corequisite module:

- *Animal Nutrition Science 344*

Home department: Animal Sciences

464 (16) Extensive management systems (3l, 3P)

Sheep and cattle management practices; production systems; mating systems; mating and lambing seasons; identification of animals; fattening; marketing; animal-waste management; flock and herd health; principles of wool production.

Practicals: Assessment and handling of sheep and sheep management practices. Identification of animal diseases and herd health programmes. Students compile a complete herd management and fodder flow programme and visit relevant production facilities and farms. In addition, students also follow short courses in grading of animals presented by the industry.

Method of assessment: Flexible assessment.

Corequisite module: Animal Nutrition Science 324

Home department: Animal Sciences

711 (16) Intensive management systems

Biology, morphology and development of modern lines of pigs and poultry; housing requirements and ventilation regarding pig and poultry housing as influenced by the various growth and development phases; management programmes for pig and poultry diseases; management of breeding animals, weaners and growers; management of breeders, layers, broilers and hatcheries; biosecurity; recordkeeping.

Home department: Animal Sciences

712 (16) Wildlife management

Wildlife management practices and production systems; interaction between animal husbandry and wildlife management; breeding and selection practices; nutritional requirements of browsers and grazers; principles of feed formulation suitable for game species; consumptive and non-consumptive usage of wildlife products.

Practical: Development of a complete management plan; feed formulation; excursions to wildlife ranches in the Western Cape.

Home department: Animal Sciences

741 (16) Extensive management systems

Students will be trained in the management practices of sheep and beef cattle, with emphasis on production systems, mating systems, mating and lambing or calving seasons, the fattening and marketing of animals, flock and herd health and the relevant principles of wool production. Reference will also be made to Angora and Boergoat production.

Practical: Development of a complete management plan; feed formulation; excursions to wildlife ranches in the Western Cape.

Home department: Animal Sciences

56898 Animal Nutrition Science

324 (16) Introduction to ruminant nutrition (3L, 3P)

Chemical composition of feedstuffs; digestive processes and digestibility of feeds and nutrients; metabolism and utilisation of end products of digestion; mineral and vitamin metabolism; protein and energy systems of ruminants; ARC and NRC nutrient standards; feed evaluation.

Practicals: Execution of a digestibility and balance trial with sheep (or other animals), including laboratory analyses and the execution of an in vitro digestive technique.

Corequisite modules:

- *Animal Science 244*
- *Biochemistry 214, 244*

Prerequisite module:

- *Physioloy 214*

Home Department: Animal Sciences

344 (16) Introduction to monogastric nutrition (3L, 3P)

Metabolisable energy and the shortcomings of ME as a criterion; methodology for determining the ME value of raw materials; importance of endogenous energy and the N retention correction; effective energy as alternative criterion; impairment of protein and amino acid in raw materials and the need to use the availability values of amino acid; methodology of determination; nature of the techniques for determining the utilisation coefficients of energy and amino acids for growth and maintenance; calorimetry and carcass analysis; characteristics of the most common raw materials for use in rations; ration formulation.

Method of assessment: Flexible assessment.

Corequisite modules:

- *Biochemistry 214, 244*
- *Animal Science 244*

Prerequisite module:

- *Physiology 214*

Home Department: Animal Sciences

414 (16) Advanced ruminant nutrition (3L, 3P)

Applied nutrition of sheep, goats, dairy cattle, beef cattle and game. Metabolic disorders; processing of raw materials and feeds.

Practicals: Ration formulation with the aid of microcomputers. Visits to feedstuff manufacturers and farms.

Method of assessment: Flexible assessment.

Corequisite module: Animal Nutrition Science 324

Home department: Animal Sciences

444 (16) Advanced monogastric nutrition (3L, 3P)

Energy systems; Protein and amino acids; Anti-nutrients and toxins in feed; Species specific nutrition – poultry and pig nutrition; the use of non-nutritive feed additives; Nutritional pathology.

Method of assessment: Flexible assessment.

Corequisite module: Animal Nutrition Science 344

Home department: Animal Sciences

711 (16) Advanced ruminant nutrition

Students will be trained in modern and advanced concepts of ruminant nutrition, focussing on sheep, beef and dairy cattle. Knowledge will be applied through training in the processing of raw materials and the formulation and manufacturing of complete feedstuffs and feed supplements (licks). Metabolic disorders will be discussed in detail. In addition to using modern software packages to formulate feed, visits to feed manufacturers and producers will also be incorporated.

Home Department: Animal Sciences

741 (16) Advanced monogastric nutrition

Energy systems; protein and amino acids; anti-nutrients and toxins in feed; species-specific nutrition – poultry and pig nutrition; the use of non-nutritive feed additives; nutritional pathology.

Home department: Animal Sciences

11851 Animal Physiology

324 (16) Applied physiology in farm animals (3L, 3P)

Endocrinology and cell communication; regulation of acid-base balance; applied digestive physiology and relevant intermediary metabolism; cardiovascular system and regulation of blood pressure; thermoregulation.

Prerequisite pass module: Physiology 214

Corequisite modules: Biochemistry 214, 244

Home Department: Animal Sciences

344 (16) Advanced animal production physiology (3L, 3P)

Immunology and disease resistance; principles and application of pharmaceuticals in animal health; species comparative reproduction physiology; introduction to assisted reproduction techniques.

Prerequisite pass module: Physiology 214
Corequisite modules: Biochemistry 214, 244

Home Department: Animal Sciences

11878 Animal Production

214 (16) Management technology: Production animals (3L, 3P)

Introduction to nutrients and their functions, classification and processing of raw materials for livestock feed.

Sheep and goats: Supplementary nutrition of grazing sheep and feedlot finishing. Sheep management. Goat management.

Beef cattle: Nutrition and husbandry of breeding herds produced under grazing and intensive systems; feedlot finishing.

Dairy cattle: Nutrition and husbandry of non-lactating and lactating cows and dairy calves. Housing facilities and herd health.

Poultry: Basic principles in poultry production. Broiler management.

Pigs: Management of pigs in different production stages.

The cost and return calculations of each of the above mentioned operations are discussed.

Practical: Feeding practices, visits to farming units and experimental trials, visual evaluation of dairy and beef cattle, discussion of prepared assignments.

Corequisite module:

- *Animal Production Physiology 112 or*
- *Biology 154*

Home department: Animal Sciences

44733 Animal Production Physiology

112 (8) Animal production physiology (1.5L, 1.5P)

An introduction to the anatomy, histology and physiology of the digestive and reproductive systems of domesticated animals; ruminants and monogastric animals. Training includes the dissection of the gastro-intestinal tract and a basic introduction to principles of animal nutrition.

Method of assessment: Flexible assessment.

Home department: Animal Sciences

51004 Animal Product Science

334 (16) Meat science (3L, 3P)

Meat production and meat consumption in perspective; factors that influence carcass composition; slaughter and processing of animals; pre-slaughter and post-slaughter effects on meat quality; storage and processing of meat products.

Practicals: Visits to abattoirs, production of various meat products.

Method of assessment: Flexible assessment.

Corequisite module: Animal Science 244

Home department: Animal Sciences

352 (8) Dairy science and dairy cattle management (2L, 1.5P)

Composition and properties of milk and dairy products; factors that influence milk composition; lactation physiology, milk production; housing; management of dry and lactating cows; control of mastitis.

Practicals: Determination of milk quality. Operation of the milking machine. Layout of housing. Visits to commercial dairies. Production of soft cheese.

Corequisite module: Animal Science 244

Home department: Animal Sciences

20826 Animal Science

144 (16) Introductory animal science (3L, 3P)

An introduction to Animal Sciences and important terminology in Animal Science. An overview of the livestock industry in South Africa and the world. Domestication of livestock and a general introduction to animal production systems, viz. large stock, small stock, poultry and pigs. Care and handling of sheep, cattle, pigs, poultry and horses. An introduction to animal behaviour and welfare.

Home department: Animal Sciences

244 (16) Basic principles of animal production and management (3L, 3P)

A short introduction to Animal Science and Aquaculture. Overview of veld types and rainfall areas in South Africa. Management of sweet and sour veld. Adaptation of animals to changing environments Growth and development of chickens, cattle, sheep and pigs as influenced by age, breed and gender. Introduction to animal breeding and genetics including breed science: the study of a selection of livestock breeds with historical or economic importance in South Africa.

Home department: Animal Sciences

442(8) Practical training (1.5L, 1.5P)

Methods of gathering scientific literature; seminar preparation and presentation; training in writing and presentation skills and exposure to the industry where, inter alia, students partake in a tour of relevant industries. Practical work (one month) as prescribed in the "Compulsory practical work"

section of this part of the Calendar. Of this, preferably two weeks should be completed in a relevant commercial industrial environment and another two weeks in a farm environment. Practical work: Report preparation and submission. Students also undertake a tour of the Western Cape livestock farms and related industries.

Home department: Animal Sciences

772 (24) Scientific skills in animal science

Students will be trained in different manners of scientific method and design; literature review, evaluation and compilation into a seminar and the oral presentation of scientific findings; developing a critical way of thinking and interpreting scientific findings; reporting observations and findings in technical reports; ethics of Animal Science-based research; theoretical biometrical concepts and their practical application.

Home department: Animal Sciences

20753 Applied Mathematics B

124 (15) Statistics (4L, 2T)

Vectors; forces; sum of forces at a point; direction cosines and direction angles; components and component vectors; scalar products; vector products; moment of a force; force systems on rigid bodies; equivalent force systems; couples; line of action of the resultant; equilibrium of a rigid body; friction; centre of mass; centroid; volumes; definite integration; moment of inertia of areas.

Method of assessment: Flexible assessment.

Home department: Applied Mathematics

12487 Applied Plant Physiology

414 (16) Ecophysiology of horticultural and agronomical crops (3L, 3P)

Advanced principles of stomatal conductance, transpiration, photosynthesis and respiration. Micro-climatological influences on gas exchange. Effects of excess energy – temperature and light. The use of chlorophyll fluorescence as stress indicator. Upscaling of gas exchange and carbon balance of crops. Water relations of cells, tissues and whole plant. Stress physiology and advantageous aspects of stress. Climate change and agriculture. Theory and application of ecophysiological measurement techniques.

Corequisite module: Soil Science 344 and
Prerequisite module:

- *Horticultural Science 314 or*
- *Agronomy 322*

Home department: Horticultural Science

464 (16) Nutrition of horticultural and agronomical crops (3L, 3P)

Phloem transport and carbohydrate partitioning. Root anatomy, mineral application, uptake and partitioning. Crop-based nutritional requirements and application strategies; management of

vegetative and reproductive balances and the role of rootstocks. Factors affecting mineral uptake.

Practicals: An orchard report, amongst others. Cultivation of alternative crops

Prerequisite modules:

- *Soil Science 244 and*
- *Horticultural Science 314 or*
- *Agronomy 342*

Home department: Horticultural Science

714 (16) Ecophysiology of horticultural and agronomical crops

Students will be trained in advanced principles of stomatal conductance, transpiration, photosynthesis and respiration. Micro-climatological influences on gas exchange. Effects of excess energy – temperature and light. The use of chlorophyll as stress indicator. Upscaling of gas exchange and carbon balance in crops. Water relations of cells, tissues and whole plant. Stress physiology and advantageous aspects of stress. Climate change and agriculture. Theory and application of ecophysiological measurement techniques.

Home department: Horticultural Science

734 (13) Applied plant physiology and tree architecture

Lectures: Underlying physiology of growth, development and production practices of horticultural crops. Correlative phenomena and the role of plant hormones supported by an overview of relevant cell, tissue and organ anatomy as well as basic genetic principles. Overview of environmental perception and acclimation/adaptation. Dormancy as morphogenetic and survival mechanism. Physiology of growth cessation, hardening, induction and progression of dormancy, rest breaking and branching. Tree architecture and training systems, principles and techniques of tree manipulation and the role of rootstocks. Integration of the above taking production practices into account.

Practicals: Inter alia lectures by industry specialists on relevant pre-harvest topics as well as visits to fruit production areas to illustrate and support the module content.

Home department: Horticultural Science

744 (13) Postharvest physiology and technology of horticultural and agronomical crops

Postharvest physiology of fresh plant products: structure and composition of the product, role of respiration and ethylene metabolism, fruit ripening and senescence, physiological defects or disorders, food safety.

Postharvest technology: water relations and psychrometrics, quality and maturity parameters, harvest and packing, cooling and storage technology such as controlled atmosphere, transport of fresh plant products.

Plant products that are discussed to illustrate principles include deciduous fruit (pome fruit, stone fruit and table grapes) as well as some tropical and subtropical crops and vegetables.

Practicals: A series of lectures by industry specialists on topics such as postharvest problems,

profitability of certain deciduous fruit types, market trends, and alternative crops like fynbos. Visits to the Cape Town market in Epping, pack houses and cold stores, fresh-cut facilities and the Cape Town port for handling of export products.

Home department: Horticultural Science

764 (16) Nutrition of horticultural and agronomical crops

Phloem transport and carbohydrate partitioning. Root anatomy, mineral application, uptake and partitioning in deciduous fruit and proteas. Crop-based nutritional requirements and application strategies; management of vegetative and reproductive balances and the role of rootstocks. Factors affecting mineral uptake**.**

Practicals: An orchard report and cultivation of alternative crops.

Home department: Horticultural Science

773 (30) Research project

Research project and presentation. Literature review on selected research topics, drawing up a research plan, performing experiments, collection, processing and interpretation of data, writing a research report. Regular feedback on the above via oral presentations.

Home department: Horticultural Science

46213 Aquaculture

314 (16) Introduction to aquaculture (3L, 3P)

Fish and shellfish in aquaculture. Overview of national and international developments in aquaculture. Applied biology of aquaculture species: fish, shellfish and crustaceans. Nutritional requirements and management. Water quality and management. Environmental impact and monitoring.

Method of assessment: Flexible assessment.

Home department: Animal Sciences

344 (16) Aquaculture production and processing (3L, 3P)

Choice of species and site selection. Aquaculture husbandry system. Intensive and extensive management systems. Fish diseases: health management, identification and prevention. Processing of aquaculture products and product quality and marketing.

Method of assessment: Flexible assessment.

Prerequisite module: Aquaculture 314

Home department: Animal Sciences

414 (16) Freshwater aquaculture (3L, 3P)

Production and management of freshwater aquaculture species: trout, tilapia, catfish, ornamental species, crocodiles, freshwater crawfish and prawns. Management techniques: broodstock, eggs, incubation and hatching, fingerlings and grow-out stages. Production planning, management systems and computer usage.

Method of assessment: Flexible assessment.

Prerequisite module: Aquaculture 344

Home department: Animal Sciences

444 (16) Marine aquaculture (3L, 3P)

Production and management of marine aquaculture species: oysters, mussels, abalone, salmon, seaweed and prawns. Management techniques: brood stock, eggs, incubation and hatching, fingerlings and grow-out stages. Production planning, management systems and computer usage.

Method of assessment: Flexible assessment.

Prerequisite module: Aquaculture 414

Home department: Animal Sciences

478 (32) Aquaculture research project (3L, 3P)

Formulation of an applicable research project proposal, including liaison with the industry and drawing up a budget. Literature study, experimental design, planning and execution, including supervision of facilities and experimental material, usage of apparatus and utilisation of calibrators and calibration techniques. Data processing, analysis, interpretation and reporting.

Prerequisite modules: Aquaculture 314, 344

Home department: Animal Sciences

711 (16) Aquaculture production and management systems I

Management practice of aquaculture production in relation to production systems; production planning; production management: applied biology, nutrition, water quality; including intensive and extensive systems, with reference to marine and freshwater species.

Home department: Animal Sciences

712 (16) Aquaculture products

Processing technology and management practices in aquaculture. Product quality, food and health standards. Product development.

Home department: Animal Sciences

741 (16) Aquaculture production and management systems II

Management practice of aquaculture production in relation to production systems; production planning; production management; fish health, quality, processing; including intensive and extensive systems, with reference to marine and freshwater species.

Home department: Animal Sciences

742 (16) Aquaculture ecology

Aquaculture ecology.

Home department: Animal Sciences

743 (16) Aquaculture nutrition

Feeding behaviour of aquaculture species. Nutrition management practices of aquaculture species. Nutrition and food quality of aquaculture species.

Home department: Animal Sciences

771 (36) Aquaculture management practice

Management practice of aquaculture production in relation to production systems, production planning, production management; including intensive and extensive systems, with reference to marine and freshwater species.

Home department: Animal Sciences

772 (30) Aquaculture research practice

Preparation and planning of research projects in relation to species, facilities, equipment and apparatus; technique and handling methods; collection, processing and interpretation of data; presentation and information transfer.

Home department: Animal Sciences

12910 Aquaculture Management Science

724 (16) Aquaculture review, assessment and project development I

Aquaculture species; species selection and biology; aquaculture management practices and production systems; site selection.

Practical: The development of a complete production and management plan; species review, species selection, applied biology and production systems; site selection, risk assessment, budget, marketing plan; excursions to aquaculture operations in the Western Cape.

Method of assessment: Flexible assessment.

Home department: Animal Sciences

754 (16) Aquaculture review, assessment and project development II

Aquaculture risk assessment; aquaculture best management practices; production planning; financial planning.

Practical: The development of a complete production and management plan; risk assessment; EIA procedures; preparation of a project proposal for presentation; excursions to aquaculture operations in the Western Cape.

Method of assessment: Flexible assessment.

Home department: Animal Sciences

13265 Assessing Food Security

821 (10) Assessing food security

The module covers food and nutrition assessment methods, different levels as well as indicators,

analysis, monitoring and evaluation.

Home division: Human Nutrition

11053 Biochemistry

214 (16) Biomolecules: Structure-function relationships (3L, 3P)

Please note:

Students intending to take Biochemistry as a subject are required to take modules in Biology, Physics and Mathematics during their first year. Chemistry 124 plus Chemistry 144 are taken as the first-year equivalent of Biochemistry.

Structures, characteristics and functions of bio-molecules (bio-elements, water, nucleic acids, proteins, enzymes, coenzymes, carbohydrates, lipids).

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Chemistry 124 and 144*
- *Biology 124*

Home department: Biochemistry

244 (16) Intermediary metabolism (3L, 3P)

Bioenergetics; metabolism of carbohydrates, lipids and nitrogenous compounds; integration of metabolism.

Method of assessment: Flexible assessment.

Home department: Biochemistry

314 (16) Specialised biochemical topics I (3L, 3P)

Advanced protein biochemistry: Basic protein purification techniques and structure/function relationships studied in the context of a number of specialised complex protein systems. Intracellular signal transduction pathways; receptors; hormones; cAMP; networks and cross-talk; biochemistry of vision, biochemistry of smell.

Method of assessment: Flexible assessment.

Prerequisite pass modules: Biochemistry 214, 244

Home department: Biochemistry

315 (16) Biophysical and structural biochemistry (3L, 3P)

Advanced protein biochemistry, including basic protein purification techniques and analysis of protein purity, composition and structure.

Analysis of biological molecules and processes with light, fluorescence, infrared, Raman and nuclear magnetic resonance spectroscopy, mass spectrometry, circular dichroism, optical rotatory dispersion, isotope-dependent techniques, advanced gel electrophoresis and chromatographic techniques.

Practicals: Purification, analysis and characterization of proteins using selected methods. The practicals will be presented in the first week of the June/July holiday.

Prerequisite pass modules:

- *Biochemistry 214 and 244*
- *Physics 144 or*
- *Physics (Bio) 134*

Home department: Biochemistry

345 (16) Specialised biochemical topics (3L, 3P)

Intracellular signal transduction pathways; receptors; hormones; cAMP; networks and cross talk; biochemistry of vision; biochemistry of smell.

Immunology: Innate and specific acquired immunity; antibody structure and function; defence mechanisms against pathogenic organisms; vaccinations; allergies; immune disorders; AIDS.

Control of eukaryotic gene expression: Control at transcriptional and translational level, promoters and enhancers, transcription factors, control of gene expression by steroid hormones and control of immunoglobulin genes.

Practicals: Recombinant gene cloning and protein expression; analysis and quantification with selected methods. The practicals will be presented in the last week of the June/July holiday.

Method of assessment: Flexible assessment.

Prerequisite modules:

- *Biochemistry 315 and 324 (324 not applicable to BSc Food Science Students)*

Home department: Biochemistry

365 (16) Practical protein expression, purification and analysis techniques (3L, 3P)

Recombinant protein expression and protein purification techniques. Analysis of protein purity and integrity. Techniques include: plasmid DNA isolation, PCR, restriction enzyme digests, agarose gel electrophoresis, preparation of competent cells, transformation, induction of protein expression, gel permeation chromatography, ion exchange chromatography, immobilized-metal affinity chromatography, protein concentration determinations, SDS-PAGE, western blot, activity assays and spectrophotometric analysis.

Practicals will be presented during the recess periods, specifically during a) the week before the 2nd semester officially starts, and b) the recess between the 3rd and 4th terms. Students registering for this module declare that they are available during both these periods.

Method of assessment: Flexible assessment.

Prerequisite modules: Biochemistry 315, 324

Home department: Biochemistry

53953 Biodiversity and Ecology

212 (16) Statistics and other tools for biologists (3L, 3P)

This module is a thorough introduction to the key numerical skills and processes underpinning the good practice of biological sciences. It covers statistical analyses, the concept of null and alternative hypotheses, data handling and logical interpretation, data presentation and scientific communication, advanced use of Microsoft Excel, PowerPoint and Statsoft Statistica. Hands-on statistical exercises cover a range of parametric, non-parametric and contingency-based analyses from descriptive statistics through to combinations of analysis of variance and regression analysis. Applied scientific investigatory principles to biology are explored using experimental design, ethics, scientific and popular publication processes, and the use of scientific literature.

Corequisite module: Computer Skills 171

Home department: Botany and Zoology

214 (16) Principles of ecology (3L, 3P)

The basics of aquatic biology and population ecology are taught by integrating theory and practical field work. Topics will focus on population growth and life history strategies used by organisms to maximise fitness. This module will be closely integrated with Biodiversity and Ecology 212 in which students will be taught how to analyse ecological data. There will be a three-day, compulsory field course in which students conduct their own research projects.

Method of assessment: Flexible assessment.

Prerequisite pass module:

- *Biology 144*

Prerequisite modules:

- *Mathematics (Bio) 124 or*
- *Mathematics 114 and 144*

Corequisite modules:

- *Biodiversity and Ecology 212 or*
- *Probability Theory and Statistics 114 or 144 (Not applicable to BScAgric (Animal Science with Conservation Ecology)*

Home department: Botany and Zoology

224 (16) Diversity and function of invertebrates (3L, 3P)

The focus of this module is invertebrate diversity and physiology. Major evolutionary changes in morphology (form) within each of the phyla that allow animals to survive in their respective habitats and eventually colonise the terrestrial environment will be explored. Within each environment (marine, freshwater and terrestrial), students will be exposed to the physiological challenges animals have to endure in order to survive. Major physiological changes within major invertebrate phyla will be explored in relation to their evolution. The practical component of the module will entail both laboratory and field work.

Method of assessment: Flexible assessment.

Prerequisite pass module:

- *Biology 144 or 154 and a final mark of at least 40% in the remaining Biology module*

Home department: Botany and Zoology

254 (16) Vertebrate life (3L, 3P)

The vertebrate story: where they originated, present diversity, how they evolved, what they do and how they work. Topics include characteristic features of vertebrates and their body plans; the broad pattern of the evolutionary relationships of vertebrates; ontogeny of vertebrates and the evolutionary implications of developmental mechanisms; basic anatomy, physiology and evolution of vertebrate organ systems; reproductive biology and strategies: sex determination; hormonal control; seasonal cycles; evolution of viviparity; thermo-energetics; water balance, osmoregulation and excretion; surviving in extreme environments. This module includes practical sessions/workshops and a research project with data collected in the laboratory or during a field excursion.

Method of assessment: Flexible assessment

Prerequisite pass module:

- *Biology 124 or 154 and a final mark of at least 40% in the remaining Biology module*

Prerequisite modules:

- *Chemistry 124, 144*

Home department: Botany and Zoology

264 (16) Diversity of plant form and function (3L, 3P)

Plants occupy the most diverse habitats on earth. A wide range of morphological and physiological adaptations are required to conquer these habitats. The diversity of plant form and function will be explored as interlinked themes to understand how plants grow, respond to natural cycles, capture resources and survive in adverse conditions. The theory and practicals will explore each theme in a complementary way that will include formal lectures, group discussions, laboratory and field experiments.

Prerequisite pass module:

- *Biology 144 or 154 and a final mark of at least 40% in the remaining Biology module)*

Home department: Botany and Zoology

315 (16) Ecology field course (3L, 3P)

This is a field-based module. The location of the module will change from year to year. The module will be timed to fall outside of the formal lecture periods – typically two weeks during January. The aim of the module is to bring ecological and evolutionary theory to life in the field. The main foci are biotic interactions (e.g. pollination, competition, and facilitation), animal behaviour and ecosystem-level ecology. Lectures, assignments and discussion groups will be conducted in the field, as well as during the normal university term.

This module is a restricted module and largely limited to students registered in the Biodiversity and Ecology programme. Participants maybe selected from other programmes based on past performance and available places.

Method of assessment: Flexible assessment.

Prerequisite pass modules: Biodiversity and ecology 212, 214

Home department: Botany and Zoology

324 (16) Angiosperm diversity and evolution (3L, 3P)

The theory investigates the origin and phylogenetic relationships among angiosperms, as determined through different classification systems. Angiosperm diversification and classification is studied through the use of morphological, anatomical, embryological, palynological and molecular characters. The role of hybridisation and polyploidy in the diversification of the angiosperm lineage is assessed. Specialised morphological and physiological adaptations to suboptimal environments and the effect of such adaptations on the diversification of angiosperms are discussed.

The practical series focuses on Fynbos taxa and plant identification up to the family level.

Method of assessment: Flexible assessment.

Prerequisite pass modules: Biodiversity and Ecology 264

Home department: Botany and Zoology

334 (16) Global change biology (3L, 3P)

The study of global change with a biological perspective, which brings together historical and current evidence for such change and summarises its main drivers. Topics include global climate change, anthropogenic change such as pollution, and land use. Data at different spatial and temporal scales and at different levels of biological organisation are covered, highlighting the technologies and numerical techniques used to study these processes. Finally, ways of ameliorating the process are covered, as is communication about all of the above topics both between scientists, and between scientists and the public.

Any 4 of the following 6 prerequisite pass modules:

- *Biodiversity and Ecology 212, 214, 224, 244, 254, 264*

Home department: Botany and Zoology

345 (16) Invasion biology (3L, 3P)

Biological invasions provide fascinating opportunities to improve our understanding of how the world works (from genes to ecosystems), but invasions also represent a major challenge to our sustainable use of resources (from impacts on rural communities to effects on major shipping companies). As such invasion science involves a wide range of disciplines. Biological invasions are widely recognised as one of the main threats to both the conservation of biodiversity, and the maintenance of ecosystem services worldwide. In many parts of the world, the most challenging and time-consuming tasks of conservation biologists and managers are those relating to controlling alien species and preventing impacts, and, increasingly, repairing systems already damaged by aliens. The interaction between invasions and other drivers of global change creates fascinating areas for research.

The aim of this module is to provide an introduction to the exciting and important field of "invasion science" – the full spectrum of fields of enquiry that address issues pertaining to alien species and

biological invasions.

Any 4 of the following 6 prerequisite pass modules:

- *Biodiversity and Ecology 212, 214, 224, 244, 254, 264*

Home department: Botany and Zoology

364 (16) Conservation biology (3L, 3P)

This module will introduce the topic of conservation biology with a focus on the role that science plays in this field. It aims to equip young biologists and conservation managers with a working knowledge of modern conservation biology principles. On completion, students will have an understanding of biodiversity patterns, how conservation can be addressed at the molecular, population, ecosystem and landscape scales, and how resource management interfaces with conservation efforts and the relevant policy framework.

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Biodiversity and Ecology 212 or*
- *Biomathematics214*
- *Biodiversity and Ecology 214*

Home department: Botany and Zoology

11490 Biodiversity and Ecosystem Services

874 (6) Biodiversity and ecosystem services

Students will be able to explore the diversity of plant species, vegetation types and habitats that exist in South Africa in general, and in the Fynbos biome in particular, by using a tool called SynBioSys Fynbos. This tool is a multi-media platform that includes a geographic information system (GIS), allowing the student to query various biodiversity databases to see how various land uses, e.g. farming, conservation and eco-tourism, impact on the extant biodiversity and ecosystem services. Ultimately, the student will be able to derive biodiversity and ecosystem services data as inputs for qualitative and quantitative land use analysis.

Learning outcomes

At the end of the module the student is expected to be able to:

- appreciate the existence value of biodiversity as well as the importance of the different types of ecosystem services
- appreciate the complexity of impacts of agricultural practices, and benefits of sustainable farming within a given landscape and biome
- analyse the biological values of land use systems at different levels (species, ecosystems and landscapes) by querying the information system SynBioSys Fynbos
- use geographic information systems (GIS) to analyse biodiversity at both temporal and spatial scales
- discuss the potential of databases to assess the impact of climate change, invasive

species and land degradation on biodiversity

- use the SynBioSys system to provide biodiversity data and proxies for ecosystem services, which can be used for quantitative and qualitative land use analysis (QUALUS) and thus farm planning and decision making.

Home department: Conservation Ecology and Entomology

25046 Biology

124 (16) Cell biology (3L, 3P)

Origin and early history of life. Cytology. Cell chemistry, biological membranes and cellular respiration. Fixation, transfer and expression of genetic information. Evolution.

Responsible departments: Biochemistry, Botany and Zoology, and Genetics

Home department: Botany and Zoology

144 (16) Biodiversity and ecology (3L, 3P)

Classification of organisms. Diversity of micro-organisms, plants and animals. Ecological principles and global changes.

Responsible departments: Botany and Zoology and Microbiology

Corequisite modules:

- *Biology 124 and*
- *Chemistry 124, 144*

Home department: Botany and Zoology

154 (16) Functional biology (3L, 3P)

Plant anatomy and morphology; photosynthesis; water relations; transport in plants; plant mineral nutrition; growth and development; responses to the environment. Functional biology of animals. Introduction to biotechnology.

Responsible departments: Botany and Zoology and Genetics

Corequisite modules:

- *Biology 124 and*
- *Chemistry 124, 144 (not applicable to the stream Biomathematics, option 2: ecology)*

11061 Biometry

212 (8) Introductory biometry (2L, 1T, 1P)

Role of statistics in research; methods of tabulation and graphical representation of data; descriptive measures of locality, variation and association; the elementary principles of estimation, sampling, randomization, unbiasedness and distributions; simple linear and non-linear regression; calculation of standard errors; introduction to hypothesis testing; contingency tables and chi-square tests; tests for normality; F-test for homogeneity of variance. All data will be analysed using applicable software.

Method of assessment: Flexible assessment.

Prerequisite module:

- *Mathematics (Bio) 124 or*
- *Mathematics 114*

Home department: Genetics

242 (8) Applications in biometry (2L, 1T, 1P)

Treatment and experimental design; efficiency of estimation; analysis of variance; hypothesis tests for means and differences between means: F-test, t-test, Student's LSD; confidence intervals; non-parametric tests; multiple linear regression. All data will be analysed using applicable software.

Method of assessment: Flexible assessment.

Prerequisite module: Biometry 212

Home department: Genetics

312 (8) Biometrical inference (1L, 1P, 1T)

Linear and multiple regression; statistical inference; prediction and calibration; testing the assumptions; diagnosis of outliers and influential observations; data transformations; data processing with Excel.

Method of assessment: Flexible assessment.

Prerequisite module: Biometry 242

Home department: Genetics

771 and 881 (8) Postgraduate biometry

Data processing with SAS Enterprise Guide (or alternatively: R). Simple descriptive statistics; t-tests for single populations, combined t-tests and paired t-tests for two populations; analysis of variance: completely random design, random blocks design, Latin square design, cross-classification designs; repeated-measures analysis of variance; multiple comparison procedures; non-parametric tests: Mann-Whitney, Wilcoxon, Kruskal-Wallis and Friedman; linear regression and correlation; polynomial regression, multiple regression; selection of independent variables with stepwise regression and all-subset regression; analysis of covariance analysis; categorical data analyses (Chi-squared tests); logistic regression. This module is presented in two blocks of five half days each

Method of assessment: Flexible assessment.

Prerequisite modules:

- *Biometry 212 and 242 or 211*
- *Students with different undergraduate Statistics modules must obtain at least 50% for an admission examination.*

Home department: Genetics

48550 Business Management

113 (12) Business management (3L, 1P)

Procedures for the establishment of a new business, the business environment, business ethics, competition, idea generation and entrepreneurship, choice of form of business, determining break-even levels, resources and people involved in the business, management and managerial resources.

Home department: Business Management

142(6) The investment decision (1.5L, 1P)

The investment cycle; the role and functioning of the JSE Securities Exchange SA; investment risks; factors that influence share prices; fundamental and technical analysis of companies.

Method of assessment: Flexible assessment.

Home department: Business Management

11479 Chemistry

124 (16) Fundamental principles of chemistry I (3L, 3P)

Matter and its properties; chemical formulae; stoichiometry; solution stoichiometry and reactions in aqueous solution; thermodynamics: energy, enthalpy, entropy and Gibbs free energy; atomic structure and bonding; molecular geometry and structure according to Lewis and VSEPR; intermolecular forces; chemical kinetics.

Home department: Chemistry and Polymer Science

144 (16) Fundamental principles of chemistry II (3L, 3P)

Chemical equilibrium (both quantitative and qualitative), with applications in acid-base and precipitation reactions of aqueous solutions; an introductory study of organic compounds with a variety of functional groups; reaction mechanisms; stereochemistry; polymerisation.

Corequisite module: Chemistry 124

Home department: Chemistry and Polymer Science

234 (16) Inorganic chemistry (3L, 3P)

Periodic trends; structure and bonding in molecules; structure and bonding in solids; acid-base chemistry; main group elements.

Coordination chemistry: Introduction, types of ligands, nomenclature; isomerism in coordination compounds; different geometries; formation constants; crystal field theory.

Prerequisite pass module: Chemistry 124

Home department: Chemistry and Polymer Science

254 (16) Physical chemistry (3L, 3P)

Chemical thermodynamics; colligative properties; phase diagrams; reaction kinetics; electrochemistry.

Prerequisite pass module: Chemistry 124
Prerequisite modules: Mathematics 114, 144

Home department: Chemistry and Polymer Science

264 (16) Chemical analysis I (3L, 3P)

Introduction to chemical analysis; basic classical analytical chemistry; errors and uncertainty in analytical data; basic statistical methods; volumetric methods (acid-base, redox and complexometric analysis); solvent extraction; introduction to chromatographic separation; introduction to analytical molecular spectroscopy: fundamental principles and quantitative aspects of UV/visible spectrophotometry; introduction to infrared spectroscopy.

Prerequisite pass module: Chemistry 124, 144 and
Prerequisite modules:

- *Mathematics 114, 144 or*
- *Mathematics (Bio) 124 or*
- *Engineering Mathematics 115, 145*

Home department: Chemistry and Polymer Science

314 (16) Chemical Analysis II (3L, 3P)

Introduction to instrumental analysis. Error theory in quantitative chemical analysis, calibration in instrumental analysis and figures of merit. Introduction to atomic spectroscopy: atomic absorption and atomic emission spectroscopy for quantitative elemental analysis. Molecular spectroscopy: basic principles and application of ^{1}H and ^{13}C nuclear magnetic resonance spectroscopy (NMR); introduction to analytical mass spectrometry; instrumental chromatographic methods.

Prerequisite pass module: Chemistry 264

Home department: Chemistry and Polymer Science

324 (16) Physical chemistry (3L, 3P)

Quantum mechanical description of atoms and molecules; vibrational and rotational spectra; statistical thermodynamics.

Prerequisite pass modules:

- *Chemistry 254*
- *Mathematics 114, 144*

Home department: Chemistry and Polymer Science

344 (16) Organic chemistry (3L, 3P)

Reaction mechanisms, including those pertaining to enolate chemistry, chemo-, stereo- and diastereoselectivity, controlling geometry of double bonds, pericyclic reactions; stereochemistry; syntheses.

Prerequisite pass module: Chemistry 214

Home department: Chemistry and Polymer Science

364 (16) Inorganic chemistry (3L, 3P)

Stereochemical non-rigidity; structure and strength correlations for acids and bases; structure, bonding and reactivity of transition metal complexes; selective metal-complexation; kinetics and mechanisms of selected inorganic reactions; bio-inorganic chemistry and the role of metal complexes in biological systems; introduction to organometallic chemistry and catalysis; the synthesis and characterisation of inorganic compounds (practicals).

Prerequisite pass module: Chemistry 234

Home department: Chemistry and Polymer Science

30317 Computer Programming

143 (12) Computer programming (3L, 2P)

Introduction to computer systems. Introduction to a programming environment; expressions; conditional statements; iterative structures; data types; static and dynamic data structures; file handling; abstract data types; objects; structured program design. Emphasis is placed on modular programming for engineering applications.

[Presented by the Department of Electrical and Electronic Engineering (75%) and by the Department of Mechanical and Mechatronic Engineering (25%)]

Examination

Formula for Final mark: P=0,4K + 0,6E

Home Department: Electrical and Electronic Engineering

50040 Computer Skills

171 (4) Computer skills (1L)

Study load: 26 lectures in total, presented as 2L per week for 13 weeks, distributed over the year

Introduction to general computer usage with the focus on the development of skills in using software for word processing, skills in using spreadsheets to perform calculations in creating meaningful graphs and skills in using presentation software.

An optional test can be written during the first term to obtain exemption from the module.

The class mark will serve as the final mark.

Home department: Computer Science

272 (5) Computer skills (2L)

Study load: 35 lectures in total

The main objective of this module is to equip the student with the relevant skills required to successfully and efficiently perform tasks identified as fundamental to the scientific process. Each topic is presented using an appropriate computer software package. Specific attention is given to the following topics: obtaining relevant literature, data capturing and analysis, creation and technical maintenance of electronic documents for reporting and presentation.

Method of assessment: Flexible assessment.

Home department: Computer Science

13255 Conceptualising Food Systems

811 (10) Conceptualising food systems

Thorough scientific based knowledge and research techniques in the field of the food and nutrition security are reviewed in this module. This will require experience and an understanding of the situation in which the problem is embedded in the food system.

Home division: Food Science/ Agricultural Economics/ Human Nutrition

55638 Conservation Ecology

212 (8) Conserving nature (2L, 1P)

What is biodiversity; a brief history of biodiversity; the importance of biodiversity; how many species are there; global patterns in biodiversity; human impacts and species extinctions; maintaining biodiversity, conventions, sustainable use and approaches to conservation.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

244 (16) Conservation censusing (3L, 3P)

Planning and conducting monitoring and biodiversity surveys for major plant and animal taxa, including indices for river system health and ecological integrity; social censusing and its importance in conservation; develop experience in indices of species richness and diversity; introduction to community composition and differences. Exposure to taxonomic identification of insect orders and small mammal species.

Method of assessment: Flexible assessment.

Prerequisite pass module: Conservation Ecology 212

Home department: Conservation Ecology and Entomology

314 (16) Biome ecology (3L, 3P)

Introduction to biomes and ecosystem services; key drivers; social-ecological systems of dynamics and biome-level management issues; ecology of tropical and afromontane forests, woodlands, savannahs, treeless vegetation types; wetlands; animal diversity-habitat interactions; patterns of endemism,

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

344 (16) Introduction to conservation management (3L, 3P)

The relationship between society and the natural environment; history and philosophy of conservation; environmental and research ethics; cultural conservation; government and

community influences on conservation; environmental legislation; environmental impact assessment (EIA); challenges in community based natural resource management; human environmental stressors; public opinion on environmental issues; the meaning of "the environment" and "nature" to people of various cultural and social backgrounds; conservation management for ecotourism and recreation; management plans and research.

Method of assessment: Flexible assessment.

Prerequisite pass module: Conservation Ecology 314

Home department: Conservation Ecology and Entomology

414 (16) Advanced conservation management (3L, 3P)

Conservation in utilised landscapes; conservation planning; disturbance ecology; grazing; harvesting; ecological monitoring; restoration ecology; current issues in biodiversity and resource conservation, for example: invasive species, ecosystem health and emerging diseases, climate change, genetically modified organisms, pollution. There is a compulsory field trip during the Easter vacation.

Method of assessment: Flexible assessment.

Prerequisite pass module: Conservation Ecology 344

Home department: Conservation Ecology and Entomology

424 (16) Wildlife management in a changing environment (3L, 3P)

Decision-making in the face of uncertainty; sustainable harvesting – terrestrial and marine environments; wildlife management – principles, habitat and game assessment, grazing management, sustainable utilisation, game capture and translocation, wildlife diseases, nutrition and contraception methods; planning and executing conservation-based research; case studies in conservation research.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

448 (32) Conservation plan/research project (6L, 6P)

Students develop and undertake a project to prepare a management plan or research paper, with supervision from a staff member with appropriate expertise. Project ideas can be co-developed between the student, course co-ordinator and conservation agencies, such as CapeNature, South African National Parks, private reserves and conservation non-government organisations (NGOs). Management plans could be for government or private reserves, or be species or community specific, e.g. a species recovery plan for a threatened species or ecosystem. They might also include sustainability plans, such as carbon off-setting or stewardship agreement property plans. Research projects can be on any topic related to nature conservation generally and agreed on between the student and the course co-ordinator.

Method of assessment: Report/ mini-thesis (due October).

Prerequisite module: Conservation Ecology 314 or 344

Corequisite module: Conservation ecology 414

Home department: Conservation Ecology and Entomology

14052 Crop Production

152 (8) Introduction to applied plant science (1.5L, 1.5P)

Classification systems and classification of agricultural crops; structure of plants of agricultural significance; plant growth regulators; ecological principals and introductory agricultural ecology.

Home department: Viticulture and Oenology

214 (16) Plant propagation (3L, 3P)

Principles and practices of plant propagation: brief overview of different crop types and the aim of plant propagation. Plant life cycles and phases and their relative importance in plant propagation. Principles of sexual versus asexual propagation. Seed propagation and seed production. Asexual propagation by means of cuttings, grafting, layering and tissue culture. Propagation of plants from specialised roots and stems. Pathogens during the propagation process and their control. Propagation of specific commercial crops. Legal protection of cultivars.

Corequisite module: Biology 124
Prerequisite module:

- *Biology 144 or 154 or*
- *Crop Production 152*

Home department: Horticultural Science

53961 Crop Protection

244 (16) Introductory plant pathology and entomology (3L, 3P)

The nature and causes of plant diseases, the impact of pathogens and pests on agriculture, the biology of important pathogens and pests, factors influencing disease development, diagnosis of plant diseases and principles of plant disease control.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

13327 Crops for Extensive Production Systems

711 (18) Crops for extensive production systems (3L, 3P)

Identification, morphology and growth requirements of existing and new potentially important food, fibre, medicinal and industrial crops for the winter rainfall area, management practices for sustainable maximum production of the particular crops.

Method of assessment: Flexible assessment.

Home department: Agronomy

12084 Economics

114 (12) Economics (3L, 1T)

The economic problem: scarcity, priorities and opportunity cost. Introductory microeconomics: demand and supply and the determination of equilibrium in goods markets, production and cost theory, market structures and the theory of the firm, market failures and the role of the government.

Home department: Economics

144 (12) Economics (3L, 1T)

Introductory macroeconomics: income and production theory, the foreign sector and monetary economics. National Accounting and macroeconomic data. The South African economy: history and features.

Corequisite module: Economics 114

Home department: Economics

214 (16) Economics (3L, 1T)

Macroeconomics: the IS-LM-model, total demand and supply, inflation, monetary transmission mechanism, stabilisation policy.

Microeconomics: goods and factor markets, demand theory, production and cost theory, market structures and the theory of the firm, welfare theory.

Prerequisite pass modules: Economics 114, 144

Home department: Economics

244 (16) Economics (3L, 1T)

South African monetary policy. International trade and finance: the theory of international trade, barriers to free trade, the World Trade Organisation and regional economic integration, the balance of payments, international financial markets, adjustment mechanisms, policy options, exchange rate determination, the international monetary system and South African exchange rate policy.

Prerequisite pass modules:

- *Economics 114, 144*

Corequisite module:

- *Economics 214*

Home department: Economics

318 (24) Economics (4L, 1S)

Macroeconomics: economic growth, business cycle, monetary and fiscal policy. Quantitative economics: general data analysis, mathematical and econometric techniques, input/output analysis. Microeconomics: industrial structures, market structures, the theory of the firm, introduction to game theory.

Prerequisite pass modules: Economics 214, 244

Home department: Economics

348 (24) Economics (4L, 1S)

This module focuses on the economic policy debate in a developing country. This includes economic policy criteria, structural characteristics of the South African economy, economic thought and systems, and growth and development policies, which include demand and supply aspects of economic growth, sectoral and spatial development, distribution of income and social expenditure, competition policy, environmental economics, labour policy, education and investment in human capital and the macroeconomic policy debate.

Prerequisite pass module: Economics 214
Prerequisite module: Economics 244
Corequisite module: Economics 318

Home department: Economics

388 (24) Economics (2L, 2T)

Introductory applied econometrics: statistical concepts, the classical linear model of regression, multicollinearity, autocorrelation, heteroscedasticity, dummy variables, estimation of regression models.

Labour economics and labour econometrics: labour market, demand and supply, demographic tendencies, trade unions, the South African labour market. Management economics: mathematical techniques, analysis of demand, cost and production, price determination, introduction to linear programming.

South African economic issues.

Method of assessment: Flexible assessment.

Prerequisite pass module: Economics 214
Prerequisite module: Economics 244
Corequisite module: Economics 318

Home department: Economics

13345 Economics of sustainable agriculture (including farm management)

876 (8) Economics of sustainable agriculture (including farm management)

The module provides an introduction to the economics of the major aspects of sustainable agriculture. These include market analysis, contractual arrangements, environmental dimension and farm-level decision making.

Learning outcomes

At the end of the module the student is expected to be able to:

- apply basic notions of environmental economics

- appreciate the organisation of supply chains
- explain the basics of price formation process
- explain the basics of competitiveness
- apply the basics of economic multipliers
- appreciate the basics of typical farm modelling as a farming system planning tool
- critically assess the potential of certification to value environmental services
- recognise market forces governing credit and insurance
- evaluate contractual arrangements as to land and labour.

Home department: Agricultural Economics

49484 Engineering Chemistry

123 (15) Chemistry for engineering students (4L, 2T)

Basic concepts, units and dimensions, significant figures, conversion between unit systems; components of matter, atomic structure, the periodic table and chemical bonding; stoichiometry; chemical reactions (acid-base, precipitation and redox); properties of mixtures and solutions; chemical equilibrium; electrochemistry; gas laws, state functions and (T, P, V) relationships; thermodynamics and thermochemistry; introduction to basic engineering applications.

Method of assessment: Examination.

Corequisite module: Engineering Mathematics 115
Formula for Final mark: P=0,4K + 0,6E

Home department: Processing Engineering

46825 Engineering Drawings

123 (15) Orthographic drawings (1L, 3P, 3T)

Projection planes; points, lines and planes in space; trace points of lines and trace lines of planes; true lengths and true angles between lines and planes; true angles between planes; new projection planes; interpenetrations; developments; isometric projections. Works drawings: 1st- and 3rd-angle projections; line alphabet; dimensioning; scale; three-view drawing layout; auxiliary views; hidden detail; introduction to sections and cross-hatching. Introduction to 2D CAD and 3D parametric CAD.

Method of assessment: Examination.

Formula for Final mark: P=0,5K + 0,5E

Home department: Mechanical and Mechatronic Engineering

18791 Engineering Economy

212 (8) Engineering economics (2L, 2T)

Introduction to accounting: financing, tax and growth of a business. Income, balance sheet and cash flow statements. Financial ratios.

Method of assessment: Flexible assessment.

Home department: Industrial Engineering

38571 Engineering Mathematics

115 (15) Introductory differential and integral calculus (5L, 2T)

Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics in the NSC or the IEB's school-leaving certificate or must have successfully completed the first year of a suitable extended degree programme.

Mathematical induction and the binomial theorem; functions; limits and continuity; derivatives and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of simple functions.

Method of assessment: Flexible assessment.

Home department: Mathematics

145 (15) Further differential and integral calculus (5L, 2T)

Complex numbers; transcendental functions; integration techniques; improper integrals; conic sections; polar coordinates; partial derivatives; introduction to matrices and determinants.

Method of assessment: Flexible assessment.

Prerequisite module: Engineering Mathematics 115

Home department: Mathematics

214 (15) Differential equations and linear algebra (4L, 2T)

Ordinary differential equations of first order; linear differential equations of higher orders; Laplace transforms and applications. Matrices: linear independence, rank, eigenvalues. Laplace transforms and applications.

Method of assessment: Flexible assessment.

Prerequisite pass module: Engineering Mathematics 115 or 145
Corequisite module: Engineering Mathematics 145

Home department: Mathematics

59498 Engineering Statistics

314 (15) Engineering statistics (3L, 2.5T)

Applied probability theory; applications based on discrete and continuous random variables and their probability distributions, such as the normal, gamma, lognormal, log-Pearson type 3 (LP3),

Gumbel (EV1) distributions; queuing processes; joint distributions; descriptive statistics and graphical presentations; moments, averages, median and standard deviations; moment generating functions; variation coefficient; skewness coefficient; peaking coefficient; sampling theory; point and interval estimation; hypothesis testing; μ2 and K-S testing; simple linear and non-linear regression and correlation analyses; introduction to multiple linear regression; introduction to analysis of variance and experimental design.

Method of assessment: Examination.

Prerequisite pass modules: Engineering Mathematics 115, 145
Formula for Final mark: P=0,4K + 0,6E

Home department: Statistics and Actuarial Science

59501 Enterprise Design

444 (15) Enterprise design (2L, 2T)

Systems engineering, approaches towards enterprise modelling and supply chain management. Concepts like knowledge management, innovation, and different life cycles will be applied through the complete design of an enterprise within formal information, manufacturing and organisational architectures.

Method of assessment: Flexible assessment.

Final-year enrolment

Home department: Industrial Engineering

34576 Entomology

314 (16) Insect pest management (3L, 3P)

Origin and types of insect pests; analysis of an insect problem; methods of control: Biological control, lures, sterilants, juvenile hormones, resistant plants, agrotechnical methods, legislative measures and chemical control; properties and testing of pesticides; pest management. Biology and control of key pests.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

418 (32) Insect diversity (6L, 6P)

Introduction to the Arthropoda and its classes; nomenclature of insects, generalised morphology, physiology and anatomy of insects; growth and metamorphosis of insects; diversity and classification of the Hexapoda (Protura, Collembola, Diplura and Insecta) with emphasis on ecologically and economically important groups.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

454 (16) Applied insect ecology (3L, 3P)

Economically important insects: management for abundance using ecologically sensitive techniques. This includes looking at their biology and population dynamics; application of integrated pest management (IPM) tactics; ecosystem services. Introduction to practical methods to reduce pesticides / human impacts across agricultural landscapes.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

464 (16) Insect conservation ecology (3L, 3P)

Insects as successful organisms; ethics underpinning their conservation; insects and the conservation of ecosystem processes; threats to insects; management for insect diversity conservation; restoration of insect diversity; conventions and social issues in insect diversity conservation.

Method of assessment: Flexible assessment.

Home department: Conservation Ecology and Entomology

58335 Entrepreneurship and Innovation Management

214 (16) Introduction to entrepreneurship (4L)

Introduction to the world of entrepreneurship in South Africa; drivers of entrepreneurship; introduction to the identification of opportunities and development of ideas; the analysis of the entrepreneurial process; feasibility analysis; building a new venture team; assessing a new venture's financial strength and viability; ethics and legal considerations; getting finance; the importance of intellectual property; the importance of growth; growth strategies; buying an existing business.

Home department: Business Management

244 (16) Small business management (4L)

The scope and nature of small business development in South Africa; the important role of SMMEs in the South African economy; management of entrepreneurial opportunities; small business marketing management, purchasing, manufacturing and financial management; alternative routes to entrepreneurship; financing of opportunities in the market environment; management of growth of the small business; legal requirements which small businesses must adhere to; E-commerce and the entrepreneur; compilation of the business plan with the emphasis on the layout; different elements of the plan, balance sheet, income statement and cash flow statement; broad-based black economic empowerment and opportunities for SMMEs.

Prerequisite module: Entrepreneurship and Innovation Management 214

Home department: Business Management

318 (24) Creativity and innovation management (4L)

The importance of technological innovation; sources of innovation: creativity and organisational creativity; translating creativity into innovation; types and patterns of innovation; standards battles

and design dominance; timing of entry; innovation strategies; choosing innovation projects; collaboration strategies; protecting innovation; introduction to the new product development process.

Prerequisite module: Entrepreneurship and Innovation Management 214 or 244

Home department: Business Management

26883 Financial Accounting

188 (24) Financial accounting (4L)

Theoretical principles of International Financial Reporting Standards; accounting systems; preparation and presentation of financial statements for different enterprises and introduction to group statements.

Note: Students who did not pass Accounting in their matric year must attend five lectures in Financial Accounting 188 per week in the first semester.

Home department: School of Accountancy

288 (32) Financial accounting (4L)

Continuation of generally accepted accounting practice.

Preparation and presentation of financial statements for different enterprises.

Prerequisite pass module: Financial Accounting 178 or 188

Home department: School of Accountancy

389 (48) Financial accounting (4L)

Advanced aspects of international financial reporting standards; continuation of group statements and consolidated cash flow statements.

Prerequisite pass module:

- *Financial Accounting 278 or 288 (No third-year Logistic Management modules may be taken in combination with Financial Accounting 389.)*

Home department: School of Accountancy

51047 Financial Management

214 (16) Introduction to financial management (3L, 1P)

Compiling of the statement of financial position, the statement of comprehensive income and the statement of cash flow; the measurement and evaluation of financial performance with reference to profitability, liquidity and solvency analysis; case studies about financial analysis; introduction to the investment decision; the financing decision; sources of finance; the dividend decision; financial planning and the management of working capital with specific reference to cash, trade receivables and inventory control; financial failures; international financial management.

Method of assessment: Flexible assessment.

Corequisite module:

- *Business Management 142 or*
- *Mathematics 114 or*
- *Mathematics (Bio) 124*

Home department: Business Management

244 (16) Corporate financial management (3L, 1P)

The evaluation and interpretation of corporate financial performance by means of detailed ratio analyses; extensive analysis of the statement of cash flows; basic share and bond valuation; discussion of the influence of dividend policy on corporate valuations; the influence of financing policy on a firm's value; evaluation of working capital management by means of the cash conversion cycle.

Method of assessment: Flexible assessment.

Corequisite module: Financial Management 214

Home department: Business Management

314 (12) Financial planning and control (2L)

Standardisation of published financial statements; reclassifying items from financial statements for managerial decision-making; application of financial planning process by means of financial forecasting; calculation of the sustainable growth rate; estimation of an optimal capital structure; the application of free cash flow valuations; the influence of inflation on annual financial statements.

Corequisite modules:

- *Financial Management 214, 244 or*
- *Investment Management 254*

Home department: Business Management

324 (12) Short-term insurance (2L)

Insurance management with special reference to the application of financial and risk management in the South African context; the financial significance of the basic principles of short-term insurance; financial management practices and annual financial statements of short-term insurers; the calculation of the office premium; the significance of the solvency margin for short-term insurers; types of short-term insurance; the financial aspects when obtaining short-term insurance as well as the claim procedure; the financial aspects of reinsurance; the government as an insurer; international aspects of insurance management.

Home department: Business Management

332 (12) Capital investments (2L)

The application of the following financial selection measures on large capital projects: payback period method, method of the equivalent uniform annual cost, net present value method and the internal rate of return method; the impact of inflation when assessing investment projects and the calculation of the cost of capital; priority determination for multiple mutually exclusive projects.

Corequisite modules:

- *Financial Management 214, 244 or*
- *Investment Management 254*

Home department: Business Management

352 (12) Financial management research (2L)

Identification and formulation of financial management problems and/or opportunities; setting financial research objectives; identifying appropriate research designs; conducting secondary and/or primary research; conducting financial data analysis to achieve research objectives.

Corequisite modules:

- *Financial Management 214, 244 or*
- *Investment Management 254*

Home department: Business Management

354 (12) Mergers and acquisitions (2L)

Processes during mergers and acquisitions; financial and strategic aspects; theories; relevance of competition and other legislation; empirical information; LBOs; MBOs; defensive strategies; joint ventures and alliances; unbundling; management guidelines.

Corequisite modules:

- *Financial Management 214, 244 or*
- *Investment Management 254*

Home department: Business Management

13264 Food Chains and Consumers

844 (10) Food chains and consumers

This theme focuses on providing insight into the agri-food business system, related governance systems and strategies and the role of value chains and how the food chain performance can be improved. Economics, management and marketing terminology and principles will be considered. This module also focuses on the factors impacting the human behaviour and the decision-making process regarding food choice.

Home division: Agricultural Economics

21180 Food Factory Machinery

414 (15) Engineering fundamentals of food processing (3L, 1P, 2T)

Engineering approach to problem-solving; thermodynamic properties of water and an ideal gas; conservation of mass, momentum and energy, and entropy; thermodynamic processes in closed and open systems; generation, usage and reticulation of steam; pump and pipe systems; fans and ducts; steady-state conduction, convection and radiation; air-water vapour mixtures and air conditioning processes.

Method of assessment: Flexible assessment.

Home department: Mechanical and Mechatronic Engineering

444 (15) Food processing engineering (3L, 2T)

Behaviour and properties of Newtonian and non-Newtonian fluids; the refrigeration cycle and refrigeration components and equipment; storage of food products by cooling and freezing; heat transfer, including the determination of heat transfer coefficients, boiling and condensation; transient heat transfer during heating, freezing and thawing; mass transfer; thermal processing of foodstuffs; evaporation and concentration; drying theory and drying equipment; mixing; process control.

Method of assessment: Examination.

Prerequisite module: Food Factory Machinery 414
Formula for Final mark: P=0,5K + 0,5E

Home department: Mechanical and Mechatronic Engineering

13267 Food and Nutrition Policies

823 (10) Food and nutrition policies

This theme focuses on providing insight into the contemporary focus areas in food and nutrition policies in South Africa. It makes students familiar with the principles and the diversity of the South African food and nutrition policies.

Home division: Human Nutrition

13259 Food Processing and Preservation

815 (10) Food processing and preservation

This theme focuses on providing insight into the most important unit operations applied in the food industry and the impact of these unit operations on the quality of food products and the most important novel food processing technologies applied in the food industry and on postharvest handling, energy efficiency water use and water treatment.

Home division: Food Science

13256 Food Safety, Hazards & Risks

812 (10) Food safety, hazards & risks

This theme focuses on providing insight into microbiological, chemical and physical aspects of food safety, the lines of defence and responsibilities in prevention and the quality assurance systems and legislation in place to reduce risks in relation to food.

Home division: Food Science

21210 Food Science

144 (16) Introduction to food Science (3L, 3P)

An overview of food science as a discipline and a career choice. Introduction to the principles and practice of food science and technology. Interrelationships between the chemical, physical, biological, nutritional and general quality properties of food products as affected by formulation, processing and packaging. Current issues in food science and ethics in the food industry. Compulsory factory visits.

Home department: Food Science

214 (16) Commercial food processing and preservation I (3L, 3P)

Commercial food processing: introduction to principles and methods; microbial growth and food spoilage and control; technological principles of heating, chilling, freezing, dehydration and concentration; effect of processing on nutritional value, sensory characteristics and microbial growth. Compulsory factory visits.

Home department: Food Science

244 (16) Commercial food processing and preservation II (3L, 3P)

Commercial food processing and preservation: technological principles of chemical control and irradiation and the effect on nutritional value, sensory characteristics and microbial growth; chemical and physical characteristics of milk; technological principles of fermented foods and enzymes; environmental management in the food industry. Compulsory factory visits.

Prerequisite module: Food Science 214

Home department: Food Science

314 (16) Animal food products (3L, 3P)

Meat, fish and poultry structure and composition. Chemical and biochemical reaction processes. Preservation and product spoilage. Processing of emulsion products. Overview of the meat, poultry, and fishing industries with special reference to the main products, production problems, quality factors and legislative and regulatory control. Compulsory factory visits.

Method of assessment: Flexible assessment.

Prerequisite pass module: Food Science 244

Home department: Food Science

324 (16) Nutrition for the food scientist (3L, 3P)

Nutrients and implications for food product development, processing and preservation. Carbohydrates, proteins, fats, vitamins and minerals pertaining to human nutrition. Detrimental food reactions and functional foods. Critical analysis of commercial food products concerning nutritional aspects, legislation and labelling.

Prerequisite pass module: Food Science 244

Home department: Food Science

333 (16) Quality management systems (3L, 3P)

Principles and advantages of quality and food safety management systems; fundamental principles of food safety, hygiene and the impact of food processing on food safety; prerequisite programmes; definitions, twelve stages and seven principles of HACCP; construction of a process flow diagram; identification of food risks, physical, chemical and biological food hazards and critical control points; completion of the HACCP plan and HACCP control chart.

Method of assessment: Flexible assessment. No examination; class mark serves as final mark.

Home department: Food Science

344 (16) Food of plant origin (3L, 3P)

Cereal, milling and baking science. Chemical composition of cereals. Milling processes and determination of chemical and rheological quality. Physical, chemical and functional characteristics of ingredients and principles of processing of wheat products. Manufacturing of baked products, pasta products and breakfast cereals. Manufacturing of products from other cereals such as barley, oats, rice, maize and sorghum. Compulsory factory visits.

Prerequisite pass module: Food Science 244

Home department: Food Science

354 (16) Sensory analysis and process control (3L, 3P)

Introduction to sensory science; consumer sensory analysis, statistical analysis of data; correlation of data obtained through physical measurement and sensory analysis; fundamental principles and implementation of statistical food processing control. Compulsory visits to industry.

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Food Science 244*
- *Biometry 242*

Home department: Food Science

454 (16) Food packaging (3L, 3P)

Introduction to food packaging and packaging materials; the functions of packaging, the respective packaging materials and selection of suitable packaging materials for specific food applications; the possible interaction between food products and packaging materials; packaging innovations such as modified-atmosphere, active and intelligent packaging; compulsory factory visits.

Prerequisite pass modules: Food Science 214, 244

Home department: Food Science

478 (48) Trial design and product development (3L, 6P)

Process of product development, legislation, marketing and labelling of food products. Identification of product niche markets and product criteria, market evaluation and trends. Formulation development. Evaluation of sensory characteristics, cost and nutritional content. Proximal analyses. Food safety. Group and individual product development. Product development

includes market research, product development, evaluation, use of measuring instruments, measuring techniques, data processing, analyses, interpretation and reporting. Problem diagnosis. Project management programme. Compulsory industry training and report.

Method of assessment: No examination, class mark serves as final mark

Prerequisite pass modules: Food Science 324, 333, 344, 354

Home department: Food Science

488 (32) Food chemistry analysis (3L, 3P)

Advanced analysis of foods. Chemistry of proteins, carbohydrates, fats, enzymes, water, food additives and complex food systems.

Prerequisite module:

- *Food Science 344*

Prerequisite pass modules:

- *Biochemistry 244*
- *Chemistry 264*

Home department: Food Science

13266 Food Security Project Analysis

822 (10) Food security project analysis

This theme focuses on providing insight into the planning and implementation of nutrition focused interventions and the monitoring and evaluation of the performance, relevance and effects of these interventions.

Home division: Agricultural Economics

11290 Forest Science

171 (24) Introduction (2L, 2P)

Introduction to forest and wood products science, global forest resources, the forest and wood products industry locally and internationally, plantation systems; silvicultural systems and agroforestry; an introduction to, and terminology of, forestry engineering; forest management, forest economics and forest policy. Composition of wood, decay, preservation, processing, sawmill layout, wood defects, grading, wood products, pulp and paper. One week of practical work in September is to be completed satisfactorily as part of this module.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

212 (8) Natural forest ecosystems (2L, 2P)

The importance of natural forests and their functions, including products for livelihoods and industry and the management of woodlands and savannahs for sustainability; classification of forests based on structure and function; characterisation of natural forests based on structure and

layering; species composition and diversity; succession concepts and theory; silvicultural systems and sustainable management of natural forests; the ecological and socio-economic sustainability methods of natural tropical forests, including criteria and indicators for sustainable forest management; certification and management of non-timber forest products.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

254 (16) Forest mensuration and inventory (3L, 3P)

Measurement of diameter and height, and determination of volume, form and density of trees, stands of timber and forest products. Measurement and estimation of wood properties and product quality in standing trees; quantitative description of forest structure, sampling techniques and their application in forest inventory. Use of remote sensing for forest measurement and assessment.

Method of assessment: Flexible assessment.

Prerequisite module:

- *Mathematics (Bio) 124 or engineering Mathematics 115*

Home department: Forest and Wood Science

334 (16) Forest growth and yield science (3L, 3P)

Theory of tree growth, site evaluation; development of site index equations; growing stock and stand density; developing volume and taper equations; prediction of current yield; tree and forest growth models; prediction of future yield, modelling wood property variation.

One week of practical work in September to be completed satisfactorily as part of this module.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

355 (16) Forest finance, economics, policy and marketing (3L, 3P)

Background to the forestry business environment in South Africa; International forest policy and processes; Forestry finance; financial analysis and feasibility studies of forestry projects; Valuation of land and plantations; forest resource economics; Basic principles of forest product marketing; international forestry marketing; timber and non-timber forestry products; forestry business environment.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

356 (16) Silviculture I (3L, 3P)

Environmental factors that influence tree and stand growth; species-site-market matching; site preparation; plantation establishment and regeneration; vegetation management (including coppice management, pruning and thinning); integrated pest- and disease management.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

364 (16) Timber harvesting (3L, 3P)

Introduction to timber-harvesting; timber-harvesting nomenclature/terminology, equipment and systems; time study, time components, production, productivity and machine and harvesting systems costing; evaluation and system selection; operational and tactical harvest planning; ergonomics and forest work-science, health and safety in forest operations; impact of harvesting on the environment; harvesting of biomass.

One week of practical work (power-saw course) in September of the second year to be completed satisfactorily as part of this module.

Method of assessment: Flexible assessment.

Corequisite module: Forest Science 254

Home department: Forest and Wood Science

414 (16) Forest management and planning (3L, 3P)

Principles of business management; peculiarities in forest production systems; decision-making and decision support in forest management; planning techniques; classification and subdivision of land; annual planning of operations; scheduling of logging operations.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

424 (16) Forest management and planning (3L, 3P)

Principles of business management; peculiarities in forest production systems; decision-making and decision support in forest management; planning techniques; classification and subdivision of land; annual planning of operations; scheduling of logging operations.

Method of assessment: Flexible assessment.

Prerequisite module: Forest Science 254

Home department: Forest and Wood Science

434 (16) Forest roads and transport (3L, 3P)

Introduction to surveying; road construction materials and materials testing and pavement design. Road transport terminology/ nomenclature and applicable legislation; Introduction to access development; forest road network planning and management; influencing factors and road placement techniques. Road construction; road maintenance and drainage; impacts of roads on the environment. Introduction to secondary timber transport. Introduction to logistics.

Method of assessment: Flexible assessment.

Corequisite module: Food Science 364

Home department: Forest and Wood Science

435 (8) Silviculture III (2L, 2P)

Genetic tree improvement of forestry species; principles and practices of tree propagation and nursery management; principles of sexual and asexual tree propagation; population genetics, quantitative traits and continuous variation within forestry species; developing, monitoring and

evaluating nursery and tree improvement experiments.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

442 (0) Experiential work (1P)

Three weeks of practical work during the four years of study. Two-week study tour during the winter recess of the fourth year.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

468 (32) Research or management project (3L, 3P)

A study of a management unit in the forest and wood industry.

The data collected at the management unit are analysed, processed and used for the compilation of a comprehensive management plan on the basis of which the module will be assessed

Or

Independent execution of a theoretical and/or practical investigation in any forest science or wood science related field, and the submission of a comprehensive research report.

Method of assessment: No examination is written; class mark serves as final mark.

Home department: Forest and Wood Science

724 (32) Tree propagation

Plant propagation of forestry species, principles and practices of tree propagation and nursery management; principles of sexual and asexual tree propagation; seed management principles.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

766 (16) Geo-information science for resource managers

The use of GIS in the context of natural resource research and management (agriculture, forestry, conservation); the nature of geographical data, data models, co-ordinate systems and map projections; sources of spatial data in Southern Africa; GPS and Remote Sensing technology use in GIS; GIS processes: data capture, ordering, storage and manipulation; specific emphasis on analysis of spatial patterns for natural resources; visual output for research publication.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

772 (32) Silviculture

Basic forest eco-physiology; silvicultural systems; characteristics of commercially important species and hybrids; site-species-market matching; stand regeneration; site, vegetation and nutrient management; pruning; thinning; risk management and sustainability.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

773 (32) Timber harvesting and transport logistics

Timber-harvesting techniques and nomenclature/ terminology, harvesting methods and systems selection; tactical and operational harvest planning; forest biomass; work/time study; machine and system costing and ergonomics; forest road and timber transport management and logistics.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

774 (32) Forest inventory and yield prediction

Coverage of forest mensuration techniques to determine tree diameter, tree height, stem form and volume, stem weight, biomass and carbon content; quantitative characterisation methods of forest structure; layout and implementation of forest inventories in natural and plantation forests; consideration of spatial aspects as well as aspects of accuracy and efficiency of inventories; theories of tree growth; tree growth and its relation to wood quality; simulation of tree and stand growth with empirical models.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

775 (32) Forest management

Forestry planning and planning systems, forestry business environment and levels of planning; forest finance and economic analysis, forest investments, trade in forest products, forestry markets, valuation of forests, land and services; international resource policies, REDD, carbon trade, renewable energy policies, forest certification.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

776 (32) Tree improvement

Genetic tree improvement of forestry species; principles and practices of tree improvement; management breeding and research programmes; population genetics, quantitative traits and continuous variation within forestry species; selective processes and testing.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

780 (24) Forest science project

Research in the context of the forestry value chain; research design and methods; data capture and analysis; formulation of results and conclusions.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

785 (32) Forestry development

Agroforestry systems; community-based natural resource management; non-timber forest products; integrated land-use systems and green landscapes; land resources and productivity in forest systems, socioeconomic aspects of forest systems, planning for agroforestry diagnosis and design, management and sustainability of forest ecosystems.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

13263 Functional Foods and GMO's

843 (10) Functional foods & GMO's

This theme focuses on providing insight into health promoting foods, the use of genetically modified crops and their relevance to food and nutrition security as well as the concept of nutritional genomics and their impact on preventing nutrition disorders.

Home division: Food Science

13285 Genetics

214 (16) Introductory genetics (3L, 3P)

Part I: Principles of Heredity

Molecular basis of genetic diversity and heredity; the cell cycle; mitosis and meiosis; chromosomes, genes and heredity; Mendelian genetics; linkage and crossing over of genes on a chromosome; linkage analysis and gene mapping; sexual reproduction and sex determining chromosomes; mutations that affect chromosome number and structure and their phenotypic effects.

Part II: Population Genetics

Introduction to population genetics; population diversity and genotype and allele frequencies; Hardy-Weinberg principle; quantitative genetics and heredity.

Prerequisite pass module:

- *Biology 124 or 144 or 154*

Prerequisite module:

- *Mathematics (Bio) 124 or*
- *Mathematics 114 or 144*

Home department: Genetics

244 (16) Introductory molecular biology (3L, 3P)

The biology of the molecule of life. The structure of double-stranded DNA; the processes of replication and recombination of DNA; the deciphering and nature of the genetic code; the processes of transcription and translation; protein structure and function; the regulation of gene expression in prokaryotes and eukaryotes; DNA mutations; DNA repair and transposable elements; the construction and analysis of DNA clones; applications and ethics of recombinant DNA

technology; introduction to bio-informatics.

Prerequisite module: Genetics 214

Home department: Genetics

314 (16) Genomes and genome analysis (3L, 3P)

The module focuses on the organisation, structure and functionality of genomes and covers the following aspects: genome structure, genome organisation, genome function and methods to study genomes. Chromosome structure and organisation are also studied. Other complementary topics include: Introductory Bioinformatics to study genomes; chloroplast and mitochondrial genomes; genome models; genetics of development.

Method of assessment: Flexible assessment.

Prerequisite pass module: Genetics 244

Home department: Genetics

324 (16) Molecular population genetics (3L, 3P)

The genetic structure and dynamics of populations; frequencies of genes and genotypes; genetic polymorphisms; random mating and the Hardy-Weinberg principle; factors that determine genetic change and genetic equilibrium: mutation, migration, selection and population size; linkage disequilibrium, heterozygosity in subdivided populations; genetic relationships between populations; implications for genetic identification (DNA typing).

Method of assessment: Flexible assessment.

Prerequisite pass module: Genetics 214
Corequisite module: Genetics 244

Home department: Genetics

344 (16) Advanced topics in molecular genetics (3L, 3P)

Various advanced topics are addressed in this module and include: DNA markers and applications in mapping of genes involved with genetic diseases; diagnostic applications in human genetics; marker-assisted selection in plant and animal breeding; DNA fingerprinting and forensic science; applications from genome projects; personalised medicine and pharmacogenetics; epigenomics; genetic modification; cancer and apoptosis; gene therapy; genetics of behavioural traits.

Method of assessment: Flexible assessment.

Prerequisite pass module: Genetics 244

Home department: Genetics

354 (16) Quantitative genetics (3L, 3P)

Quantitative traits and continuous variation; components of phenotypic and genetic variances; resemblance between relatives; estimation of heritability and breeding value; selection methods and genetic improvement; correlated traits; multiple traits selection; principles of marker-based selection; mapping and characterising of quantitative trait loci.

Method of assessment: Flexible assessment

Prerequisite modules:

- *Genetics 324*
- *Biometry 211 or 212*

Home department: Genetics

414 (16) Plant breeding techniques (3L, 3P)

Plant breeding objectives; reproduction in plants; cell and tissue culture; breeding strategies for self- and cross-pollinating crops; the utilisation of hybrid vigour; mutation breeding; breeding for insect and disease resistance; variations in chromosome number and its exploitation in breeding programmes; plant breeders' rights.

Method of assessment: Flexible assessment.

Prerequisite pass module: Genetics 344

Home department: Genetics

444 (16) Quantitative traits and selection methods (3L, 3P)

Components of phenotypic and genetic variance in self-pollinating crops, cross-populations and cross-pollinating crops; the role of linkage and recombination; experimental design and data analysis; methods of selection and predictions of genetic progress; index selection; genotype-environment interaction; gene mapping of quantitative traits by means of marker genes; marker-assisted selection.

Method of assessment: Flexible assessment.

Prerequisite module: Genetics 414

Home department: Genetics

64165 Geo Environmental Science

124 (16) Introduction to human-environmental systems (3L, 3P)

Nature of human geography; Demography of world population; Food resources; Urbanisation: models of urban structure, functional areas in cities, cities in developing countries; Politico-geographical organisation: nations and states in conflict, regions in the news; Environmental systems on a global scale: fluvial, arid, karst, coastal and glacial environments; Ecosystems and humans; Utilisation of environmental resources: global occurrence, use and depletion of non-renewable energy, water and soil resources; Practical mapping and graphics.

Home department: Geography and Environmental Studies

154 (16) Introduction to earth systems science (3L, 3P)

Introduction to Earth Systems Science; Internal earth processes; Mineral- and rock-forming processes; Origin of magma and igneous rocks; External structure of the earth; Formation of continents; Plate tectonics; Sedimentary rocks and the geological record; Geological time scale; Metamorphic rocks and mountain building; Geology of South Africa; Energy and mineral resources; Humans and tectonics: earthquakes and volcanoes; The hydrosphere; Surface-water

processes; Groundwater processes; Theory of the origin and evolution of life.

Home department: Earth Sciences

12923 Geographical Information Technology

214 (16) Spatial data management (3L, 3P)

Map projections and coordinate systems; spatial data modelling (e.g. vector, raster, object-orientated); topology and topological dimensions; topological-dimension conversions; geodatabases; data model and format conversions; data generalisation and aggregation.

Method of assessment: Flexible assessment.

Prerequisite modules: Geography and Environmental Studies 214

Home department: Geography and Environmental Studies

312 (16) Spatial analysis (3L, 3P)

Query operations and query languages; Geometric measures; Spatial analytical operations; Surface analysis; Geostatistics; Network analysis; Analysis design; Fuzzy sets.

Method of assessment: Flexible assessment.

Prerequisite modules:

- *Geography and Environmental Studies 214*
- *Geographical Information Technology 241*

Home department: Geography and Environmental Studies

56502 Geography and Environmental Studies

214 (16) Geographical information systems (3L, 3P)

Introductory overview and comprehension of GIS in the context of geo-information science; The nature of geographical data, data models, coordinate systems and map projections; GIS processes: data capturing, ordering and storage, manipulation and analysis; Map design and cartographic visualisation with a GIS; GIS applications.

Prerequisite module:

- *Geo Environmental Science 124 (Not applicable to BScForc (NHB) students)*

Corequisite module:

- *Mathematics 114 or*
- *Mathematics (Bio) 124*

Home department: Geography and Environmental Studies

324 (16) Introduction to geographical information systems (3L, 3P)

Definition and technical overview of GIS; principles of spatial data structures; South African co-ordinate and projection systems; input, capture, manipulation, analysis and presentation of geo-data; integration and exchange of South African national data sets: censuses, topographic data, research; practical GIS application: South African case studies decision support in socio-economic

and physical environmental problems.

Method of assessment: Flexible assessment.

Home department: Geography and Environmental Studies

334 (16) Spatial modelling (3L, 3P)

Models in science; Spatial models: types, construction, design and development; Cartographic modelling: terminology, methodology, in- and outputs, functions.

Method of assessment: Flexible assessment.

Prerequisite module: Geography and Environmental Studies 214

Home department: Geography and Environmental Studies

39632 Horticultural Science

222 (8) Fruit production (1.5L, 1.5P)

Overview of the fruit industry with emphasis on the technology of fruit production, including vegetative reproduction, rootstocks, delayed foliation, cross pollination, fruit thinning, ripeness maturity standards, principles of pruning and training.

Method of assessment: No examination; class mark serves as Final mark.

Prerequisite module: Crop Production 152 or Biology 154

Home department: Horticultural Science

314 (16) Deciduous fruit production (3L, 3P)

Biology and technology of deciduous fruit production (pome fruit, stone fruit and table grapes). Bearing habits, rootstocks, nursery tree quality, vegetative development, shoot and root growth, growth reactions to bending and pruning of shoots. Eco-, para- and endo-dormancy. Carbohydrate and nitrogen reserves. Reproductive development, flower formation, fruit set, regulation of yield, fruit growth, fruit colour development, fruit ripening.

Corequisite module: Crop Production 214

Home department: Horticultural Science

342 (8) Citrus production (1.5L, 1.5P)

Biology and technology of citrus production. Rootstocks, nursery tree quality, vegetative development, shoot and root growth. Reproductive development, fruit growth, external and internal fruit quality.

Home department: Horticultural Science

352 (8) Ornamental, foliage and aromatic plant production systems (1.5L, 1.5P)

Biology and technology of the production of cut flowers, foliage and herbs/aromatic plants, including orchard-based fynbos production. Production prerequisites for selected flower types, fynbos, culinary herbs and lavender as an essential oil producing plant. Control of flower initiation, scheduling of flowering time and harvesting, colour and flavour development and other quality

characteristics.

Home department: Horticultural Science

434 (16) Applied plant physiology and tree architecture (3L, 3P)

Lectures: Underlying physiology of growth, development and production practices of horticultural crops. Correlative phenomena and the role of plant hormones supported by an overview of relevant cell, tissue and organ anatomy as well as basic genetic principles. Overview of environmental perception and acclimation/adaptation. Dormancy as morphogenetic and survival mechanism. Physiology of growth cessation, hardening, induction and progression of dormancy, rest breaking and branching. Tree architecture and training systems, principles and techniques of tree manipulation and the role of rootstocks. Integration of the above with knowledge on production practices gained in preceding modules.

Practicals: Inter alia lectures by industry specialists on relevant pre-harvest topics as well as visits to fruit production areas to illustrate and support the module content.

Prerequisite module: Horticultural Science 314

Home department: Horticultural Science

444 (16) Postharvest physiology and technology (3L, 3P)

Postharvest physiology of fresh plant products: structure and composition of the product, role of respiration and ethylene metabolism, fruit ripening and senescence, physiological defects or disorders, food safety.

Postharvest technology: water relations and psychrometrics, quality and maturity parameters, harvest and packing, cooling and storage technology such as controlled atmosphere, transport of fresh plant products.

Plant products that are discussed to illustrate principles include deciduous fruit (pome, stone and table grapes) as well as some tropical and subtropical crops, cut flowers and vegetables.

Practicals: A research project as well as a series of lectures by industry specialists on topics such as postharvest problems, profitability of certain deciduous fruit types, market trends, and alternative crops like fynbos. Visits to the Cape Town market in Epping, pack houses and cold stores, cut facilities and the Cape Town port for handling of export products.

Prerequisite module: Biochemistry 244

Home department: Horticultural Science

714 (16) Deciduous fruit production (3L, 3P)

Seasonal vegetative and reproductive developmental biology of deciduous fruit (pome and stone fruit): shoot, flower formation, fruit set, fruit growth and ripening of fruit. Production technologies to ensure a sustainable production of high quality fruit: bearing habits, rootstocks, bending and pruning of shoots, mechanical and chemical regulation of crop load. Endogenous tree dynamics: Eco-, para- and endo-dormancy, carbohydrate and nitrogen reserves.

Home department: Horticultural Science

742 (8) Citrus physiology and technology (1.5L, 1.5P)

The physiology, biology and technology aspects involved with the aim of optimizing citrus production. Manipulations of the citrus physiology with choices of genetic material and plant growth regulators to obtain higher yield and improved fruit quality.

Home department: Horticultural Science

752 (8) Ornamental and foliage plant production systems (1.5L, 1.5P)

Biology and technology of the production of cut flowers and foliage plants, such as roses, chrysanthemums, tulips (geophytes), also including orchard-based fynbos production and geophytes. Production prerequisites for selected flower types and fynbos. Control of flower initiation, scheduling of flowering time and harvesting, colour development and implementation of optimum postharvest practices.

Home department: Horticultural Science

13257 Human Economic Development

813 (10) Human economic development

This theme focuses on providing insight into the concept, theories and measures of economic development. It serves to further examine the extreme contrast not only between developed and developing countries, but also the different livelihood situations between population groups/families within the countries.

Home division: Agricultural Economics

44792 Industrial Ergonomics

414 (15) Industrial ergonomics (3L, 1.5T)

Operation analysis, work standards; reduction of setup times, training practices, remuneration, anthropometry, workstation and tool design, man/machine interfaces, work physiology and biomechanics, the work environment, cognitive work, shift work, aspects of occupational health and safety.

Method of assessment: Flexible assessment.

Home department: Industrial Engineering

53937 Industrial Management

354 (15) Industrial management (3L, 2T)

Industry dynamics and the value chain, BPR (Business Process Re-engineering); SCM (Supply Chain Management) and logistics management, information technology and e-commerce within the framework of a formal ERP (Enterprise Resource Planning) system.

Prerequisite module: Production Management 314

Home department: Industrial Engineering

47422 Industrial Programming

244 (15) Industrial programming (2L, 3T)

Use of spreadsheets: data manipulation, numerical methods, graphs, basic financial calculations, planning and analysis of scenarios and optimising. Visual Basic for Applications for spreadsheet use. Basic computer communication. Theory and application of forecasting with emphasis on spreadsheet applications.

Method of assessment: Flexible assessment.

Prerequisite module: Engineering Mathematicsc145

Home department: Industrial Engineering

44776 Industrial Psychology (Special)

354 (12) Industrial psychology (Special) (2L, 1S)

Human resource management: human resource planning, recruitment, selection, induction, training and development, performance appraisal, compensation management, labour turnover, absenteeism, health and safety. Labour relations: field of study, organised labour, role of employers; labour legislation. Organisational behaviour: introduction and orientation, organisational design, the individual, groups and teamwork, motivation, leadership, organisational effectiveness.

Home department: Industrial Psychology

13334 Intensive Crop Production Systems

771 (18) Intensive crop production systems (3L, 3P)

Morphology and physiology of the most important vegetable crops for intensive production systems, soilless production techniques (hydroponics), effect of different growth mediums and climate control systems and optimum concentrations of nutrient solutions for different crops.

Method of assessment: Flexible assessment

Home department: Agronomy

13506 Introduction to Animal Nutrition

244 (16) Introduction to animal nutrition (3L, 3P)

Digestive systems and digestion in various domestic and wild animals. Raw material identification and application in basic feed formulation. Energy, protein, vitamin and mineral nutrition of domestic animals.

Corequisite module: Animal Anatomy and Physiology 214

Home department: Animal Sciences

13261 Introduction to Epidemiology

841 (10) Introduction to epidemiology

The content module will cover basic principles of nutritional epidemiology and types of nutritional surveys, the association between poverty and health and the social determinants of health.

Home division: Human Nutrition

13341 Introduction to Systems Thinking

870 (6) Introduction to systems thinking

Analysis of an existing farm and its environment by using a problem tree. The concept of a transect walk will be introduced. The issue of food security is studied as an overarching issue.

In the lectures, systems thinking and the associated terminology and concepts are introduced including system boundaries, system components, system structure, internal and external factors.

Learning outcomes

At the end of the module the student is able to:

- distinguish the main components of farming systems and rural livelihoods
- appreciate the complexity of the farming systems and their context
- explain the basic concepts of systems analysis
- describe the importance of the different disciplines for the multiple dimensions of sustainable agriculture with food security as an overarching issue
- use a problem tree to assess sustainability of a farming system

Home department: Animal Sciences

55344 Investment Management

254 (16) Introduction to investment theory (3L, 1P)

Portfolio theory and portfolio management; the relationship between risk and return; the efficient market hypothesis; valuation and risk of fixed income securities; evaluation of share investments; properties of derivative instruments; derivative strategies; valuation of options and futures; measurement and evaluation of portfolio returns.

Prerequisite modules:

- *Business Management 142*
- *Statistical Methods 176 or*
- *Statistics 186 or*
- *Probability Theory and Statistics 114 or 144*

Home department: Business Management

314 (12) Equity analysis and portfolio management (1.5L, 0.5P)

Theory of valuation; valuation models and techniques; practical implementation of valuation models; valuation variables; stock market analysis; industry analysis; company analysis and stock selection; technical analysis; equity portfolio management strategies.

Prerequisite module:

- *Investment management 254*

Prerequisite pass module:

- *Statistical Methods 176 with 65% or*
- *Statistics186 or*
- *Probability Theory and Statistics 114 or 144*

Home department: Business Management

324 (12) Fixed income securities (1.5L, 0.5P)

Trading of fixed income securities; price sensitivity; fixed income securities in structured portfolios; indexing; liability funding; credit risk in corporate bonds; credit risk in international sovereign bonds; embedded options in bonds; securitisation; mortgage pre-payment; active portfolio management; economic analysis and management of bond portfolios.

Prerequisite module:

- *Investment management 254*

Prerequisite pass module:

- *Statistical Methods 176 with 65% or*
- *Statistics186 or*
- *Probability Theory and Statistics 114 or 144*

Home department: Business Management

344 (12) Derived financial instruments and alternative investments (1.5L, 0.5P)

Exposure to and handling of financial risk; the risk management process; the hedging concept; the functions of the treasury and the management of negotiable value; characteristics of derived financial instruments; strategies for the use of derived financial instruments; valuation of options and futures contracts; basic arbitrage strategies with options and futures contracts; swaps and forward rate agreements; alternative investments.

Prerequisite module:

- *Investment management 254*

Prerequisite pass module:

- *Statistical Methods 176 with 65% or*
- *Statistics186 or*
- *Probability Theory and Statistics 114 or 144*

Home department: Business Management

348 (12) Real estate investment and financing (4L)

Introduction to the nature and scope of real estate; real estate markets and trends; legal aspects; financial and investment analysis in respect of the acquisition, ownership and sale of real estate;

the role and impact of capital gains tax; market valuation approaches; types of real estate investment and financing instruments in the real estate market.

Corequisite module:

- *Financial Management 214 or*
- *Financial Accounting 178 or 188*

Prerequisite pass module:

- *Statistical Methods 176 with 65% or*
- *Statistics186 or*
- *Probability Theory and Statistics 114 or 144*

Home department: Business Management

50407 Logistics Management

144 (12) Introduction to transport and logistics systems (3L, 1P)

Introduction to the unique purpose of the transport system; the components of the system; the economic significance of the transport system; the organisation and regulation of transport; concepts of demand and supply; and transport from a management perspective.

The scope of product supply chains; aspects of utility and value creation; aspects of materials management, including resource and inventory acquisition; aspects of production and operations management; aspects of physical distribution management; conforming to customer requirements with respect to product supply and delivery.

Prerequisite module: business Management 113

Home department: Logistics

214 (16) Logistics management (3L, 1P)

Introduction to Logistics Management: the role of logistics in the firm, the elements of logistics, integrated logistics management, channels of distribution, client/customer service, strategic aspects of logistics management, organisation for effective logistics, international logistics, and new trends.

Prerequisite module:

- *Business Management 113 (Not applicable to BScAgric (Agricultural Economy and Food Science) student.)*

Home department: Logistics

244 (16) Logistics management (3L, 1P)

Business logistics: private (own) logistics, the outsourcing decision, professional logistics, transport management and operations, arrangement of the supply chain.

Prerequisite pass modules:

- *Business Management 113*
- *Logistics Management 214*

Home department: Logistics

314 (12) Logistics management (2L)

Functional excellence: Major logistics activities related to transport, storage, packaging and handling covered in more detail than introduced in Logistics Management 214 and 244. Topics to cover: sourcing strategies and plans, total cost analysis, supplier selection and development, supplier collaboration, relationship management, negotiation and contracting, warehousing and materials handling, materials management, master production scheduling, product conversion, production and inventory control, process control & quality management, delivery management, warehousing layout and flow optimization, inventory control, international logistics (global), reverse logistics and its impact, waste management, maritime management, customer service, relationship management.

Prerequisite pass modules:

- *Logistics management 214, 244*
- *Statistical Methods 176 or*
- *Statistics186 or*
- *Probability Theory and Statistics 114 or 144 (No third-year Logistic Management modules may be taken in combination with Financial Accounting 389.)*

Prerequisite modules:

- *Economics 114, 144*

Home department: Logistics

324 (12) Logistics management (2L)

Integrative excellence: Internal/functional integration as well as external integration with supply chain partners has become a business imperative. Business process integration is a critical enabler. Topics to cover: logistics planning and control, inventory planning and management, coordination of supply chains. Monitoring and control of logistics performance, measurement and standards, efficiency and effectiveness and financial performance indicators, client/customer requirements versus achievable logistics performance, review of logistics goals and objectives, risk management, sustainable logistics, logistics and the environment, closed-loop supply chains.

Prerequisite pass modules:

- *Logistics management 214, 244*
- *Statistical Methods 176 or*
- *Statistics186 or*
- *Probability Theory and Statistics 114 or 144 (No third-year Logistic Management modules may be taken in combination with Financial Accounting 389.)*

Prerequisite modules:

- *Economics 114, 144*

Home department: Logistics

344 (12) Logistics management (2L, 1P)

Logistics analysis: For both functional excellence and integrative excellence, a variety of analytical techniques and enabling technology can be employed to support decisions on the short, medium and longer timeframes. Analytical techniques (descriptive and normative) and enabling technology

(transactional vs. analytical information technology) form an integral part of the support decision makers require.

Logistics Management 314, 324 (No third-year Logistics Management modules may be taken in combination with Financial Accounting 389)

Home department: Logistics

13262 Macro- & Micronutrients & Health

842 (10) Macro- & micronutrients & health

This theme focuses on providing insight into the problem of malnutrition, and evidence-based approaches to address the problem.

Home division: Human Nutrition

23795 Marketing Management

214 (16) Marketing management (3L, 1P)

Modern marketing dynamics in enterprises and the community; marketing and the value creation process; customer satisfaction through quality and service; strategic marketing planning; analysis of the marketing environment; marketing information and research; analysis of consumer markets and other types of markets; measurement and forecasting of demand; market segmentation and target market selection; product decisions; price decisions; channel decisions and place strategy; communication decisions; direct marketing and sales promotion decisions.

Corequisite modules:

- *Financial Management 214 or*
- *Financial Accounting 278 or 288 or*
- *Biometry 212*
- *Mathematics (Bio) 124 and*
- *Statistical Methods 176 (Only for BScAgric students)*

Home department: Business Management

244 (16) Advertising and sales promotion (3L, 1P)

Marketing communication, advertising and the marketing process; the consumer audience; marketing communication research; functioning of marketing communication; marketing communication planning and strategy in traditional and digital environments; media; media planning and buying; traditional, new and digital media; planning and execution of creative advertising aspects; integration of the elements of marketing communication.

Prerequisite module: Marketing Management 214

Home department: Business Management

314 (12) Retail management (2L)

Retail strategy and the retailing mix; location decisions; merchandise decisions; price decisions; communication decisions; consumer services and information; technology and systems; franchise

agreements.

Prerequisite module: Marketing Management 214

Home department: Business Management

324 (12) Services management (2L)

Unique characteristics of services; nature and process of service delivery; differences between product and service evaluations; development, communication and delivery of services; service quality and its measurement; the role of service providers and the environment of service delivery; implementation of service-marketing strategies.

Prerequisite module: Marketing Management 214

Home department: Business Management

344 (12) Marketing research (2L)

Defining of the marketing problem; research design; exploratory research design for secondary data and qualitative research; surveys and observations as part of descriptive research; measurement of perceptions; questionnaire design; sampling; fieldwork and data preparation; formulation of hypotheses and basic statistical tests.

Prerequisite modules:

- *Marketing Management 214, 244*
- *Probability Theory and Statistics 144 or*
- *Statistical Methods 176 or*
- *Statistics 186*

Home department: Business Management

354 (12) Strategic marketing (2L)

Function and application of marketing in different organisations and conditions; enterprise and marketing strategy; competitive marketing strategies; international marketing strategies; the marketing system; consumer markets and buying behaviour; institutional markets and buying behaviour; marketing planning processes; marketing controls.

Prerequisite modules: Marketing Management 214, 244

Home department: Business Management

21539 Mathematics

114 (16) Calculus (5L, 2T)

Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics in the NSC or the IEB's school-leaving certificate.

Induction and the binomial theorem. Functions, limits and continuity; derivatives and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of elementary functions.

Home department: Mathematics

144 (16) Calculus and linear algebra (5L, 2T)

Complex numbers; transcendental functions; techniques of integration; improper integrals; conic sections; polar co-ordinates; partial derivatives; introduction to matrices and determinants.

Prerequisite module: Mathematics 114

Home department: Mathematics

21547 Mathematics (Bio)

124 (16) Mathematics for the biological sciences (4L, 2T)

Functions and their inverses: polynomial functions, rational functions, power functions, exponential functions, trigonometric functions. Solution of trigonometric equations. Composition of functions. Limits. Definition of the derivative of a function. Continuity. Rules of differentiation, certain formulae. Higher order derivatives. Implicit differentiation. Applications of differentiation: processes of growth and decay, graph sketching, optimisation problems. Indefinite integrals. Techniques of integration: substitution, integration by parts. The definite integral as the limit of a sum. The Fundamental Theorem of Calculus. Definite integrals as areas. Solution and use of simple differential equations.

Home department: Mathematics

16284 Microbiology

214 (16) Introductory microbiology (3L, 3P)

History, microscopy, classification, structure and function, nutritional requirements and growth factors, nutrient uptake, energy generation, culture media, growth curves, yields and effect of nutrient limitation, continuous culture, physical and chemical control, environmental factors, antimicrobial therapy.

Prerequisite pass modules:

- *Biology 124 or 144*
- *Chemistry 124 and 144*

Home department: Microbiology

244 (16) Microbial diversity (3L, 3P)

Prokaryotes, kingdoms of life and modern classification, Archaeal cell structure and function, Gram-positive bacteria, Gram-negative bacteria, actinomycetes, cyanobacteria. Fungal divisions, cell structure and function. Structure of viruses and virus taxonomy, bacteriophages, human viruses. Microbiology of air, water and soil environments, different metabolic types of micro-organisms, the role of micro-organisms in biogeochemical cycles and energy flow in the food web, the dependence of animals and plants on micro-organisms, including symbiotic associations, microbe-plant associations and microbe-insect associations, interactions between micro-organisms.

Prerequisite pass modules:

- *Biology 124 or 144*
- *Chemistry 124 and 144*

Home department: Microbiology

43850 Nematology

344 (16) Plant nematology (3L, 3P)

An introduction to Nematology, which includes plant and insect parasitic nematodes. Morphological characteristics of diagnostic value, reproduction and biology in general. Agricultural control of plant parasitic nematodes and the control of insects by using insect parasitic nematodes. Identification and biology of specific plant parasitic and insect nematode genera of economic importance. Extraction techniques and identification of life specimens by means of light microscopy.

Home department: Conservation Ecology and Entomology

33103 Oenology

142 (8) Introduction to oenology (1.5L, 1.5P)

Basic grape morphology and production directions. Wine grape cultivars. An introduction to the composition of grapes, must and wine, as well as micro-organisms in winemaking. The fundamentals of alcoholic fermentation, winery equipment and production methods. An introduction to wine styles and wine evaluation.

Corequisite modules:

- *Crop Production 152 and*
- *Chemistry 124*

Home department: Viticulture and Oenology

214 (16) The wine trade (3L, 3P)

The global wine trade; trends, countries and forecasts, production and consumption.

The South African wine trade; industry structure in South Africa; legal issues and licensing.

Understanding South African consumer preferences, brand loyalty, product developments.

Devising and using component recognition tests, discrimination tests, paired comparisons, triangular tests.

Prerequisite modules:

- *Chemistry 124*
- *Crop Production 152*
- *Oenology 142*

Home department: Viticulture and Oenology

244 (16) Wines of the world, South African wines and brandies and regulations (3L, 3P)

Wines of the world. Evaluation of wines. The South African wine industry: Wine of Origin system, legislation and regulations. Industrial health and safety in a winemaking context. Introduction to brandy and sparkling-wine production basics.

Prerequisite modules:

- *Crop Production 152*
- *Oenology 142, 214*

Home department: Viticulture and Oenology

314 (16) Pre-fermentation processing of grapes and must (3L, 3P)

Harvesting and handling of grapes, must and skins and determining of harvest readiness. Composition of grapes, must and wine, as well as physical and chemical analyses thereof, must adjustments and appropriate legislation, enzymes. Cellar technology used in pre-fermentation processing, including methods for temperature control and colour extraction. Brandy and sparkling base wine production.

Prerequisite modules:

- *Oenology 244*
- *Chemistry 124, 144*

Home department: Viticulture and Oenology

342 (8) Postfermentation operations (1.5L, 1.5P)

Fining and clarification of wine: fining trials, filtration of wine. Bottling principles. Wine faults. Blending of wines and evaluation.

Prerequisite module: Oenology 314

Home department: Viticulture and Oenology

344 (16) Applied wine microbiology (3L, 3P)

Applied aspects of yeasts, moulds and bacteria during vinification; yeast physiology; yeast and bacterial metabolic pathways; malolactic fermentation; production of aroma and flavour compounds; microbial spoilage of wines.

Corequisite modules:

- *Oenology314*
- *Biochemistry 214, 244*

Home department: Viticulture and Oenology

444 (16) Applied oenology (3L, 3P)

Chromatographic and spectral techniques for wine analysis, including HPLC, GC, UV/visible spectrophotometry, infrared spectrophotometric analyses (FOSS); advanced sensory and statistical analyses of datasets, as well as interpretation of research results; exposure to scientific investigations; brandy distillation and maturation; development of critical and evaluative scientific thinking through group work, designing and carrying out experiments, presentations, writing

projects; fault recognition and analysis by sensory and chemical means.

Prerequisite modules: Oenology 314, 344

Home department: Viticulture and Oenology

454 (16) Wine maturation and quality systems (3L, 3P)

Wood chemistry, phenols in grapes and wine, aging reactions, oxidation and reduction reactions, quality control systems, cooling systems, environmental management systems, product development, protein and cold stabilisation, stability tests in wine; brandy maturation.

Prerequisite modules: Oenology 314, 344

Home department: Viticulture and Oenology

478 (32) Oenology internship (3S)

Identification and solving of a problem in the cellar or design of a product or system. Learning activities include involvement in all commercial cellar activities during the harvest season, conducting of experiments in the cellar, data gathering and processing, complete project reporting.

Method of assessment: Flexible assessment.

Prerequisite pass module: Oenology 314
Prerequisite modules: Oenology 342, 344

Home department: Viticulture and Oenology

59528 Operations Research (Eng)

345 (15) Operations research (Deterministic Models) (3L, 3T)

The systems approach to problem-solving; problems leading to linear programming, network, integer and non-linear programming models; algorithms for solving such models; tasks, including exercises with computer packages.

Method of assessment: Flexible assessment.

Prerequisite module: Engineering Mathematics 214

Home department: Industrial Engineering

415 (15) Operations research (Stochastic Models) (3L, 3T)

Analysis of problems leading to deterministic and stochastic dynamic programming models; Markov chains and waiting-line models; techniques for solving such models; decisions under uncertainty; Bayes' theorem; multi-criteria decision-making.

Method of assessment: Flexible assessment.

Home department: Industrial Engineering

13005 Physics (Bio)

134 (16) Introductory physics for biological sciences A (3L, 3P)

Selected topics, relevant to the biological sciences, from introductory mechanics, hydro-statics and

optics.

Method of assessment: Flexible assessment.

Corequisite modules:

- *Mathematics (Bio) 124 or*
- *Mathematics 114*

Home department: Physics

154 (16) Introductory physics for biological sciences B (3L, 3P)

Selected topics, relevant to the biological sciences, from introductory electricity, magnetism, thermodynamics, gas laws, atomic physics, radioactivity, oscillations and waves.

Method of assessment: Flexible assessment.

Prerequisite module: Physics (Bio) 134

Home department: Physics

13328 Physiological and Ecological Principles of Natural Pasture Management

712 (18) Physiological and ecological principles of natural pasture management (3L, 3P)

Development and ecology of South African veld types; morphology and physiology of pasture plants; physiology of defoliation and plant response to it; physiological principles of veld management; determination of veld condition; veld burning; bush encroachment; veld management on game farms; causes and control of erosion.

Method of assessment: Flexible assessment.

Home department: Agronomy

13080 Physiology

214 (16) Physiological principles and systems (3L, 3P)

Textbook-based overview of the following physiological principles and systems: Homeostasis and body fluids, cell membranes, general physiological control systems, nervous, muscle, respiratory, hormonal, digestive (basic single stomach) systems, and also typical diseases applicable to these systems.

Prerequisite pass modules:

- *Biology 124, 154 or*
- *Biology (OCC) 111 or*
- *Physiology 114, 144*

Corequisite module:

- *Biochemistry 214*

Home department: Physiological Sciences

244 (16) Systems in physiology (3L, 3P)

Textbook-based overview of the following physiological systems of the body: Special sense organs, acid/base balance, blood, cardiovascular, renal and reproductive systems.

Prerequisite module: Physiology 214

Corequisite module: Biochemistry 244

Home department: Physiological Sciences

13537 Plant Genetics and Crop Improvement

722 (8) Plant genetics and crop improvement (3L, 3P)

Plant breeding objectives; reproduction in plants; cell and tissue culture; breeding strategies for self- and cross-pollinating crops; the utilisation of hybrid vigour; mutation breeding; breeding for insect and disease resistance; variations in chromosome number and its exploitation in breeding programmes; plant breeders' rights.

Method of assessment: Flexible assessment.

Prerequisite module: Genetics 324 or Genetics 354

Home department: Genetics

32891 Plant Pathology

314 (16) Plant disease dynamics (3L, 3P)

Components of plant diseases, such as the plant pathogens that cause them, the host factors that influence their development, and the environmental conditions that favour them. Diseases of national and international importance and the damage they have caused to food production in the world. The dynamics of pathogens associated with seed and nursery plants, as well as those causing soil-borne, foliar and fruit diseases before harvest, and decay and damage after harvest.

Home department: Plant Pathology

344 (16) Plant disease management (3L, 3P)

The underlying principles and methods used for plant disease control from pre-planting to postharvest. This includes the role of plant quarantine, disease certification and cultivation practices on disease development, and on the epidemiological considerations for plant disease forecasting and disease assessment. Emphasis is placed on plant disease resistance, and chemical and biological control, either as primary control strategies or as components of an integrated disease control programme, to ensure efficient and sustainable protection against a diverse range of pathogens.

Prerequisite pass module: Plant Pathology 314

Home department: Plant Pathology

414 (16) Taxonomy and biology of plant pathogens (3L, 3P)

Morphology, taxonomy and biology of plant pathogenic fungi, oomycetes, bacteria, mollicutes

(spiroplasmas and phytoplasmas) and viruses. Practicals include microscopic cultural morphology and physiological and biochemical methods used to identify the major groups of plant pathogenic fungi, oomycetes and bacteria.

Prerequisite pass modules: Plant Pathology 314, 344

Home department: Plant Pathology

444 (16) Plant-microbe interactions (3L, 3P)

The dynamic interaction between plants and micro-organisms, both detrimental and beneficial. Aspects related to fungal diversity, genetics and genomics, and the role of microbial pathogenicity factors and secondary metabolites in plant disease development. The plant's defence mechanisms and ability to recognise and respond to pathogen attack. Enhancement of disease resistance in plants against pathogens, and the development of novel disease control strategies. Methods used for gene discovery and functional gene analyses in plants and pathogens, and concepts such as transformation and gene manipulation.

Prerequisite pass modules: Plant Pathology 314, 344

Home department: Plant Pathology

478 (32) Advanced plant pathology (3L, 3P)

Field trips to study diseases, assess field situations and collect plant pathogens that will be identified during laboratory sessions. Formulation of disease management strategies. Relevant and current experimental approaches and methods of analysis used in plant pathology. Topical issues in plant pathology related to food security and environmental challenges. Exercises in project planning and execution conducted under supervision.

Method of assessment: Flexible assessment.

Prerequisite pass modules: Plant Pathology 314, 344

Home department: Plant Pathology

771 (16) Advanced plant disease dynamics

Components of plant diseases, such as the plant pathogens that cause them, the host factors that influence their development and the environmental conditions that favour them. Diseases of national and international importance and the damage they cause to food production in the world. The dynamics of pathogens associated with seed and nursery plants, as well as those causing soil-borne, foliar and fruit diseases before harvest, and decay and damage after harvest.

Home department: Plant Pathology

772 (16) Advanced disease management

The importance of epidemiology in control and management of plant diseases through the integration of cultivation practices, physical, biological and chemical strategies (seed technology, minimum manipulation, plant quarantine, sanitation practices and resistance). The mode of action of fungicides and the management of fungicide resistance in fungal populations. Biological control. Development and production of biocontrol systems for soil-borne, plant and fruit

pathogens.

Home department: Plant Pathology

773 (10) Research methodology

Relevant and current experimental approaches and methods of analysis used in plant pathology. Experimental design and statistical analysis, molecular methods, phylogenetic analysis, paper reviews.

Method of assessment: Flexible assessment.

Home department: Plant Pathology

774 (60) Project management and presentation

Course work will include lessons in project identification, planning and execution, writing of research proposals and reports, presentation of research findings, scientific collaboration and ethics in science. Exercises in project planning and execution will be conducted under supervision. A literature study and scientific findings will be presented as scientific manuscripts and as an oral presentation.

Method of assessment: Flexible assessment.

Home department: Plant Pathology

775 (18) Advanced topics in plant pathology

Topical issues in plant pathology will be discussed in this module. These include aspects such as climate change, food security and genetic modification. Students are expected to prepare properly for these discussions by doing internet searches and reading research papers and books on the individual topics. The topic will be introduced by an expert, after which a class discussion will follow. Students will be expected to prepare a one-page document of their views on the topic and list the literature sources that they have accessed.

Method of assessment: Flexible assessment.

Home department: Plant Pathology

13342 Plant Production and Plant Protection

872 (8) Plant production and plant protection

This module focuses on integrated crop management and integrated pest management (IPM) within farming systems. It covers the complex relationships between soil, plants, microbes, growing practices and nutrient kinetics. This module provides knowledge and tools to understand the interactions between the biotic and abiotic factors in agrosystems in order to facilitate agricultural demands.

The module uses a systems approach to integrate disciplinary knowledge of plant production at various integration levels (plant, crop, farm) taking farming externalities, such as effluent and off-farm nutrients, into account. Attention will be paid to conservation agriculture including aspects such as no- and minimum till, rotational and intercropping, precision agriculture, cover crops, green manuring and alternative crops.

Learning outcomes

At the end of this module the student is expected to be able to describe the agro-ecological determinants of cropping systems:

- use a systems approach to farms using basic knowledge of plant production
- recognise the influence of diverse farming methods on natural resources and on the environment
- explain insect and pathogen ecology as related to integrated pest management in diverse agricultural systems
- evaluate the dynamics of biological control of pests and diseases
- explain the processes related to the influence of climate change on crop production and crop protection.

Home department: Plant Pathology

23256 Production Management

212 (8) Production and operational management (2L, 2T)

Introduction to the operational environment; strategy and productivity; process flow analysis; service processes; lean operations management; facility location; scheduling techniques.

Method of assessment: Flexible assessment.

Home department: Industrial Engineering

13336 Production Physiology and Technology for Annual Agronomical Crops

742 (18) Production physiology and technology for annual agronomical crops (3L, 3P)

Physiological processes involved in yield increases of temperate crops, crop rotations, soil tillage and biological management for sustainable production, quality improvement and utilization of crops.

Method of assessment: Flexible assessment.

Home department: Agronomy

59447 Professional Communication

113 (8) Professional communication (2L, 1T)

Effective communication with various target audiences with specific objectives in mind; particular focus on the planning and writing of a technical report; other document types in the professional environment such as proposals and correspondence; text skills, such as coherence, appropriate style and text structure; appropriate referencing methods; introduction to oral presentation skills; written communication in teams.

Project

Formula for Final mark: P=K

Home department: Engineering (Admin)

51993 Project Management

412 (12) Project management (3L, 1T)

Project management framework: integration, scope, time, cost, human resources, communication, risk, safety and procurement. Project management processes: initiating, planning, execution, control and commissioning.

[Presented by the Department of Process Engineering (25%) and the Department of Industrial Engineering (75%)]

Method of assessment: Flexible assessment.

Home department: Industrial Engineering

46167 Quality Assurance

344 (15) Quality assurance (3L, 3T)

Definition of quality, methods and techniques of quality assurance, statistical process design, sampling. Principles of robust design. Formulation of measures of system performance and quality. Identification of quality noise factors. Formulation and implementation of techniques to reduce effects of noise. Synthesis and selection of design concepts for robustness.

Method of assessment: Flexible assessment.

Prerequisite module: Engineering Statistics 314

Home department: Industrial Engineering

59471 Quality Management

444 (15) Quality management (2L, 3T)

Definition of reliability and maintainability; reliability management; methods and techniques for reliability modelling, allocation, prediction and maintainability assurance; fault tree analysis; failure mode analysis; quality management; history and background; ISO 9000; total quality management; leadership, 6-sigma; cost considerations; quality audits; experimental design with Statistica.

Prerequisite module: Engineering Statistics 314

Home department: Industrial Engineering

13347 Quantitative Analysis of Land Use Systems

881 (8) Quantitative analysis of land use systems (QUALUS)

The module deals with qualitative land evaluation and presents an overview of quantitative

methods for regional land use analysis and design. The methods identify options for sustainable systems and land use and provide trade-offs among objectives. Disciplinary knowledge about economics, soil, water, climate, animals and plants is integrated at different levels. Important aspects of the various methods treated are their aim, spatial and temporal scale under different climate regimes and the use of biological information systems. The module will be illustrated primarily with a case study on fynbos, but other cases will also be used.

Learning outcomes

At the end of the module the student is expected to be able to:

- give an overview of the qualitative and quantitative methods for (sustainable) regional land use analysis;
- give an overview and explain the role of models within land use design and planning;
- explain competing claims between various types of land use, such as agriculture and nature conservation;
- carry out a qualitative evaluation of sustainable land use using QUALUS;
- understand the influence of temporal and spatial scales on the methodology and the results of land use analysis;
- carry out data collection (mainly literature) on different aspects of sustainable land use.

Home department: Agricultural Economics

13533 13534 13535 Research Assignment

841, 842, 843 (60) Research assignment

Includes the planning and implementation of a research project. The research assignment will be submitted in the format of a scientific report/publication.

Home division: Food Science/ Agricultural Economics/ Human Nutrition

13349 Research Thesis (Sustainable Agriculture)

883 (90) Research thesis

Conduct a literature review on selected research topics, drawing up a research proposal, performing experiments, collection, processing and interpretation of data, writing a research report. Regular feedback on the above via oral presentations.

Learning outcomes

At the end of the module the student is expected to be able to:

- prepare a research proposal
- conduct a literature review on selected research topics
- perform experiments according to statistical designs
- collect relevant data

- process and interpret data
- write a research report
- provide feedback on the above via oral presentations to peers, academic staff and relevant industry partners.

Home department: Animal Sciences

19003 Sociology

334 (12) Environmental sociology (2L, 0.5T)

An introduction to the field of environmental sociology; the sociological understanding of contemporary environmental issues and problems, particularly as they pertain to South Africa, and with a focus on their socially constructed and contingent nature.

Method of assessment: A system of flexible assessment is used in module 334 (Environmental Sociology).

Home department: Sociology and Social Anthropology

13344 Sociology of Sustainable Agriculture

875 (6) Sociology of sustainable agriculture

An introduction to sociological perspectives on social relationships (including gender), sustainability, land and the environment. Topics covered include the sociological imagination; introduction to the sociology of the environment; sociological debates on sustainability, development, and livelihoods; social stratification, gender and diversity; sociological perspectives on land and conservation issues in South African society and participatory research methodologies.

Learning outcomes

At the end of the module the student is expected to be able to:

- appreciate the value of 'the sociological imagination' for understanding human action and social relationships in agricultural contexts
- explain key sociological concepts, e.g. social structure, human agency, modernisation, power, social stratification, gender, social identity
- join key sociological debates on sustainability, livelihoods and the sociology of the environment
- describe the social dynamics in the South African countryside, including in relation to land and conservation
- be able to apply the concepts and principles of social analysis presented in this module to the broader social context in which sustainable agriculture is defined and practised
- apply participatory research methodologies useful for research and practice in the management of natural and agricultural resources.

Home department: Conservation Ecology and Entomology

14176 Soil Science

114 (16) Principles of soil science (3L, 1.5P)

An elementary overview on the origin and distribution of soils. Discussion of the most important physical, chemical and morphological characteristics of soil. Soil water. Soil organic matter. Soil organisms. Chemical and mineralogical characteristics of soil. Soil ph. Classification and development of South African soils. Land and soil suitability.

Method of assessment: Flexible assessment.

Home department: Soil Science

142 (8) Applications of soil science (1.5L, 1.5P)

Principles of plant nutrition and fertilisation; ground water and irrigation; salinity and drainage; soil management.

Method of assessment: Flexible assessment.

Prerequisite module: Soil Science 114

Home department: Soil Science

214 (16) Introduction to soil science (3L, 3P)

Soil as a three-dimensional unit; soil formation factors: climate, parent material, relief, organisms and time; weathering processes and products; physical properties of soil: texture, structure, colour, air-water-temperature relationships; chemical properties of soil: soil colloids, clay minerals, cation adsorption and exchange, soil reaction; formation and properties of soil organic material; elementary interpretation and evaluation of physical, chemical and morphological soil characteristics for resource use.

Prerequisite module: Chemistry 144

Home department: Soil Science

244 (16) Plant nutrition and fertilisation (3L, 3P)

Composition and nutrition of plants; individual plant nutrient elements; equilibria in the soil; fertilisers: their characteristics and uses; determination of fertiliser requirements and fertiliser application in practice; interaction with rhizosphere and pedosphere organisms.

Prerequisite modules:

- *Soil Science 214*
- *Chemistry 124, 144*

Home department: Soil Science

314 (16) Genesis, morphology, classification and uses of soil (3L, 3P)

Development and classification of South African soils; terrain classification; soil and land mapping; methodology of soil and land suitability evaluation with special reference to crop suitability; soil use planning; soil erosion and its control.

Prerequisite modules:

- *Soil Science 214*
- *Chemistry 124 and 144*

Home department: Soil Science

344 (16) Soil and water management (3L, 3P)

Soil as storage medium for plant water; atmospheric energy balance: evaporation, transpiration and plant water requirements; soil water uptake and water loss in the soil-plant-atmosphere continuum; hydrological cycle and water resources in South Africa; methods of irrigation and irrigation scheduling; irrigation with saline water and salt balance in the soil; irrigation backflow; elimination and management of physical, morphological and chemical limitations of soil; principles of drainage; soil surface management.

Prerequisite modules:

- *Soil Science 214, 244, 314*
- *Mathematics (Bio) 124*

Home department: Soil Science

414 (16) Advanced soil physics (3L, 3P)

General physical properties: texture, particle size distribution and specific surface area. Structure and aggregation. Soil aeration. Soil temperature. Soil compaction and strength. Characteristics of water in porous media. Soil water content and potential. Soil water flow in saturated and unsaturated soil. Movement of dissolved salts and other inorganic compounds in soil. Miscible transfer. (Laboratory and practical fieldwork).

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Soil Science 214, 244*

Prerequisite modules:

- *Soil Science 314, 344*

Home department: Soil Science

424 (16) Advanced soil chemistry (3L, 3P)

The colloidal fraction of soil: structure of the diffuse double layer, cation adsorption and exchange, anion adsorption. Soil reaction: acidity and alkalinity, influences and control. Oxidation and reduction in soil. Organic material. Salinity. (Laboratory and practical fieldwork).

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Soil Science 214, 244*

Prerequisite modules:

- *Soil Science 314, 344*

Home department: Soil Science

444 (16) Advanced pedoloy (3L, 3P)

Weathering of minerals and rocks: important crystalline layer silicate clay minerals and amorphous weathering products in soils; techniques of mineral identification; advanced soil genesis; development and nature of the South African soil landscape; age of soils; international soil classification systems. (Laboratory and practical fieldwork.)

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Soil Science 214, 244*

Prerequisite modules:

- *Soil Science 314, 344*

Home department: Soil Science

454 (16) Advanced resource management (3L, 3P)

Practically orientated chemical, physical and pedological field and laboratory investigations, with a theoretical foundation; technical report and recommendations; evaluation of the literature; writing and presentation of articles and seminars on subjects related to soil science.

Method of assessment: Flexible assessment.

Corequisite modules: Soil Science 414, 424, 444

Home department: Soil Science

19690 Statistical Methods

176 (18) Statistical methods with computer implementation (3L, 2T)

*First semester: 3L, 1½T; Second semester: 2L, 1½T

Sampling techniques: Simple random; Stratified; Systematic; Cluster; Probability proportional to size.

Descriptive Statistics: Various data types; Stem-and-leaf display; Frequency distributions; Graphical representation of data (histogram, polygons, bar and pie charts);

Descriptive measures of location and spread (mean, median, mode, variance, standard deviation, percentiles); Approximate measures for grouped data; Box plots; Measure of association (coefficient of correlation).

Probability theory: Basic probability concepts (sample spaces, events, addition and multiplication rules, conditional probabilities, probability trees, contingency tables); Bayes' theorem; Counting rules.

Discrete random variables and probability distributions: Expected value, variance, and standard deviation of a discrete random variable; Covariance between discrete random variables; Expected value and variance of a portfolio; Binomial and Poisson distributions.

Continuous random variables and probability distributions: Normal and exponential distributions.

Sampling distributions: The central limit theorem; Sampling distribution of the mean and a proportion.

Inferential Statistics: Interval estimation and hypothesis testing for the mean and a proportion; Interval estimation and hypothesis testing for the difference between two means; Sample size calculation based on interval estimation.

Analysis of variance: One-way and two-way designs.

Regression analysis: The simple linear regression model; Inference about model parameters and the coefficient of correlation; Multiple linear regression.

Time series analysis: The components of a time series; Smoothing; Least squares trend fitting and forecasting.

Notes

1. Microsoft® Excel will be used throughout the module for the application of the different statistical techniques.
2. Students who passed Statistical Methods 176(18) will be allowed to continue with Statistics 214(16), provided that they obtained a final mark of at least 60%.

Differences between Statistics 186 and Statistical Methods 176:

In Statistics 186 and Statistical Methods 176 similar statistical techniques are covered. However, in Statistics 186 basic mathematical techniques are revised and expanded, which are not covered in Statistical Methods 176. The Statistics 186 module is a normal exam written module with three tests that are written during the year and a final examination written at the end of the year. The Statistical Methods 176 module is a more practical module that focuses on applications in Excel and computer assignments. These assignments form an important component (40%) of this module that is subject to flexible assessment.

Method of assessment: Flexible assessment.

Home department: Statistics and Actuarial Science

19658 Statistics

186 (18) Introduction to statistics (4L)

Linear programming: Graphical techniques to solve problems with two variables; Shadow prices; Sensitivity analyses.

Sampling techniques: Simple random; Stratified; Systematic; Cluster; Probability proportional to size.

Descriptive Statistics: Various data types; Stem-and-leaf representations; Frequency distributions; Graphical representation of data (histograms, polygons, bar and pie charts); Descriptive measures of location, spread and association (mean, median, mode, percentiles, variance, standard deviation, coefficient of correlation); Box plots.

Probability theory: Basic probability concepts (sample spaces, events, addition and multiplication rules, conditional probabilities, probability trees, contingency tables); Bayes' theorem; Counting rules.

Discrete random variables and probability distributions: Expected value, variance and standard deviation of a discrete random variable; Covariance between discrete random variables; Portfolio

management; Binomial and hypergeometric distributions.

Basic calculus: Introduction to differentiation and integration with simple applications.

Continuous random variables and probability distributions: Expected value, variance and standard deviation of a continuous random variable; Normal distribution.

Sampling distributions: Central limit theorem; Sampling distributions of the mean, a proportion and the variance; Sampling distribution of the difference between two means.

Inferential Statistics: Interval estimation and hypothesis testing for the mean, a proportion, the variance and the standard deviation; Interval estimation and hypothesis testing for the difference between two means and the ratio of two variances; Applications of interval estimation in auditing.

Regression analysis: The simple linear regression model; The method of least squares estimation; Inference on the model parameters and coefficient of correlation; Residual analysis.

Time series analysis: Components of a time series; Smoothing; Least squares trend fitting and forecasting; Index numbers.

Differences between Statistics 186 and Statistical Methods 176:

In Statistics 186 and Statistical Methods 176 similar statistical techniques are covered. However, in Statistics 186 basic mathematical techniques are revised and expanded, which are not covered in Statistical Methods 176. The Statistics 186 module is a normal exam written module with three tests that are written during the year and a final examination written at the end of the year. The Statistical Methods 176 module is a more practical module that focuses on applications in Excel and computer assignments. These assignments form an important component 40% of this module that is subject to flexible assessment.

Home department: Statistics and Actuarial Science

214 (16) Applied statistics (3L, 2T)

Sampling techniques: Simple random; Stratified; Systematic; Cluster; Probability proportional to size.

Descriptive statistics: Various data types; Frequency distributions; Contingency tables; Graphical representation of data (histograms, polygons, bar charts, pie charts); Descriptive measures of location and spread (mean, median, mode, variance, standard deviation, coefficient of variation, percentiles); Approximate measures for grouped data; Box plots; Measure of association (coefficient of correlation); Determining the regression line.

Probability theory: Basic probability concepts (sample spaces, events, addition rules, multiplication rules, conditional probabilities, contingency tables); Bayes' theorem; Counting rules.

Discrete random variables and probability distributions: Expected value, variance and standard deviation of a discrete random variable; Correlation between discrete random variables; Joint, marginal and conditional distributions; Distribution of the sum of variables; Binomial and Poisson distributions.

Continuous random variables and probability distributions: Expected value, variance and standard deviation of a continuous random variable; Uniform, normal and exponential distributions.

Sampling distributions: The central limit theorem; Sampling distributions of the mean and a proportion; Sampling distributions of the difference between two means and the difference between two proportions.

Inferential statistics: Interval estimation and hypothesis testing for the mean, a proportion and the variance; Interval estimation and hypothesis testing for the difference between two means, the difference between two proportions and the ratio of two variances; Concept of and calculation of p-values in above cases; Determining sample sizes; Calculation of power and the effect of sample size on power.

Note: Application of statistical *techniques* using Microsoft® Excel is emphasised throughout.

Method of assessment: Flexible assessment.

Prerequisite pass modules:

- *Statistical Methods 176 with a final mark of at least 60% or*
- *Statistics 186 or*
- *Probability Theory and Statistics 114 or 144*

Corequisite module:

- *Statistics 224 (Students who have passed Mathematics 114 or 144 are exempt from this.)*

Home department: Statistics and Actuarial Science

224 (16) Statistical inference (3L, 2T)

Sampling techniques: Simple random sampling; Stratified sampling; Systematic sampling; Cluster sampling; Probability proportional to size sampling.

Properties of estimators: Unbiasedness; Efficiency; Consistency; Sufficiency;

Robustness.

Estimation methods: Maximum likelihood; Method of moments.

Simple linear regression analysis: The simple linear regression model; Method of least squares estimation; Inference on the model parameters and the correlation coefficient; Residual analysis; Prediction intervals and confidence intervals.

Multiple linear regression analysis: The multiple linear regression model; Residual analysis; Inference on the parameters of the model; Regression models with dummy variables and interaction terms; Polynomial regression; Transformations; Collinearity; Variable selection.

Analysis of variance: Completely randomized factorial designs; Block designs.

Non-parametric techniques for analysis of variance: Wilcoxon's rank sum test; The sign test; Wilcoxon's signed-rank test; Kruskal-Wallis test; Friedman's test.

Note: Application of statistical *techniques* using Microsoft® Excel and STATISTICA is emphasised throughout.

Method of assessment: Flexible assessment.

Prerequisite modules:

- *Statistics 214 and*

- *Statistics 224*

Home department: Statistics and Actuarial Science

59587 Strategic Management

344 (12) Strategic management (1.5L, 0.5P)

Strategic management challenges in complex environments; business models and strategy; strategic environmental analysis; strategic resources and capability analyses; strategic leadership; strategy development; knowledge, innovation and complexity management; strategy implementation; performance measurement and change management.

Corequisite module:

- *Business Management 113 *Not applicable for students in Forest Science.*

Home department Business Management

19712 Strength of Materials

143 (12) Introduction: Mechanics of deformable bodies (3L, 2T)

Introduction to mechanics, internal forces and stresses, deformations and strain, material response: material law, axially loaded elements, torsion elements with circular cross section, symmetrical bending of beams, thin walled pressure vessels. Introductory materials science: crystalline and amorphous solids, crystalline structures, defects and applications.

[Presented by the Department of Civil Engineering (80%) and by the Department of Mechanical and Mechatronic Engineering (20%)]

Examination

Corequisite modules:

- *Engineering Mathematics 115*
- *Applied Mathematics B 125*

Formula for Final mark: P=0,4K + 0,6E

Home department: Civil Enineering

13343 Sustainable Animal Production

873 (8) Sustainable animal production (including global change, LCA)

This module will focus on livestock production both as an activity on its own, and as an integral part of a mixed system, together with crop production. Emphasis will be on cattle, pigs, small ruminants, poultry and wildlife. Topics to be taught in this module will be advanced principles of nutrition, breeding and genetics, physiology and how they relate to sustainable animal production, the environmental impact of different rangeland production systems, perception of welfare of the animals in view of markets and social acceptance.

Furthermore, the module addresses various approaches that can be used to analyse problems with respect to sustainable development of livestock-related production. Students will learn how to

tackle problems related to ecological, societal and economic sustainability. The course will also include a sustainability assessment of innovations in farming systems.

Learning outcomes

At the end of the module the student is expected to be able to:

- explain advanced principles of animal production and how they relate to intensive and extensive animal production systems (small and large scale) in different biomes
- calculate environmental indicators of animal production systems and their innovations
- explain the potential use of environmental indicators from a farm and life cycle perspective
- make a stakeholder analysis by making use of a power analysis
- interview farmers and other stakeholders to obtain data on e.g. social sustainability issues such as animal welfare, power relations and gender and analyse it statistically
- evaluate the sustainability of innovations in farming systems using a round table discussion and a decision matrix.

Home department: Animal Sciences

13340 Sustainable Soil Management

871 (8) Sustainable soil management

This module covers Integrated Soil Fertility Management (ISFM) within crop production systems. As part of crop and soil fertility management, a systems approach is taken that analyses yield efficiencies, integrating disciplinary knowledge of crop production at various levels (plant, crop, farm). Insight is gained into agro-ecological determinants of soil that would influence cropping systems. The course addresses various methods/approaches that can be used to analyse problems with respect to sustainable development of crop related production. The macro and micro-organisms present in soils will be covered with specific reference to organisms that are pests or pathogens. Indicators of system performance are assessed and related to certification opportunities of sustainable agriculture.

Learning outcomes

At the end of this module the student is expected to be able to:

- explain production and ecological principles of crop production
- recognise and understand the importance of soil characteristics for crop production and select relevant nutrient and soil management solutions
- appreciate the complexity in the relationship between soil, including soil organisms, plant and cultivation practices
- interpret long-term carbon and nutrient balances of cropping systems

- evaluate cropping systems with respect to sustainability indices (e.g. soil quality, water and nutrient productivity, input-output ratios, biodiversity, landscape).

Home department: Soil Science

13346 Systems Analysis and Simulation

880 (6) Systems analysis and simulation

This module introduces the student to complex agro-ecosystems. It will address system dynamics and simulation of simple systems in practical work. Model development, evaluation and exploration of management options will be illustrated by case studies. Specifically systems approaches will be applied to crop sciences, soil sciences and animal sciences to evaluate options for improved management.

Learning outcomes

At the end of the module the student is expected to be able to:

- apply elementary concepts such as feedback, time coefficient, relational diagram, analysis of units and numerical integration methods, following the conventions of the systems analysis approach
- analyse systems in terms of states, rates and driving variables
- discuss the outcome of basic simulation models
- explain how systems approaches can be applied in crop science, soil science and animal science and what their usefulness is for evaluating options for improved systems management
- write simple simulation models.

Home department: Animal Sciences

38784 Theory of Interest

152 (6) Theory of interest (2L, 1T)

Simple and compound interest. Force of interest. Future value, present value and discount. Accumulation and discounting of amounts of money. Various types of annuities and applications.

Home department: Statistics and Actuarial Science

21008 Transport Economics

214 (16) Transport economics (3L)

Introduction to Transport Economics: Role and functions of transport. Nature of the transport demand. Economic, physical and service characteristics of air, road rail, sea and pipeline transport, as well as pipelines. Cost principles and dilemmas of different forms of transport. Economic efficiency in the transport market. Evolution of freight transport regulation in South Africa.

Prerequisite pass modules: Economics 114, 144

Home department: Logistics

33081 Viticulture

214 (16) Wine grape cultivars and their establishment and maintenance; grapevine abnormalities (3L, 3P)

Origin, morphology, description, identification and cultivation properties of wine grape cultivars. Anatomical and morphological abnormalities associated with abiotic and biotic factors (including specific virus and virus-like diseases) and their identification under field conditions. Establishment of a vineyard: planting of vines, young vine development. Vineyard maintenance: winter pruning based on biological principles.

Corequisite module: Crop Production 152

Home department: Viticulture and Oenology

244 (16) Grape production (3L, 3P)

Advanced anatomy and morphology; directions in production; cultivation practices for wine grape vineyards: principles of location and cultivar choice; vine spacing; training and trellising systems; winter pruning; canopy management; growth regulators; weed control.

Prerequisite module:

- *Crop Production 152 or*
- *Biology 154*

Home department: Viticulture and Oenology

314 (16) Table and raisin grape production, packaging and storage (3L, 3P)

Table and raisin grape production: the global industries, cultivars, production practices, spring/summer manipulations, pre-harvest physiology. Harvest and packaging, cooling and storage, postharvest quality factors.

Prerequisite module: Crop Production 152
Corequisite module: Viticulture 214

Home department: Viticulture and Oenology

322 (8) Grapevine physiology (1.5L, 1.5P)

Molecular biology and biochemistry of core processes in grapevines and their hormonal control; grapevine vegetative growth and phenology; physiology of dormancy, nitrogen and carbon assimilation, reproductive growth and ripening, vine water status.

Prerequisite module: Crop Production 152
Corequisite module: Viticulture 214

Home department: Viticulture and Oenology

344 (16) Plant material improvement, propagation and cultivation (3L, 3P)

Improvement of grapevine material (importance, methods, schemes), success of improved

material. Vegetative propagation: collection, storage (material), multiplication, grafting techniques, nursery layout and facilities, physiology and anatomy of graft union healing, top-grafting methods. Rootstock cultivars. Plant spacing (utilisation of space above and below ground). Light environment and canopy management, trellis systems.

Prerequisite module: Viticulture 214

Home department: Viticulture and Oenology

444 (16) Advanced perspectives on wine and table grape cultivation (3L, 3P)

Global perspectives on vineyard cultivation; geographical indications; site selection, vineyard planning and modern/alternative vineyard practices. Advanced table grape cultivation practices.

Prerequisite pass modules: Viticulture 314, 322, 344
Corequisite modules: Viticulture 454, 478

Home department: Viticulture and Oenology

454 (16) Advanced vineyard management (3L, 3P)

Human resources and supply chain management; strategies for fertilisation with macro- and micronutrients; irrigation regimes for optimal production of wine grapes and table grapes; biology of weed growth and reproduction, strategies for weed control; management of vineyard pests and diseases.

Prerequisite pass modules: Viticulture 314, 322, 344
Corequisite modules: Viticulture 444, 478

Home department: Viticulture and Oenology

478 (32) Viticulture internship (3S)

Practical viticultural experience in the wine and table grape industry. Experience in all aspects of commercial vineyard management and the industry are acquired. Identification and solving of a problem or design of a product or system in the workplace. Learning activities include the conducting of experiments in the field, data acquisition and analysis, testing, complete project reporting.

Method of assessment: Flexible assessment.

Prerequisite modules: Viticulture 314, 344
Corequisite modules: Viticulture 322, 444, 454

Home department: Viticulture and Oenology

13329 Weed Management

741 (18) Weed management (3L, 3P)

Characteristics of weeds; methods of weed control; principles of weed management programmes; mechanisms of chemical herbicide action; herbicide resistance; integrated weed management.

Method of assessment: Flexible assessment.

Home department: Agronomy

50997 Wine Biotechnology

714 (5) Chemical components of grapes and wine

Water and sugars; polysaccharides; alcohols; acids; phenols; aldehydes and ketones; acetals; esters; lactones; terpenes; nitrogenous components; hydrogen sulphide and sulphur components; hydrocarbons and derivatives; macromolecules and growth factors; dissolved gases and minerals.

Home department: Viticulture and Oenology

771 (40) Research methodology for grapevine and wine biotechnology

Project planning, communication and writing skills; oral presentation of research project proposal; carrying out experimental research; data processing; written reporting on and oral presentation of research results; writing and presenting a seminar.

Method of assessment: Flexible assessment.

Home department: Viticulture and Oenology

772 (25) Techniques in grapevine and wine biotechnology

General laboratory safety and etiquette, biological calculations; project planning; general molecular biology techniques; polymerase chain reaction (PCR); agarose gel electrophoresis; cloning of DNA fragments; transforming bacterial, yeast and plant cells; DNA sequencing; plant tissue culture; hybridisation techniques; protein isolation and analysis; introduction to bioinformatics, genomics, transcriptomics and proteomics. Small-scale winemaking and analyses of wine, including sensory evaluation.

Method of assessment: Flexible assessment.

Home department: Viticulture and Oenology

773 (30) Biotechnology of wine-related microbes

Isolation, identification and classification of wine-associated yeasts and bacteria. Fermentation biochemistry and kinetics; metabolic end products; nitrogen and sulphur metabolism during fermentation; fermentation problems; ethanol tolerance; fermentation bouquet and other volatile esters. Biotechnology of lactic acid bacteria; malolactic fermentation and microbial spoilage of wines. Techniques and targets for the genetic improvement of wine yeasts; legal, ethical and consumer aspects relating to the use of genetically manipulated wine yeasts. Role of enzymes in vinification.

Home department: Viticulture and Oenology

774 (20) Vine structure and functioning and grapevine improvement

General viticultural concepts, including the vegetative structure and function; reproductive structure and development as well as integration into the establishment and management of vine balance in the viticultural system. Biotechnological aspects of vine plant diseases; molecular-genetic aspects of plant-pathogen interactions; use of recombinant DNA technology to genetically improve plants; techniques and targets for the genetic improvement of plants.

Home department: Viticulture and Oenology

57584 Wood Product Science

224 (16) Wood anatomy and identification (3L, 3P)

Introduction to plant taxonomy and commercially important tree genera; introduction to tree growth; macroscopic and microscopic anatomy and identification of types of woods; descriptions of cell wall ultrastructure, wood variability; wood quality.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

234 (16) Mechanics of wood products (3L, 3P)

Analysis of beams, columns and axially loaded elements. Elastic behaviour and deformation of materials. Design and scaling. Timber as a structural material: Influence of moisture, long-term load, pressure treatment, load sharing. Strength grading of timber. The SABS timber design code.

Prerequisite module: Strength of Materials 143

Home department: Forest and Wood Science

244 (16) Wood chemistry (3L, 3P)

Introduction to the chemistry relating to wood and wood products. Chemical composition (lignin, cellulose, hemicelluloses, extractives) and chemical utilisation of wood. Biological degradation of lignocellulosics.

Method of assessment: Flexible assessment.

Corequisite module:

- *Enineering Chemistry 123 or*
- *Chemistry 144*

Home department: Forest and Wood Science

264 (16) Wood physics and drying (3L, 3P)

The physics of water in and around wood, moisture content, the concept of humidity, equilibrium moisture content density, sorption, shrinkage and swelling of wood; electrical, thermal and acoustical properties of wood. The why and how of wood drying, description of various methods, kiln types and schedules, drying defects.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

335 (16) Wood adhesives and composite products (3L, 3P)

Adhesion; types and properties of adhesives. The manufacturing of particleboard, veneer, plywood, fibreboard, wood cement and wood plastic composites, laminated wood and paper. Processing methods, physical and chemical properties of the products and analysis methods.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

414 (16) Wood products manufacturing I (3L, 3P)

Basic wood products manufacturing with a focus on the primary manufacturing sector. Background to and economics of wood products manufacturing. Production of solid wood (industrial or furniture wood) in sawmills and further processing in secondary industries. Processing equipment; introduction to computer-based equipment.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

434 (16) Wood degradation and preservation (3L, 3P)

Degradation due to fungi, insects and weathering; Composition and properties of various surface finishes, including preservatives, surface preparation and coating application. Surface characterisation and performance testing, environmental aspects.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

444 (12) Bio-energy (2L, 2P)

Renewable energy sources, conversion of biomass into energy, biorefinery, processing methods, determination of calorific values and other properties, comparison of different biofuels, environmental aspects, emissions and emissions reduction, introduction to life cycle analysis for biofuels and bio-energy.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

781 (32) Wood properties and quality

Tree growth; bulk, macroscopic, cellular, cell wall, ultra-structural and molecular properties of wood; variability between trees and within a tree of the most important anatomical, physical and chemical properties; wood quality. Testing and analysis to evaluate wood quality.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

782 (32) Primary wood processing

Theory of wood drying; drying technology: drying methods, kiln types and schedules; drying defects. Adhesion; structure, types, properties and application of adhesives; manufacture and properties of composite products: particleboard, plywood, fibreboard, wood cement, wood plastic, laminated wood and paper; analytical methods.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

783 (32) Bio-energy

Conversion of wood into energy, processing methods, determination of calorific values and other properties, comparison of different biofuels, harvesting and storage problems, different conversion

methods, processing problems, environmental aspects, emissions. Consolidation of theoretical knowledge in a realistic case study based on South African biofuels.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

784 (24) Wood products science project

Wood Products Science research project with a focus on any aspect of materials science, product development or manufacturing; research design and methods, data capture and analysis, formulation of results and conclusions.

Method of assessment: Flexible assessment.

Home department: Forest and Wood Science

13348 Work-Integrated Learning

882 (20) Work-integrated learning

Teams of students with a different disciplinary and preferably cultural background will carry out a design type project for a client. This client may be a company with activities related to agriculture in its widest sense (e.g. seed, fertilizer, machinery, food processing), a (research) institute, an NGO, or a consultancy firm. The project must have a direct relationship with the theme "sustainable agriculture", the suitability of projects to be determined by the SU course coordinator. It could be design of new technologies, but it could also be a policy paper, a business plan, a communication plan or the draft of a plan for an integrated research programme. These project plans must address a realistic, existing problem or area of interest for the commissioner; plans should not be developed as a teaching exercise.

The ultimate goal is for teams to reach an interdisciplinary synthesis of the information they have compiled and translate this into advice on future actions for their client.

Learning outcomes

At the end of the module the student is expected to be able to:

- determine, with a team and in close interaction with a client, the goals of a project and formulate tasks and a project plan on the basis of their disciplinary knowledge and general academic skills and attitude
- defend and sell their viewpoints and conclusions in a professional and representative way and academically correct
- contribute at an academic level to the execution of an interdisciplinary project both in terms of process and content related to their own disciplinary training by gathering, selecting and analysing information and integrating this into project deliverables
- implement reflective learning by an assessment of their personal functioning in and contribution to a professional team and reflection on this in writing and during an assessment interview

- assess the contribution of other team members and other stakeholders on team functioning and execution of project tasks and appropriately reflect on these and give feedback verbally and in writing.

Home department: Animal Sciences

Research and Service Bodies

In this chapter the research and service bodies that reside in the Faculty of AgriSciences are presented.

1. Institute for Wine Biotechnology (IWBT)

History

The Institute for Wine Biotechnology (IWBT) was established at Stellenbosch University at the end of 1995 and is part of the Department of Viticulture and Oenology. The IWBT is an internationally recognised postgraduate training and research institute offering visionary training and innovative research to support the South African wine and grapevine industries.

Objectives

The South African wine industry is an important sector with substantial growth potential. The Institute strives to develop, in conjunction with other role players in the dynamic South African wine industry, a sustainable basis of cutting-edge technology and human resources so that the industry's international competitiveness may be significantly improved. Wine Biotechnology comprises the integration of molecular and genetic viticultural and oenological sciences to make it possible for the wine industry to produce cost-effective, high-quality wines and other vine-related products, using environmentally friendly technologies. The most important goals of the IWBT are:

- to co-ordinate, commission and support research in wine biotechnology at Stellenbosch University;
- to study and genetically manipulate wine yeast, wine-associated bacteria and vine fungi on a physiological, biochemical and molecular genetic level;
- to develop new and desired cultivar and product-specific wine yeast strains using genetic crosses and recombinant DNA technology; and
- to develop disease-resistant cultivars with improved characteristics by means of tissue-culture cytogenetic and molecular biology techniques.

Postgraduate students and postdoctoral fellows conduct research at the IWBT. The multi-disciplinary nature of the IWBT's research projects results in close co-operation with several departments of Stellenbosch University, as well as with other South African and foreign role players. The Institute has modern and sophisticated research facilities and equipment at its disposal.

Contact details

For more information, visit http://www.sun.ac.za/english/faculty/agri/wine-biotech or contact Prof M du Toit at mdt@sun.ac.za or 021 808 3772.

2. Institute for Plant Biotechnology (IPB)

History

The Institute for Plant Biotechnology (IPB) was founded at Stellenbosch University in 1998, in collaboration with the South African Sugarcane Research Institute. The IPB originally operated as

part of the Department of Botany, but after strategic restructuring at the University it moved to the Department of Genetics in the Faculty of AgriSciences, where it currently functions as an independent unit.

The IPB was established under the leadership of Dr Frikkie Botha. In 2004 Prof Jens Kossmann took over and was appointed director, a position that he currently still occupies. Under Prof Kossmann the IPB functions as a multicultural and interdisciplinary team of researchers and postgraduate students who focus on research opportunities in plant biotechnology. Fundamental research forms the core of the IPB's activities, but every project has some long-term application.

Objectives

The IPB specialises in the characterising and manipulation of primary carbon metabolism in plants. The ultimate goal is to manipulate the relevant metabolic pathways to either improve yield and/or quality, or to produce novel, high-value products in plants. Some projects are aimed at the genetic manipulation of carbon partitioning within plant organs, such as sugarcane culms, grape berries and potato tubers.

The Institute's approach is to first get a better understanding of the control of carbohydrate metabolism in these important sink tissues and then to genetically manipulate apparent key enzymes to investigate the effect of these modifications on metabolic flux. In addition to the work on the partitioning of endogenous compounds, the Institute also focus on the improvement of these compounds and the introduction of completely new ones. As part of several international collaborative projects, the IPB has, for example, developed transgenic plants that produce novel, high-value products, i.e. neutraceuticals and pharmaceuticals or biopolymers for industrial application. The IPB also tries to understand plant growth in relation to abiotic stress factors with the aim of breeding or engineering plants that are more productive with less input.

Contact details

The Institute is situated on the main campus of Stellenbosch University, in the heart of the Winelands region in the Western Cape province of South Africa.

For more information, visit http://www.sun.ac.za/english/faculty/agri/plant-biotech or contact Prof J Kossmann at kossmann@sun.ac.za or 021 808 3834.

3. Experimental Farms

The University owns two experimental farms (Welgevallen and Mariendahl) that are used mainly for the training of undergraduate students and for research projects of postgraduate students and academic staff of the Faculty of AgriSciences. The farms serve in the first place as field laboratories where research projects are conducted under highly controlled conditions. However, the farms are managed in a way that simulates the practical conditions on commercial farms in the agricultural industry. Where feasible, the spare capacity of the experimental farms are utilised for commercial production in order to manage these farms as far as possible towards self-sufficiency.

3.1 Welgevallen

Welgevallen was purchased in 1917 at the founding of the Faculty, specifically because it was a condition that an experimental farm be within walking distance of the campus. Its original size was

278 ha, of which only 120 ha remain available. Welgevallen is used mainly by the departments of the Faculty of AgriSciences.

The entire Department of Agronomy is situated at Welgevallen, where it has several laboratories, controlled-climate growth chambers and plastic tunnels, as well as small experimental plots.

The Department of Horticulture has at its disposal well-established deciduous fruit and soft citrus orchards, while the Department of Viticulture and Oenology has well-established vineyards producing grapes of the highest quality. An experimental wine cellar equipped with the latest technology where wine is made on a semi-commercial scale has been erected on the banks of the Eerste River.

The Department of Animal Sciences has at its disposal excellent facilities where mainly sexual physiology studies are carried out. This Department maintains a highly productive Friesian herd as well as a sheep flock of stud quality used for practical training, but also available for research purposes. This Department furthermore has at its disposal well-equipped feeding sheds and stables where intensive nutritional research on small and large ruminants can be carried out.

Other departments that are also active on the experimental farm are Genetics, Soil Science and Forest and Wood Science. The Department of Genetics annually plants 8 000 to 13 000 segregating populations and pure lines from the wheat and triticale breeding programmes under dryland conditions at Welgevallen and Mariendahl for disease evaluation and selection. The Department utilises several greenhouses and growth chambers for making crosses, doing seedling disease typing and the execution of an extensive cross-breeding programme. The latter programme focuses on producing species hybrids and secondary hybrid derivatives in an attempt to transfer disease and salt tolerance genes from the wild species to the cultivated cereals. Even departments from other faculties, such as the Department of Botany and Zoology, make use of the facilities on the farm.

Contact details

For more information, contact the experimental farm manager, Mr Willem van Kerwel, at 021 808 4870.

3.2 Mariendahl

Mariendahl (375 ha) adjoins the Elsenburg experimental farm about 14 km outside Stellenbosch. It is used mainly by the Department of Animal Sciences. The University's excellent facilities for poultry and pig research are located at Mariendahl. The Department of Animal Sciences also has a Simmentaler herd, as well as a Döhne Merino and South African Mutton Merino flock, at its disposal. These breeds are of the highest quality and well known in the industry. The facilities are used for the training of students as well as for research for the industry.

Contact details

For more information, visit

http://www.sun.ac.za/english/faculty/agri/departments1/experimental-farms or contact the Dean, Faculty of AgriSciences, at db@sun.ac.za or 021 808 4737.

Alphabetical Subject List