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# University of Pretoria Yearbook 2016

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## BScHons Biotechnology (02240392)

**Duration of study** 1 year

**Total credits** 135

### Programme information

BScHons (Biotechnology) is a unique interdepartmental programme aimed at enabling students to pursue their interest in molecular biotechnology through relevant research areas offered within fields of biochemistry, plant science, microbiology and plant pathology, plant production, as well as genetics. Students within this programme will be registered and will conduct their studies within the department of their choice. A student's choice of research programme will determine which of the respective departments will mentor their honours degree programme.

#### Renewal of registration

- i. Subject to exceptions approved by the Dean, on the recommendation of the head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
- ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

### Admission requirements

BSc in Biotechnology or equivalent degree with GTS 351, BCM 356 and MBY 364, an average pass mark of 60% or more at final-year level or permission by the head of department. Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination. Admission is furthermore contingent on the availability of supervisors and/or research projects within the participating departments.

### Other programme-specific information

- The curriculum for the balance of the credits will be determined by the heads of the participating departments.
- Additional modules may be prescribed by the head of the department where deemed necessary. Honours students may also be required to complete a biometry or equivalent module, if they have not already done so during their undergraduate training.
- A pass mark is required for all the components of the honours study programme and the final mark is calculated proportionally to the credits of the respective prescribed modules.



## Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.



## Curriculum: Final year

Minimum credits: 135

### Fundamental modules

#### Biometry 120 (BME 120)

**Module credits** 16.00

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Natural and Agricultural Sciences  
Faculty of Veterinary Science

**Prerequisites** At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123

**Contact time** 1 practical per week, 4 lectures per week

**Language of tuition** Both Afr and Eng

**Academic organisation** Statistics

**Period of presentation** Semester 2

#### Module content

Simple statistical analysis: Data collection and analysis: Samples, tabulation, graphical representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical inference: Basic principles, estimation and testing in the one- and two-sample cases (parametric and non-parametric). Introduction to experimental design. One- and two-way designs, randomised blocks. Multiple statistical analysis: Bivariate data sets: Curve fitting (linear and non-linear), growth curves. Statistical inference in the simple regression case. Categorical analysis: Testing goodness of fit and contingency tables. Multiple regression and correlation: Fitting and testing of models. Residual analysis. Computer literacy: Use of computer packages in data analysis and report writing.

### Core modules

#### Biotechnology in the workplace 701 (BTW 701)

**Module credits** 15.00

**Prerequisites** No prerequisites.

**Language of tuition** English

**Academic organisation** Genetics

**Period of presentation** Year

#### Module content

Introduction to the principles and realities of working in the field of biotechnology. Discussions on various aspects, including entrepreneurship; intellectual property; patent rights; financial management; grant applications and product marketing. The module will be assessed by way of a simulated grant application for the development of a hypothetical biotechnological venture.



## Molecular and cellular biology 721 (MLB 721)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 discussion classes per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Microbiology and Plant Path
<b>Period of presentation</b>	Semester 2

### Module content

Principles and applications of recombinant DNA, and other novel molecular and genomics technologies, to address questions in the biological sciences and/or biotechnology. Strong emphasis is placed on the principles of research planning, including identifying suitable research objectives, formulating a research strategy and understanding the relevance and feasibility of research. The module is assessed by means of a research project proposal, conceived and formulated by each student. The proposal must focus on the use of molecular technologies in addressing realistic questions in biology and/or biotechnology. There is also an oral defense of the project proposal.

This module is jointly presented in the departments of Biochemistry, Genetics and Microbiology and Plant Pathology.

## Elective modules

### Trends in biochemical research 771 (BCM 771)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 discussion class per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Biochemistry
<b>Period of presentation</b>	Year

### Module content

Study and discussion of topical research results from recent scientific publications.

### Research project and report 773 (BCM 773)

<b>Module credits</b>	60.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 other contact session per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Biochemistry
<b>Period of presentation</b>	Year



## Plant nomenclature 712 (BOT 712)

<b>Module credits</b>	10.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 practical per week, 1 lecture per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Plant and Soil Sciences
<b>Period of presentation</b>	Semester 1

### Module content

The regulations of the International Code for Botanical Nomenclature. Principles of nomenclature. History of plant collecting. Type specimens.

## Seed ecology 714 (BOT 714)

<b>Module credits</b>	10.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 lecture per week, 1 practical per week, 1 web-based period per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Plant and Soil Sciences
<b>Period of presentation</b>	Semester 2

### Module content

Regeneration of plants from seed under natural conditions. Early stages in the life of a plant from ovule to established seedling: seed production; seed predation; seed dispersal; seed germination and dormancy, seed bank dynamics and seedling establishment.

## Plant morphology 717 (BOT 717)

<b>Module credits</b>	10.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 practical per week, 1 lecture per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Plant and Soil Sciences
<b>Period of presentation</b>	Semester 1

### Module content

Speciation in flowering plants; plant variation. Sex determination in flowering plants. Reproductive systems in flowering plants.

## Introduction to plant biotechnology 718 (BOT 718)

<b>Module credits</b>	10.00
<b>Prerequisites</b>	No prerequisites.



**Contact time** 1 practical per week, 1 lecture per week

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 1

#### **Module content**

Plant genome: structure and composition of the plant genome (nuclear, mitochondrial and chloroplast); applications in plant biotechnology: plant tissue culture (micropropagation, somatic embryogenesis and cell suspension cultures). Genetic manipulation and gene transfer technology (Agrobacterium-based and other) and DNA-marker technology.

### **Primary plant metabolism 719 (BOT 719)**

**Module credits** 10.00

**Prerequisites** No prerequisites.

**Contact time** 1 discussion class per week, 1 web-based period per week, 1 practical per week

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 1

#### **Module content**

Regulation and interaction of primary plant metabolic pathways on the sub-cellular and whole plant level.

### **Plant taxonomy 741 (BOT 741)**

**Module credits** 10.00

**Prerequisites** No prerequisites.

**Contact time** 1 lecture per week, 1 practical per week

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 2

#### **Module content**

Classification, identification and nomenclature, methodology of a revision study, analysis and presentation of taxonomic information, evolution, phylogeny and cladistics.

### **Plant classification 742 (BOT 742)**

**Module credits** 20.00

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week, 1 practical per week

**Language of tuition** English



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**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 2

**Module content**

Sources of taxonomic information; morphology, anatomy, chemotaxonomy, cytogenetics, reproductive biology, plant geography, palynology, ethnobotany and paleobotany. Importance of different characteristics, methods to obtain information and interpretation of observed patterns in variation.

**Applications in plant biotechnology 746 (BOT 746)**

**Module credits** 10.00

**Prerequisites** No prerequisites.

**Contact time** 1 practical per week, 1 lecture per week

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 2

**Module content**

Creation of genetically modified plants and their impact on modern agriculture.

**Advanced phytomedicine 761 (BOT 761)**

**Module credits** 10.00

**Prerequisites** No prerequisites.

**Contact time** 1 practical per week, 1 lecture per week

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 2

**Module content**

Metabolism and functions of secondary compounds such as tannins, alkaloids, terpenoids, flavonoids and free amino acids. Importance of secondary compounds in the defence mechanisms of plants. Isolation and identification of medicinal bioactive compounds from plants. Their current scope and potential applications in ethnobotany. Strategies to discover new pharmaceuticals from ethnomedicine.

**Research report 782 (BOT 782)**

**Module credits** 60.00

**Prerequisites** No prerequisites.

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 1



### Module content

Teaching and planning, execution and documentation of a research project.

### Seminar 783 (BOT 783)

**Module credits** 15.00

**Prerequisites** No prerequisites.

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 1

### Module content

Literature study, discussion and oral presentation of a subject related to the main discipline.

### Trends in plant science 784 (BOT 784)

**Module credits** 10.00

**Prerequisites** No prerequisites.

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 2

### Module content

Literature study of recent publications in a subject related to one of the elective disciplines.

### Practical plant identification 786 (BOT 786)

**Module credits** 10.00

**Prerequisites** BSc with first year Botany/Plant Science

**Contact time** 2 lectures per week, 2 practicals per week

**Language of tuition** English

**Academic organisation** Plant and Soil Sciences

**Period of presentation** Semester 1

### Module content

Principles of identification, classification and nomenclature; identification of plants; family recognition; collection of plant specimens for identification; herbarium as a source of information. Variation in seed plants and breeding systems. Practical work involves an excursion.

### Spatial analysis in ecology 788 (BOT 788)

**Module credits** 10.00

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week





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<b>Language of tuition</b>	English
<b>Academic organisation</b>	Plant and Soil Sciences
<b>Period of presentation</b>	Semester 2

### Module content

Mapping and analysing spatial data. Theory and basic techniques of analysing and manipulating spatial data using geographical information systems. Mapping of vegetation types, species distributions and diversity, species traits. Understanding the spatial drivers of biodiversity patterns. The influence of scale on biodiversity analyses. Relevance for conservation planning for mapping biodiversity risk and prioritising conservation, especially in a South African context.

### Seminar course 702 (GTK 702)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 seminar per week, 1 discussion class per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Year

### Module content

Students are guided to collect relevant literature from disparate papers and to condense and collate this into a written seminar. Seminars are presented, along with formal article talks. Themes and articles covered in the course form part of the written examination upon completion of the module.

### Research project 703 (GTK 703)

<b>Module credits</b>	60.00
<b>Prerequisites</b>	No prerequisites.
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Year

### Module content

A mini-dissertation with well-defined limits is undertaken under the guidance of a supervisor. The students are allowed to choose from a number of projects from the different research programmes in the department. The module also has a strong theoretical component since emphasis is placed on writing and presenting a comprehensive literature review and project proposal. Additional technical and analytical training is provided. The project is concluded with a final report, presented in the format of a short manuscript, as well as a poster and an oral presentation.

### Trends in genetics 704 (GTK 704)

<b>Module credits</b>	15.00
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<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	4 discussion classes per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Year

### Module content

Discussions and essays focusing on a selection of advanced topics, as well as recent advances in the field of genetics, with an emphasis on contextualising these developments within the broader framework of the Biosciences and its role in modern society. Ethical and philosophical issues in genetics are debated.

## Research methods 751 (MCP 751)

<b>Module credits</b>	30.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	7 lectures per week, 5 practicals per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Microbiology and Plant Path
<b>Period of presentation</b>	Year

### Module content

The module provides students with planning, data handling, writing, and presentation skills required for microbiological research. In addition, students are provided with hands-on experience in the advanced techniques utilised in research and analysis. Ethical and philosophical issues in the broader field of Microbiology and Plant Pathology are also addressed.

## Seminar course 752 (MCP 752)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 seminars per week, 3 discussion classes per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Microbiology and Plant Path
<b>Period of presentation</b>	Year

### Module content

Students are guided to collect relevant literature from disparate papers in the broader field of Microbiology and Plant Pathology and to condense and collate this into a written seminar, which is also presented verbally.

## Trends in microbiology 753 (MCP 753)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	No prerequisites.



**Contact time** 3 discussion classes per week, 2 seminars per week

**Language of tuition** English

**Academic organisation** Microbiology and Plant Path

**Period of presentation** Year

### Module content

Discussions and essays focusing on recent advances in the broader field of Microbiology and Plant Pathology, as well as contextualising these developments within the broader framework of the Biosciences and its role in modern society.

## Research project and literature study 754 (MCP 754)

**Module credits** 60.00

**Prerequisites** No prerequisites.

**Language of tuition** English

**Academic organisation** Microbiology and Plant Path

**Period of presentation** Year

### Module content

The module includes both practical and theoretical components. In addition to an individual research project with well-defined limits that is undertaken under the guidance of a lecturer, the module also acquaint the student with the theoretical aspects relevant to a specific research topic. The research project is thus preceded by the presentation of an in-depth review of the relevant literature, and the project is concluded with a progress report, presented in the format of a short publication and an oral presentation.

## Research methods 774 (BCM 774)

**Module credits** 30.00

**Prerequisites** Admission into BSc Hons Biochemistry, Biotechnology, Genetics, Microbiology, Bioinformatics or Human Physiology

**Contact time** 2 web-based periods per week, 2 practicals per week, 4 lectures per week

**Language of tuition** English

**Academic organisation** Biochemistry

**Period of presentation** Year

### Module content

Students are guided through the methodology of research planning and data handling, as well as science communication skills. They are offered hands-on experience in a range of advanced techniques employed in biochemistry, molecular technologies and biochemical analysis. Scientific writing and presentation skills required for research in biochemistry, are also addressed. Ethical and philosophical issues in the broader field of the Cellular and Molecular Sciences are also addressed. Several of these aspects will be presented collaboratively by the Department of Genetics and the Department of Microbiology and Plant Pathology.



## Advanced biochemistry 775 (BCM 775)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	Admission into BSc Hons Biochemistry, Genetics, Microbiology, Bioinformatics or Human Physiology
<b>Contact time</b>	4 web-based periods per week, 4 lectures per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Biochemistry
<b>Period of presentation</b>	Year

### Module content

The latest trends towards a biological systems approach of metabolism, functional genomics and control. This includes integration of metabolic pathways, mechanisms of regulation and metabolic control analysis.

## Research methods 705 (GTK 705)

<b>Module credits</b>	30.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	5 practicals per week, 5 lectures per week, 10 discussion classes per week, 5 web-based periods per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Year

### Module content

Students are guided through the methodology of research planning and data handling. They are offered hands-on experience in a range of advanced techniques employed in molecular research and analysis. Scientific writing and presentation skills, required for research in genetics, are also addressed.

## Molecular techniques 705 (BOT 705)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	Admission into BSc Hons in Plant Science (Plant Biotechnology/Physiology)
<b>Contact time</b>	5 practical per week, 1 lecture per week, 1 discussion class per week
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Plant and Soil Sciences
<b>Period of presentation</b>	Semester 1

### Module content

Students are guided through the methodology of research planning and data handling. They are offered hands-on experience in a range of advanced techniques employed in molecular research and analysis.

## Plant ecology and conservation 730 (BOT 730)



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<b>Module credits</b>	20.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 lectures per week, 5 ppw
<b>Language of tuition</b>	English
<b>Academic organisation</b>	Plant and Soil Sciences
<b>Period of presentation</b>	Semester 1

### **Module content**

Applications of plant ecology principles in plant conservation: species-distribution modelling, alien plant invasions, conservation planning, threatened ecosystems, South African environmental legislation. Experimental design and vegetation survey techniques. Discussion of relevant topics in plant ecology. This module includes a compulsory 5-day field component.

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The information published here is subject to change and may be amended after the publication of this information. The [General Regulations \(G Regulations\)](#) apply to all faculties of the University of Pretoria. It is expected of students to familiarise themselves well with these regulations as well as with the information contained in the [General Rules](#) section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.