

# Botany

The School of Botany offers an exciting and stimulating research environment for studying plants and plant processes. Programs cover a broad spectrum of basic, strategic and applied research. Active collaborations are maintained with other universities and research institutes in Australia and overseas, and with state and Federal Government agencies and industry.

The School of Botany offers majors in several areas of plant biology, with emphasis on modern technologies and important emerging fields of research. Some subjects offer fieldwork and outdoor experience in diverse Australian environments. Botany is specifically responsible for majors in:

- terrestrial ecology
- plant ecology and ecophysiology
- biodiversity and evolutionary plant biology
- plant pathology
- plant cell and molecular biology
- plant biotechnology

Other science majors in which botany has a significant teaching involvement are as follows:

- cell and molecular biology
- marine biology
- marine ecology
- conservation of Australian wildlife
- environmental science for life sciences
- reproduction and development

All these botany majors require completion of an appropriate first year package. Students are strongly encouraged to seek advice and information on their choice of majors (second and third year courses) during the course advising sessions offered in the second semester, or by appointment with course advisers arranged through the departmental secretary.

## Bachelor of Science (Honours)

For information about the faculty and departmental entry requirements for honours, please refer to *Bachelor of Science (Honours) and Bachelor of Information Systems (Honours) (p.1)*. These requirements should be considered when planning your course.

## Further Information

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## Subject descriptions

### 200-level subjects

#### 606-201 The Living Plant

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr I Woodrow

**Prerequisites:** Biology 600-141 and 600-142 and one of chemistry 610-141 plus 610-142, or 610-161 plus 610-162 (Before 1998: 610-121 plus 610-122).

**Contact:** 24 lectures (two per week), 36 hours of practical work (3 hours per week) (*Semester 1*).

**Description:** Topics studied include:

- the anatomy of plant cells, tissues and organs;
- photosynthesis, growth and development;
- plant-animal and plant-microbe interactions;
- water relations and environmental stress;
- plant nutrition;
- secondary metabolism; and
- flowering.

Emphasis is given to crop and native plants. Upon completion of the subject, students should gain:

- a knowledge of plant structure and physiological function in relation to the environment; and
- skills in designing experiments and in studying the anatomy and function of plants.

**Assessment:** One 3-hour written examination at the end of the subject; up to 3000 words of practical assignments.

#### 606-202 Plant Biodiversity

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr A Drinnan; Dr R Willis

**Prerequisites:** Biology 600-141 and 600-142. Botany 606-201 is recommended.

**Contact:** 24 lectures (two per week) and up to 36 hours practical work (one 3-hour practical class per week) and one day-long excursion (*Semester 2*).

**Description:** Topics covered include:

- evolution, phylogeny and classification of land plants;
- major groups of land plants, liverworts, mosses, ferns and seed plants; their morphology, anatomy and development; and
- major families of flowering plants, including Australian flora; their characteristics and identification.

After completion of the lecture, practical and field components of this subject, students should appreciate:

- the variety and classification of land plants;
- skills in plant identification; use of modern identification tools including computer-interactive keys; and
- the concepts of modern phylogenetic analysis as bases for framing evolutionary hypotheses within and between major plant groups.

**Assessment:** One 3-hour written examination at the end of semester (70%); one 2-hour practical test or equivalent practical report (30%).

#### 606-203 Biodiversity of Protists

**Note:**

- Not available for students who have completed 606-202 prior to 2002.
- This subject is a prerequisite for marine biology majors from 2003.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr G Kraft; Dr G McFadden

**Prerequisites:** Biology 600-141 and 600-142

**Contact:** 24 lectures (2 per week) and 24 hours practical work (one 2-hour prac. per week) (*Semester 2*).

**Description:** Topics covered include:

- the classification, morphology, cytology and commercial value of the protistan phyla: 1) the macroscopic green, brown and red seaweeds; 2) the microalgal and phytoplankton classes: diatoms, dinoflagellates, chlorophytes, chrysophytes and other lesser-known but ecologically and phylogenetically significant groups;
- the evolutionary history of protistan organisms; and
- marine ecosystems: the importance of algae to biodiversity and habitats.

After completion of the lecture and practical components of this subject, students will have acquired a knowledge of:

- the variety and classification of algae (macro- and micro-);
- techniques for identifying algal organisms; and
- modern cytological researches and the pivotal roles that ancient bacterial and photosynthetic organisms played in the evolution of vital cellular components (e.g. mitochondria and chloroplasts) in algae, animals and higher land plants.

**Assessment:** A 3-hour written examination at the end of semester and two 2-hour laboratory examinations during term time.

#### 606-204 Ecology: Communities and Ecosystems

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr R Day; Dr R Willis; Prof N Enright

**Prerequisites:** Biology 600-141 and 600-142; or geography 121-012 and 121-013.

**Contact:** 24 lectures (two per week), 27 hours of practical work plus an excursion (*Semester 2*).

**Description:** By successfully completing this subject, students should gain:

- understanding of the concept of ecological communities, ecosystems and landscapes;
- knowledge of field sampling and techniques;
- appreciation of the roles of natural and human disturbances in ecological systems;
- understanding of the approaches to management at these ecological scales; and
- ability to synthesis, interpret and discuss current scientific literature.

In the practical component students should:

- develop an understanding of the ways in which ecological research is carried out; and

- gain an appreciation of the field sampling techniques and the role and usefulness of models, including mathematical models in ecology.

The subject provides an introduction to ecological questions that can be addressed at the levels of communities and ecosystems.

Topics include measurement of ecological systems at the level of food web, community, ecosystem and landscape; trophic interactions and resource partitioning; disturbance and ecological succession; nutrient cycling and energetics; palaeoecology; and management of human activities.

**Assessment:** One 2-hour end-of-semester written examination; up to 15 pages of practical and excursion reports; continuous assessment of practical exercises and laboratory problems.

### 606-205 Cell Biology

**Note:**

- Not available to students enrolled in the BBiomedSc.
- This subject is a joint botany and anatomy and cell biology subject.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof J Pickett-Heaps; Dr P Kitchener

**Prerequisites:** Biology 600-141 and 600-142; chemistry 610-141 plus 610-142, or 610-161 plus 610-162 (Before 1998: 610-121 plus 610-122).

**Corequisites:** Biochemistry 521-211 and/or anatomy 516-201 are recommended.

**Contact:** 36 lectures (3 per week) and 12 hours computer-aided learning/tutorials (*Semester 1*).

**Description:** This subject is designed to give students a thorough understanding of:

- basic cell structure and function;
- how cells interact in simple and complex multicellular organisms;
- the major organelles of cells, their functions and interrelationships;
- how cells communicate and interact to create tissues and simple or complex multicellular organisms; and
- how genetic information is expressed during these and other important processes such as cell proliferation and apoptosis.

Throughout, the subject will emphasise how our present understanding of cells is derived from integrating biochemical, structural and biophysical information. These topics will be illustrated by video of living material where possible.

At the end of this subject, students should:

- be able to appreciate and interpret images of cells derived from different techniques such as electron microscopy, confocal microscopy and video microscopy;
- be familiar with the diversity of cell types;
- understand how organelles interact to bring about basic life processes;
- become familiar with how living cells behave during different types of cellular activity; and
- understand modern techniques used in cell and molecular biology research.

**Assessment:** A 3-hour written examination at the end of semester.

### 606-207 Flora of Victoria

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof P Lädiges; Dr D Guest

**Prerequisites:** At least one 100-level biology subject (600-141 or 600-142 or 600-111).

**Contact:** 21 hours lectures, 33 hours practical work, including excursions full-time over two weeks in early February (*Summer semester*).

**Description:** This subject is designed for students wishing to take a summer course, who are interested in the biology of native plants and plant communities and environments in Victoria. It is suited to students studying environmental science or environmental studies.

Topics covered include:

- biogeographic regions of Victoria: climate, landforms, soils and vegetation types;
- history of the Victorian flora: fossils and evolutionary changes through the Tertiary and Quaternary;
- biology of Victorian plants: intraspecific variation and adaptation to local conditions, ecotypes and clines in eucalypts and acacias, mallee plants, coastal plants, alpine plants, marine and fungal flora; and
- threats to the Victorian flora: weeds, diseases, pests, fire, extinctions.

By taking this subject, students should:

- gain an understanding of the biogeography and biology of the Victorian flora;
- develop skills in identification of Victoria's plants and macrofungi; and

- appreciate the evolutionary history of, conservation value of and threats to Victoria's ecosystems.

**Assessment:** A 2-hour written exam (60%) at the end of the subject, a written assignment (1500 words; 20%) and a project based on excursion and practical work (six pages; 20%), submitted at the start of Semester 1.

## 300-level subjects

### 606-301 Applied Ecology (Theory)

**Note:** Students cannot receive credit for this subject and geography 121-030.

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof A Baker; Prof N Enright

**Prerequisites:** At least two of geography 121-025, botany 606-201, 606-202 606-204, 606-207 or zoology 654-204 is recommended.

**Contact:** Two 1-hour lectures and a 1-hour seminar per week. A one-day field trip (*Semester 2*).

**Description:** This subject will provide a sound theoretical background to the application of ecological concepts and their relevance to present day environmental issues.

Topics will include:

- the scientific basis of conservation and management of natural and man-made ecosystems;
- endangered species assessment and management;
- restoration ecology and contaminated land remediation;
- urban ecology and landscape management; and
- role of ecological research in global problems.

By successfully completing this subject, students should gain skills in:

- ecological tools in environmental management;
- ecological approaches to the conservation and management of species and communities, and the restoration of degraded ecosystems;
- critical interpretation of ecological data;
- preparation, writing and presentation of environmental reports; and
- professionalism in ecological and environmental practice.

**Assessment:** A 2-hour written examination at the end of semester (50%); a research report (40%); seminar notes (10%). Students must attend 80% of seminars to be eligible to sit the final examination.

### 121-030 Applied Ecology

See full subject details on page 5.

### 606-302 Marine Botany

**Credit points:** 25

**HECS-band:** 2

**Coordinator:** Dr R Wetherbee; Dr G T Kraft

**Prerequisites:** Botany 606-202 or permission of the coordinator.

**Contact:** 100 hours during late November and early December, including 34 lectures, 45 hours of practical classes and 21 hours of fieldwork (*Summer semester*).

**Description:** Topics to be covered include:

- the biology and diversity of algal protists;
- the evolution and phylogeny of protists;
- algal structure, taxonomy and classification;
- algal reproduction and life histories;
- endosymbiosis and the origin of algal chloroplasts;
- distribution and ecology of aquatic plants;
- aquatic environments and global ecology; and
- the commercial utilisation of marine algal products.

The practical component will introduce students to identifying and classifying micro- and macroalgae from marine and freshwater habitats; identifying and characterising algal pigments and use of light and electron microscopes for studying microalgae. Fieldwork along the Victorian coast will focus on the identification and ecology of Australia's unique seaweed flora. At the completion of the subject, students should have developed an understanding of:

- the biology and diversity of algal protists;
- algal reproduction and significance of their life history strategies;
- the origin and phylogenetic significance of algal chloroplasts and pigments;
- practical skills in identifying the major groups of marine and freshwater algae;
- the biology of toxic algae and their impact;
- practical skills in light and electron microscopy of algal protists;
- the unique nature of the Australian seaweed flora; and

- current themes in algal research.

**Assessment:** A 3-hour written examination in the week following the end of the subject, two 2-hour laboratory examinations and up to three field reports of 6-10 pages each.

### 606-303 Botany Systematics & Evolution

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof P Y Ladiges; Dr A Drinnan

**Prerequisites:** Botany 606-202.

**Contact:** 24 lectures (two per week), 24 hours practical work (two per week) (*Semester 1*).

**Description:** Topics studied include:

- homology and form;
- numerical methods in systematics, phenetics and cladistics;
- classification of vascular plants, especially gymnosperms and angiosperms;
- fossils;
- historical biogeography; and
- Australian flora.

At the completion of the subject students should gain:

- a knowledge of modern methods of phylogenetic systematics, including the application of morphological and molecular data;
- skills in analysing systematic data, including the use of computer interactive programs; and
- a knowledge of the evolution and diversity of Australian flora, both living and fossil groups of land plants.

**Assessment:** A 1500-word essay; practical reports totalling up to 2000 words (30%); a 3-hour end-of-semester written examination (70%).

### 606-304 Environmental Plant Physiology

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr I Woodrow

**Prerequisites:** Botany 606-201.

**Corequisites:** Botany 606-314 is recommended.

**Contact:** 24 lectures (two per week), 24 hours practical work (3 hours per week during the first part of semester) (*Semester 2*).

**Description:** Topics to be covered will be selected from the following:

- the physical environment;
- plant-animal interactions;
- metabolism of defensive compounds;
- energy exchange with the environment;
- transpiration and stomata;
- photosynthetic carbon assimilation and growth;
- coping with environmental extremes; and
- genetic engineering and plant performance.

The practical component of the course will introduce students to state-of-the-art methods for environmental monitoring using data acquisition systems and a range of environmental sensors. Emphasis will be placed on sampling strategies and data processing and presentation. Upon completion of this subject students should gain:

- a knowledge of plant function and performance in relation to the environment;
- an understanding of the relationship between plant growth and performance and various molecular, biochemical and physiological attributes; and
- skills in field sampling and using electronic data gathering and processing systems.

**Assessment:** A 2-hour examination at the end of semester, a laboratory test and practical reports totalling up to 2000 words.

### 606-307 Fungi & Plant Disease

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr D I Guest

**Prerequisites:** Biology 600-141 and 600-142

**Corequisites:** Botany 606-314 is recommended.

**Contact:** 24 lectures (two per week) and 24 hours laboratory classes (*Semester 2*).

**Description:** Topics to be covered in this subject include:

- the evolution and diversity of fungi;
- fungal physiology, growth and ecology;
- humans and fungi;
- fungi and other microbes that cause plant disease;

- plant-parasite relationships; and
- disease resistance in plants.

The practical component will introduce students to techniques used in handling and identifying fungi, and in studying plant disease. Emphasis is placed on the design of experiments and interpretation of experimental data.

Upon completion of this subject, students should have developed an understanding of:

- the biology and diversity of organisms that cause plant disease;
- the mechanisms by which fungi cause plant disease at the molecular, cellular, whole plant and community levels;
- the mechanisms used by plants to defend themselves against disease;
- biotechnology and plant pathology; and
- current themes in research into plant disease.

**Assessment:** A 2-hour examination at the end of semester (60%), weekly tests of 10 minutes (10%) and a practical report of 4 pages (30%).

### 606-309 Cell Biology III

**Note:** This is a joint botany and anatomy and cell biology and zoology subject

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof A Bacic; Dr M Dziadek

**Prerequisites:** Botany 606-205 or zoology 654-203 or anatomy 516-201 or biochemistry 521-211 and 521-212. Other combinations that provide a similar background will be considered by the coordinators.

BBiomedSc students: 521-213.

**Contact:** 36 lectures (three per week) (*Semester 1*).

**Description:** Topics to be covered include:

- the importance and applications of cell biology;
- regulation of cell phenotype, cell transformation;
- recombinant protein technology;
- plant and animal genetic manipulation; transgenesis;
- molecular basis of cell interactions; applications of plant and animal cell culture;
- cell transplantation; gene therapy;
- exploitation and commercialisation of cell biology; and ethical issues.

Upon completion of this subject, students should gain:

- an advanced level of understanding of the ways in which phenotype can be manipulated to explore cell and organ function, and in biotechnology of plants and animals;
- knowledge of the applications of cell biology in research, industry and human welfare, and policy and regulatory issues relevant to cell biology and biotechnology; and
- enhanced presentation skills.

**Assessment:** A 3-hour written examination at the end of semester (60%), a review essay of no more than 3000 words (20%) and tests during the semester (20%).

All assessment components must be completed satisfactorily before credit can be granted for the subject.

### 606-310 Field Botany

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr A Drinnan

**Prerequisites:** Botany 606-202 or 606-204 or 606-207.

**Contact:** This subject is offered full-time over the first two weeks of February. Total contact is 62 hours, comprising 36 hours fieldwork (one 6-day excursion), 8 hours lectures, 18 hours practical work (*Summer semester*).

**Description:** Topics to be covered include:

- taxonomy of the Australian flora;
- field identification of major families and genera of plants;
- collection and preservation of plant specimens; mounting and cataloguing specimens; curatorial skills; nomenclature;
- techniques for description and classification of vegetation; structural types, floristic associations, measures of abundance (cover, density, basal area, biomass), sampling techniques (quadrats, line transects, plotless methods), sampling scale and species-area relationships, profile diagrams, life-form spectra;
- soils; and
- vegetation mapping.

At the end of this subject, students will have the skills for:

- identification, description and quantification of plants and plant communities in the field;
- collection, cataloguing and preserving plant specimens; and
- constructing a vegetation map.

**Assessment:** A curated collection of up to 20 plants (20%); a written report of a maximum of 2000 words (40%); assessment of field activities (20%); and a 2-hour practical examination at the end of the subject (20%).

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### 606-314 Experimental Techniques in Plant Science

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr E Newbiggin; Dr I Woodrow

**Prerequisites:** Completion of, or concurrent enrolment in, at least one of: botany 606-303, 606-304, 606-307 or biochemistry 521-306. Other subjects that provide a similar background will be considered by the coordinators.

**Contact:** 60 hours laboratory classes, including library research and seminar presentation (*Semester 2*).

**Description:** This subject involves instruction in experimental methods in plant science useful for plant biotechnologists, physiologists, plant pathologists, environmental biologists and systematists, and researchers involved in agriculture, horticulture or forestry. It will include a research project in an area of students' choice. Methods to be covered in this subject will be selected from:

- extraction, handling and manipulation of plant nucleic acids and proteins;
- gas exchange analysis;
- plant tissue culture;
- secondary metabolite analysis;
- microscopy;
- analysis of pest and disease resistance mechanisms in plants; and
- data acquisition, analysis and presentation.

By the end of the subject, students should have:

- a knowledge of basic methods and experimental design in plant science;
- experience in written and oral presentation of original research; and
- experience of working in a research team.

**Assessment:** A research report of up to 3000 words due at the end of semester, a seminar on the research project, and laboratory tests held within timetabled classes.

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### 600-311 Research Project A

See full subject details on page 1.

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### 600-312 Research Project B

See full subject details on page 1.