

Bachelor of Food Science

First-year subjects

202-101 Chemistry for Land and Food Resources

See full subject details on page 1.

610-141 Chemistry A

See full subject details on page 2.

202-103 Biology for Land and Food Resources

See full subject details on page 1.

650-141 Biology of Cells and Organisms

See full subject details on page 1.

202-104 Information Technology and Communication

See full subject details on page 1.

202-107 Mathematics for Land and Food Resources

See full subject details on page 1.

650-142 Genetics & The Evolution of Life

See full subject details on page 1.

208-106 Introduction to Food Science

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Said Ajlouni

Prerequisites: 202-101 Chemistry for Land and Food Resources or 610-141 Chemistry

Contact: Thirty-six hours of lectures and 12 hours of tutorials and/or field site visits (*Semester 2*).

Description: Introduction to Food Science provides an overview of the course, introducing students to the make-up and structure of food and its importance in nutrition, health and well-being. Because food processing relies on an understanding of engineering principles, this subject will also provide a brief overview of the physical properties that influence changes in foods during handling, formulation, and processing. The content will include an overview of food components, additives and preservatives and their importance in nutrition, food safety and product quality; physical properties of foods; physics and engineering principles underlying processes used in the food.

On completion of this subject, students should be able to:

- recognise the chemical, physical and nutritional properties of major and minor food components;
- recognise the major food components in terms of chemical structure, reactivity and physical properties;
- describe the nature of foods and their interaction with food additives (coloring, flavoring, and functional ingredients);
- explain and apply the basic principles underlying the processes used in food preservation and processing; and
- understand the nature of unit operations used in the food industry.

Assessment: Two 2-hour examinations (50% each).

Prescribed texts: S P Murano, *Understanding Food Science and Technology*, Thomson Learning Academic Resource Centre, Wadsworth, USA, 2003.

Elective subjects

202-106 Land Resources

See full subject details on page 2.

207-101 Land, Food and Resource Economics

See full subject details on page 2.

208-101 Farm Animal Biology

See full subject details on page 4.

208-107 Vineyard & Winery Operations W-S

See full subject details on page 6.

208-109 Australian Agriculture

See full subject details on page 2.

306-106 Business Process Analysis

See full subject details on page 1.

316-102 Introductory Microeconomics

See full subject details on page 1.

610-142 Chemistry B

See full subject details on page 2.

640-161 Physics: Principles & Applications A

See full subject details on page 3.

640-162 Physics: Principles & Applications B

See full subject details on page 3.

Second-year subjects

202-202 Experimental Design/Statistical Methods

See full subject details on page 2.

208-225 Food Chemistry, Biology and Nutrition

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Hubert Roginski

Prerequisites: 202-101 Chemistry for Land and Food Resources or 610-141 Chemistry

Contact: Thirty-six hours of lectures and 12 hours of tutorials (*Semester 1*).

Description: Food is composed of natural materials of plant and animal origin plus additives that include flavours, colours, flavour-accentuating agents, micronutrients (vitamins, amino acids, minerals and trace elements) and preservatives. Microbes, or parts of these, may also be present due to their role in product preservation and flavour development of the final product. Building on the overview of these components in subject 208-106 Introduction to Food Science, the aim of this subject is to provide students with an understanding of the chemical structure of these components and the underlying biochemistry that is responsible for their synthesis. The fate of these components in terms of their biological (enzymatic) and chemical degradation when consumed will also be explored in context of their role in nutrition and cell biology. Students will also learn about food contaminants resulting from causes such as environmental pollution.

The Faculty's current research programs on chemistry and biochemistry of food components will be highlighted in lectures.

On completion of this subject students should be able to:

- describe the structure of the macro- and micro-components that make up food;
- describe the biochemical or chemical origin of these components; and
- understand the fate of these components and their role in nutrition

Assessment: Two 2-hour examinations (one mid-semester), 40% each of final marks; one written assignment of 1000 words, 20% of final marks.

208-250 Microbes in Agri-food Ecosystems

Availability: Lectures and practicals at Parkville campus

Credit points: 12.5

Coordinator: Dr Susan Pepper

Prerequisites: 202-103 Biology for Land and Food Resources or 650-141 Biology of Cells and Organisms; 650-142 Genetics & The Evolution of Life; 202-101 Chemistry for Land and Food Resources or 610-141 Chemistry.

Contact: Twenty-four hours of lectures, 12 hours of tutorial and 24 hours practical, demonstrations and Webrat or LMS learning materials (1st semester, year 2; summer semester, depending on demand) (*Semester 1*).

Description: This subject aims to provide students with a basic understanding of the role of microorganisms in agricultural and food ecosystems. The relationship between microbes and their environment is complex, with both advantageous and detrimental outcomes possible. The subject commences by introducing students to microbial cell biology and taxonomy. Students are then introduced to concepts of microbial evolution and diversity, with an emphasis on food, water, soil and animal microbiology (with an emphasis on ruminants). Laboratory skills will supplement and integrate the lecture material while introducing the student to the analytical tools used to detect, characterize and track microbes. In both lectures and laboratory, research projects

relating to food microbiology, are used as examples of current methodologies used in the area.

Assessment: Four practical reports (20%), each report is 3 pages - double spaced; one 1000 word assignment (20%), one 3-hour examination (60%).

526-201 Principles of Microbiology & Immunology

See full subject details on page 1.

208-216 Food Microbiology

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Susan Pepper

Prerequisites: 526-201 Principles of Microbiology and Immunology

Contact: Thirty-six hours of lectures and 36 hours practical, demonstrations and computer-assisted learning (2nd semester, year 2) (*Semester 2*).

Description: Microbes (viruses, bacteria, fungi, parasites and other agents) can be associated with food in several ways: as components of the fermentation processes that are associated with the development of flavours and textures of food and its preservation; as the normal microflora that is associated with the origins of the food and persist during storage, possibly contributing to food spoilage; and as contaminants that enter food during processing or through subsequent mishandling, often posing public health risks. The aim of this subject is to familiarise students with: the microbes that are important in each one of these situations, including the major food pathogens and how to identify and characterise these through microbiological and genetic analysis: understanding the kinetics of bacterial growth and the factors that may alter this (altered water activity, low pH, temperature, preservatives) and the principles of modelling growth; principles of hazard and risk assessment in microbiological safety; the role of microbes in food processing, including examples of specific fermentation processes and waste treatment. Practical exercises and case studies will be undertaken to familiarise students with traditional and emerging microbiological techniques for detecting and identifying food microbes. Case studies will be performed in groups to develop investigative and group dynamic skills.

On completion of this subject, students should be able to:

- describe the role that microbes may play in food production, preservation, storage and safety;
- explain the principles of hazard analysis and critical control point assessment as applied to microbiological safety of food;
- apply models of bacterial growth to predict the impact of storage conditions and the presence of growth inhibitors;
- understand the role of microbes in product development, preservation and trait development;
- analyse the microbiology of foods using standard microbiological techniques and apply new technologies for this purpose;
- work within groups analysing and solving complex problems.

Assessment: Practical reports (20%); reports from case studies (20%), one 1-hour examination (mid-semester) (20%) and one 2-hour examination (40%).

208-226 Food Structure and Function

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Said Ajlouni

Prerequisites: 208-225 Food Chemistry, Biology and Nutrition

Contact: Thirty-six hours of lectures and 12 hours of tutorials (*Semester 2*).

Description: The basic biochemical components that form the structure of food products consist of the natural materials assembled in relationships that can be altered by the presence of additives, ingredients and processing or handling. This subject examines the macro structure of food, and the relationships between the basic structure and the additives (emulsifiers, flavours and other components in the environment of the total matrix), plus the physical chemistry of the components as part of a food matrix, including the influence of processing on these structures. This will include the interactions between emulsifiers and flavours within a food matrix, and interactions between water-proteins, water, lipids, protein-proteins, protein-lipids, protein-carbohydrates, and carbohydrate-lipids. This subject will describe the influence of processing on these interactions among food components using examples from research projects in related areas.

On completion of this subject, students should be able to:

- recognise the importance of interactions of ingredients in food systems;
- describe the interaction of water with food components;
- explain the interactions of emulsifiers with other food components;
- describe the significance of flavour interactions with food matrix and their effects on perception;

- describe the role of interactions among food components on microstructure, texture and rheology of food products; and
- display an understanding of the impact of food processing on the interactions between macro-components of food components, the structure of the macro-components and the consequences of these interactions.

Assessment: One 2-hour final examination (45%), one 1-hour mid-semester examination (25%) and one assignment of 2000 words (30%).

Prescribed texts: G G Anilkumar (ed.), *Ingredient Interactions (Effect on Food Quality)*, Marcel Dekker, Inc., 1995.

Elective subjects

208-202 Animal Physiology

See full subject details on page 5.

208-206 Vineyard & Winery Operations S-A

See full subject details on page 5.

521-211 Biochemistry & Molecular Biology Part A

See full subject details on page 2.

521-212 Biochemistry & Molecular Biology Part B

See full subject details on page 2.

521-220 Techniques in Protein & Gene Technology

See full subject details on page 2.

207-201 Resource Management Economics

See full subject details on page 2.

208-201 Comparative Nutrition

See full subject details on page 5.

208-207 Animal Management and Production

See full subject details on page 6.

208-247 Biotechnology for Land and Food

See full subject details on page 5.

325-211 Principles of Marketing

See full subject details on page 2.

Third-year subjects

208-310 Analytical Techniques

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Said Ajlouni

Contact: Twenty-four hours of lectures and 36 hours of practical and demonstration (*Semester 1*).

Description: The objective of this subject is to develop students' ability to:

- describe the physical, chemical and microbiological principles which underlie rapid and instrumental techniques for testing and analysing raw materials and finished products;
- evaluate innovative instrumental methods for specific purposes and materials against criteria of reliability and validity of results, and of cost and efficiency of monetary and labour resources; and
- select rapid or instrumental methods for appropriate types of analyses, in order to reduce using chemicals and to protect the environment.

Each of the following types of analytical techniques will be studied in line with the objectives outlined: physical and chemical parameters to be assessed; principles of instrumentation and/or methodology and applications of these principles to the technologies employed in analytical techniques; comparison of instrumental and/or rapid methods to conventional techniques of analysis; operation, calibration and standardisation procedures as applicable to particular techniques; assessment and evaluation of data derived from research and product development. Methods to be examined are chromatographic, TLC, HPLC, GLC; ion exchange separations; spectrophotometry, UV, visible, AA; mass spectrometry; serological techniques, FA, ELISA, monoclonal antibody; DNA and RNA technology, probes, PCR; electrophoretic separations; impedance; and industrial and research applications.

Assessment: Two Laboratory reports (20% each, each report should be 8-10 pages double spaced); one 1-hour examination (mid-semester) (20%); one 2-hour examination (40%).

208-314 Technology of Food Processing

Availability: Parkville campus

Credit points: 12.5

Coordinator: Mr Stirk Kyle

Prerequisites: 208-216 Food Microbiology, 208-225 Food Chemistry Biology and Nutrition

Contact: Thirty-six hours of lectures and 24 hours of practicals, demonstrations, site visits and computer-assisted learning (1st semester, year 3) (*Semester 1*).

Description: The subject provides a detailed analysis of the processing technologies used in food production and shelf-life extension, and the underlying scientific and engineering principles involved. This will include the role of packaging materials in product integrity and quality. Students will be introduced to the concept of quality management and automated process control. Practical exercises and demonstrations will allow students to have hands-on experience in commonly applied technologies. Case studies will be undertaken on selected production technologies to develop analytical skills for selecting and evaluating the most appropriate process for specific food groups or product development.

On completion of this subject, students should be able to:

- describe the principles and application of food processing and preservation technologies;
- understand the principles of designing facilities for food production, including layout of equipment, provision of services, preventative maintenance, effective cleaning and sanitation processes;
- analyse processing technologies for their appropriate application in product development for consumer acceptance.

Assessment: Practical reports (20%). Two 2-hour examinations (one mid-semester) (40% each).

208-319 Trends in Food Science and Nutrition

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Hubert Roginski

Contact: Thirty-six hours of lectures and 24 hours practical, demonstration, site visits and computer-assisted learning (*Semester 2*).

Description: Many new technologies may influence food production in the future: some will be acceptable to consumers on the basis of lack of perceived risk, while others may be technologically sound but unacceptable to consumers. This subject will examine emerging technologies for food production, processing and preservation and the underlying scientific and engineering principles. This will include developing a greater understanding of nutritional and sensory analysis of foods, particularly where new product development involves novel functionality (such as conferring health benefits or new physical traits) or the interaction between food and packaging materials. Assignments will develop skills in critical analysis of the technologies, their possible application, risks associated with these and consumer views on these issues. Group assignments will be undertaken to develop skill in working with colleagues in critically analysing information on emerging biological, processing and engineering technologies that will influence new food product development.

On completion of this subject, students should be able to:

- describe the scientific and technological principles underpinning emerging food processing technologies and their influence on food quality, safety and nutritional benefits;
- understand the relationship between food additives and packaging materials in product development, functionality and shelf life extension;
- describe the theoretical and practical aspects of sensory analysis;
- critically analyse emerging technologies in terms of their efficacy, suitability for particular application and potential risks in their application.

Assessment: Group assignment evaluation and oral presentation (20%); assignment of 3000 words (30%); two industry visit reports of 1000 words (10%); one 2-hour examination (40%).

Prescribed texts: P J Fellows, *Food Processing Technology*, 2nd edition, Woodhead Publishing Limited, Cambridge, 2000. • E Mary et al, *Food Product Development*, Woodhead Publishing Limited, Cambridge, 2001.

208-321 Food Safety, Quality and Regulation

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Susan Pepper

Prerequisites: 208-216 Food Microbiology and 208225 Food Chemistry, Biology and Nutrition

Contact: Thirty-six hours of lectures and 24 hours of tutorials, group discussions on assignments and computer-assisted learning (*Semester 1*).

Description: A basic consumer requirement is that food must be safe and fit for human consumption, free from microbiological and chemical risk. Food production, processing and transport is a highly regulated system that engages many layers of government, from local councils, State and Federal authorities and international bodies. The nature of these organisations includes quarantine, customs and excise (regulating the flow of biological materials across State and country boundaries); health (nutrition and food contamination management); and agriculture (safety of food production at farm level). This subject will provide an in-depth understanding of the regulatory framework locally and internationally for food, including environmental legislation that impacts on food production and trade. Assignments will engage students in exploring the nature of this regulatory system in context of food production and processing technologies.

On completion of this subject, students should be able to:

- describe the regulatory framework that governs the production of safe, nutritious and risk-free food products;
- understand risk assessment and the processes involved in meeting food standards;
- assess and evaluate information on the international regulatory and trade environment; and
- understand the complementarity of the regulatory system pre- and post-farm gate.

Assessment: One 2-hour examination (40%), two assignments, maximum of 3000 words each (each 25%) and oral presentation of case studies (10%).

208-322 Food Production Chain Management

Availability: Parkville campus.

Credit points: 12.5

Coordinator: Dr Susan Pepper

Prerequisites: 208-321 Food Safety, Quality and Regulation

Contact: Thirty-six hours of lectures and 24 hours of tutorials, group discussions on assignments and computer-assisted learning (*Semester 2*).

Description: Food production is increasingly becoming a system that provides efficient production at farm level and management of the delivery of food products into international trading markets. This subject should provide insight into the concept of food production chain management. This should include developing an understanding of the links needed between farm production, processing, packaging/transport and delivery of final products, marketing and the influence of consumer opinion on product consumption and successful product sale. This requires a knowledge of the regulatory environment that spans farm production, food processing and product formulation to standards and the structure of the local and international food industry. Students should learn the methodologies used to evaluate consumer views and apply these in case studies of successful and unsuccessful supply chains.

On completion of this subject, students should be able to:

- describe the characteristics of a supply chain and the operational points for management for successful product sales;
- understand and apply methodologies for evaluating consumer views;
- understand quality assurance and auditing framework needed for supply chain management;
- develop logistical plans for meeting consumer demands in terms of product quality and traits, in context of the regulatory environment; and
- source information and prepare case studies on examples of good and bad supply chain management practices.

Assessment: One 2-hour examination (50%), two assignments, maximum of 3000 words each (20%), and oral presentation of case studies (10%).

208-343 Food Science Project

Availability: Parkville campus

Credit points: 12.5

Coordinator: Dr Said Ajlouni

Prerequisites: Completion of 1st and 2nd year of degree, or equivalent

Contact: Twelve hours of lectures, plus class contact and seminars as arranged (*Semester 2*).

Description: This subject involves the definition and development of a laboratory-based or industry-related project which will develop skills in project planning and management, problem solving and report preparation. Students will undertake an investigation that may involve one of three types of studies centred around contemporary food industry issues or a particular food sector or company:

- A laboratory-based experimental investigation undertaken individually or in small groups, performed under academic supervision sometimes in conjunction with an industry-based supervisor. Six-hours per week laboratory access will be made available within the timetable for experimentation.

- A theoretical investigation not involving experimentation but including desk-top analysis of existing data or information available from the literature, undertaken either individually or in a group.
- An investigation of the operations of a particular company through an industry placement, supervised by an industry-based supervisor under guidance from an academic supervisor.

Students work interactively with the subject coordinator, academic or industry supervisor, and the class to define their topics and mode of project operations. Every student will prepare a project proposal that includes aims, methodologies and approaches, and covers the relevant chosen option. Individual students will submit a final report that includes a literature review and deliver an oral presentation at completion. Projects undertaken in groups will be evaluated through peer-review processes in addition to evaluation by supervisors.

Students will meet regularly as a group or electronically for guided, interactive discussion on their projects. Students are required to attend a series of seminars delivered on project design, management and communication strategies, including case studies.

Assessment: Oral presentation and peer evaluation (20%), final written report 5000 words (70%), supervisor report on student performance (10%).

Elective subjects

202-302 Human Resource Management

See full subject details on page 3.

325-307 Product and Brand Management

See full subject details on page 4.

521-305 Biochemistry of Metabolism & Nutrition

See full subject details on page 3.

208-306 Agricultural Marketing

See full subject details on page 8.

208-316 Oenology

See full subject details on page 4.

208-327 Molecular Biology of Food Microorganisms

Credit points: 12.5

Corequisites: 208-216 Food Microbiology

Contact: Thirty-six hours of lectures and 24 hours of practicals and demonstrations (*Semester 1*).

Description: Microbes have been used in the food industry for centuries to extend shelf life and confer traits that alter the flavour, texture or nutritional value of the starting food materials. Improving the capability of microbes to perform their function has changed from natural selection of strains to targeted improvement through mutagenesis and the application of molecular biology techniques. This subject will provide an understanding of the principles involved in strain improvement and will include fundamentals of regulation and deregulation of biochemical pathways in microbes; mutagenesis and strain improvement methods; basic molecular biology techniques and their application in altering carbon flow in bacteria or protein synthesis; and current examples of manipulation of microbes and their use in the food industry. In both lectures and practical classes, research projects investigating the topic of molecular biology of food organisms, are used as examples of current methodologies used in the area.

Assessment: Four practical reports (20%), each report is 3 pages - double spaced; one 1000 word assignment (20%), one 3-hour examination (60%).

208-345 Agricultural Management Economics

See full subject details on page 3.

208-346 Production & Waste Management

Credit points: 12.5

Prerequisites: 208-216 Food Microbiology

Contact: Thirty-six hours of lectures and 24 hours practical work, demonstrations and site visits (*Semester 2*).

Description: Food production is increasingly concerned about effective production and minimization of losses, using all parts of starting materials as primary food products or composites, and extracting all valuable components in agricultural or processing by-products, including water for re-use. This includes developing new products that may have use in alternative sectors, including as pharmaceuticals, fuels, food and feed additives or as chemicals for a variety of different manufacturing sectors. The type of technologies that are applied to achieve waste minimisation and utilisation may rely on extrac-

tion, concentration, chemical modification or biological conversion *via* fermentation, or combinations of these approaches. This subject will explore the technologies and researches involved in regulations and codes of practice, factory design, planning and construction, production scheduling and budgeting, stock rotation and control, environment sustainability, and loss minimisation.

Assessment: One 2-hour final examination (50% of final marks), one 1000 word assignment (25% of final marks), preparation of 3 practical and site visit reports (25% of final marks). Each report should be 4-5 pages double spaced.

Fourth-year (honours)

208-411 Research Philosophies and Statistics

See full subject details on page 3.

207-414 Social Research Methods

See full subject details on page 4.

220-404 Methods for Forest & Ecosystem Research

See full subject details on page 3.

202-401 Honours Research Project

See full subject details on page 4.

202-403 Honours Research Project (MYE)

See full subject details on page 4.