

# 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.

### 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.

### 208-101 Farm Animal Biology

See full subject details on page 5.

### 208-106 Introduction to Food Science

**Availability:** Parkville campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Said Ajlouni

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

**Contact:** Thirty-six hours of lectures and 24 hours of tutorials and 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:** Assignment of 1500 words (20%) and two 2-hour examinations (40% each).

**Prescribed texts:** O R Fennema, *Food Chemistry*, 3rd edn, Marcel Dekker, Inc, 1996.

### 208-107 Vineyard and Winery Operations I

See full subject details on page 5.

### 208-109 Australian Agricultural Production Sys

See full subject details on page 1.

### 650-142 Genetics & The Evolution of Life

See full subject details on page 1.

### 207-101 Economics of Resource Use

See full subject details on page 2.

### 202-106 Land Resources

See full subject details on page 2.

### 208-206 Vineyard and Winery Operations II

See full subject details on page 7.

### 610-142 Chemistry B

See full subject details on page 2.

## Second-year subjects

### 526-201 Principles of Microbiology & Immunology

See full subject details on page 1.

### 202-202 Experimental Design/Statistical Methods

See full subject details on page 2.

### 207-201 Resource Industry Economics

See full subject details on page 5.

### 208-225 Food Chemistry, Biology and Nutrition

**Availability:** Lectures at Parkville campus; practicals at Gilbert Chandler campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Hubert Roginski

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

**Contact:** Thirty-six hours of lectures, 24 hours of practicals 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 the synthesis of these. 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.

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;
- understand the fate of these components and their role in nutrition; and
- understand the basis of analysis of the major components of food, including carbohydrates, proteins, lipids, micronutrients, ingredients and additives.

**Assessment:** Two 2-hour examinations (one mid-semester), 40% each of final marks, and practical reports, 20% of final marks.

### 208-201 Comparative Nutrition

See full subject details on page 6.

### 208-202 Animal Physiology

See full subject details on page 6.

### 521-211 Biochemistry & Molecular Biology Part A

See full subject details on page 2.

### 208-216 Food Microbiology

**Availability:** Lectures at Parkville campus; practicals at Gilbert Chandler campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Ms Susan Pepper

**Contact:** Five hours per week (*Semester 2*).

**Description:** The objective of this subject is to enable students to:

- describe the micro-organisms of importance to the manufacture of food products and explain the effects they exert upon manufacturing practice and quality;
- explain the effect of manufacturing processes upon the activity and survival of particular types and species of micro-organisms;
- analyse problems associated with micro-organisms that occur within food factories and dairy foods;
- describe the role of microbes in the treatment of factory effluent; and
- describe new applications of microbes and microbial by-products in the food industry.

The content includes microflora of dairy products; food spoilage; public health hazard; characteristics of *Salmonella*, *S. aureus*, *Clostridium*, *E. coli*, *B. cereus*, *Yersinia*, *Campylobacter*, *Listeria*; control of micro-organisms in food manufacturing; sampling and line and environmental survey techniques; and applications of microbial genetics to new technologies.

**Assessment:** Three practical reports of 1000 words (10% each); two 2-hour examinations (30% each); assignment of 1500 words (20%).

### 208-218 Production Management

**Availability:** Gilbert Chandler campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Mani Iyer

**Contact:** Five hours per week (*Semester 2*).

**Description:** The objective of this subject is to enable students to:

- state and evaluate the requirements of various regulations influencing food manufacturing units;
- identify strategies for scheduling of production;
- evaluate critical factors in planning and constructing a dairy food manufacturing unit, and apply an understanding of these factors to the design of a dairy food manufacturing unit;
- identify key components of an effective storage and distribution system for food;
- prepare operating budgets for defined production units;
- develop and implement strategies for the optimisation of production systems and resources;
- identify and evaluate different methods for treating factory effluent;
- implement strategies for preventative maintenance programs in a food production unit;
- understand the principles of factory layout, provision of factory services preventative maintenance, effective cleaning and sanitation practices, retrieval and storage of raw materials, prevention of contamination, effective personal hygiene practices, regulatory requirements and disposal of waste materials;
- understand the factors involved in factory layout and the associated provision of services;
- implement sound principles of raw material handling and storage;
- apply the principles of preventative maintenance;
- identify and manage sources of contamination of foodstuffs;
- have a working knowledge of regulations relevant to factory practice;
- understand factors affecting efficient cleaning and sanitation; and
- apply principles of waste disposal.

The content includes regulations and codes of practice; factory design, planning and construction; production scheduling; production scheduling; concepts, factors influencing production budgeting, factors influencing budget preparation, loss monitoring; stock rotation and control, storage, warehousing, materials handling, transport, regulatory requirements; effective storage and distribution systems, food storage requirements and systems; environment and effluent control, effluent disposal, types of effluent, regulations, costs; factory layout and services; raw material handling; preventative maintenance; contamination of foodstuffs; regulatory requirements; cleaning and sanitation; and waste disposal.

**Assessment:** Five industry visit reports of 1000 words (40%); assignment-literature review of 2000 words (20%); 2-hour examination (40%)

### 202-001 Industry Placement#

See full subject details on page 3.

### 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.

### 208-316 Oenology

See full subject details on page 3.

### 208-210 Financial Management for Resource Ind I

See full subject details on page 3.

### 208-207 Animal Management and Production

See full subject details on page 7.

### 208-226 Food Structure and Function

**Availability:** Lectures at Parkville campus; practicals at Gilbert Chandler campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Alan Hillier

**Prerequisites:** 208-225 Food Chemistry, Biology and Nutrition.

**Contact:** Thirty-six hours of lectures and 36 hours of practicals, demonstrations and computer-assisted learning (*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.

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 examination, 40% of final marks, one open-book examination (mid-semester), 30% of final marks and one assignment of 3000 words, 30% of final marks.

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

### 208-227 Molecular Biology of Food Microorganisms

**Availability:** Lectures at Parkville campus; practicals at Gilbert Chandler campus

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Alan Hillier

**Corequisites:** 208-216 Food Microbiology.

**Contact:** Thirty-six hours of lectures and 24 hours of practicals and demonstrations (*Semester 2*).

**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.

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

- describe how genes are regulated in microbes and the results of deregulation of these to produce particular traits, using classical mutagenesis or molecular genetic approaches;
- develop strategies for improving the performance of food microbes, based on models used currently in the food industry;
- understand the principles of molecular biology as applied to strain improvement for particular outcomes in the food industry; and
- source and analyse information from protein and DNA databases.

**Assessment:** One 2-hour examination (40% of final marks), one on-line practical examination (20% of final marks), one assignment, maximum 3000 words (20% of final marks) and preparation of practical reports (20% of final marks).

### 208-228 Waste Management and Use

**Availability:** Not offered in 2004

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Dr Mani Iyer

**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 minimising losses in production and processing, 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 extraction, concentration, chemical modification or biological conversion via fermentation, or combinations of these approaches. This subject will explore the technologies involved in loss minimisation through case studies on processing specific commodities and where efficiencies are generated through waste management and use.

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

- describe current and future technologies for minimising waste during food production, from farm to plate;
- understand the fate of materials across food production and product delivery, including flow into supply chains outside the food industry;
- describe concepts of water management and process design in context of processing specific agricultural commodities, particularly during processing, storage and delivery of food products;
- source information and prepare case studies on examples of good and bad practices in waste management;
- work alone and in groups in presenting information for discussion; and
- prepare reports and present these in written and oral form.

**Assessment:** One 2-hour examination (50% of final marks), one assignment, maximum 3000 words (20% of final marks), preparation of practical and site visit reports (20% of final marks), oral presentation of case studies (10% of final marks).

## Third-year subjects

### 208-314 Technology of Food Processing

See full subject details on page 1.

### 208-310 Analytical Techniques

See full subject details on page 1.

### 202-302 Human Resource Management

See full subject details on page 3.

### 208-319 Trends in Food Science and Nutrition

See full subject details on page 1.

### 202-303 Industry Project

See full subject details on page 4.

### 208-321 Food Safety, Quality and Regulation

**Availability:** Parkville

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Margaret Britz

**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 2*).

**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 include 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% of total marks), two assignments, maximum of 3000 words each (25% of total marks each) and oral presentation of case studies (10% of total marks)

### 208-322 Food Production Chain Mgt&ConsumerIssues

**Availability:** Not offered in 2004

**Credit points:** 12.5

**HECS-band:** 2

**Coordinator:** Prof Margaret Britz

**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% of total marks), two assignments, maximum of 3000 words each (20% of total marks each) and oral presentation of case studies (10% of total marks).

