

■ SE400 MAJOR PROJECT

CREDIT POINTS 15

OFFERED Both semesters

The major project is intended to provide students with an opportunity to plan and carry out an independent research project, and to encourage them in best practice for presentation of results as a written report, as a poster, and as an oral presentation. Content is by negotiation between individual students and GDLR staff. Cooperation with industry and Government agencies involved in land rehabilitation will provide students with a project reflecting the integrated nature of the course and one where the results are likely to be utilized.

■ SE490 VEGETATION MANAGEMENT

CREDIT POINTS 15

OFFERED Block mode

This unit is designed to give an understanding of the role of vegetation in functional landscapes and the management tools and strategies that can be considered when using vegetation to rehabilitate degraded and dysfunctional landscapes. Content: role of vegetation in landscape function; human impact on vegetation communities and their function; plant community assessment and description; ecological succession and vegetation management; reproductive strategies of plants; plant identification and propagation; case studies of techniques and species in land rehabilitation projects; strategies for selection of appropriate techniques and species in land rehabilitation and restoration projects.

■ SE491 CATCHMENT MANAGEMENT

CREDIT POINTS 15

OFFERED Block mode

This unit is designed to give an understanding of the ecological, political and social basis of integrated catchment management. Content: ecological and philosophical basis of integrated catchment management; landscape function and dysfunction; political programs relevant to catchment management, including Commonwealth and State Landcare plans, catchment nutrient and salinity plans, and State of the Environment reporting; catchment management funding opportunities and requirements; exploration of the social basis of catchment management; tools and case studies in creating shared visions and "building bridges" between stakeholders.

■ SE520 AUSTRALIAN BIOTA

CREDIT POINTS 15

OFFERED One Semester

Evolutionary processes; origins of the Australian biota; phylogeny and taxonomy; binomial nomenclature; cytology and microscopy; procaryotes; archezoans and protozoans; fungi, lichens and (chromist) pseudofungi; sponges and radiates; flatworms and roundworms; annelids; molluscs; arthropods and allies; algae, bryophytes; ferns and allies; gymnosperms and angiosperms.

■ SE522 ENVIRONMENTAL MANAGEMENT

CREDIT POINTS 15

OFFERED One Semester

A practical introduction to Environmental Management with a field and project emphasis. Theoretical components include: an introduction to ecosystems and systems ecology; philosophies of environmental management; Australasian geological and biotic evolution; ecological sustainable development. Practical components introduce students to resource management issues, including wildlife management, forest industry conflict, remnant vegetation management and land rehabilitation techniques.

■ SE532 ECOLOGICAL METHODS

CREDIT POINTS 15

OFFERED One Semester

The unit will consider the following concepts: precision; accuracy; objective and subjective data; quantitative and qualitative data; robustness of data and integrity of experimenters and experiments; methods of collecting environmental data, recording data and analysis; reporting and interpretation of data; experimental design for laboratory and field studies and scientific reporting. Students will experience a range of ecological techniques.

■ SE560 AUSTRALIAN ECOSYSTEMS

CREDIT POINTS 15

OFFERED One Semester

Biogeographical principles: origin of the Australian flora and fauna. Biotic processes including photosynthesis and respiration, productivity and cycles in the context of Australian environments. Invertebrate guilds inhabiting soil ecosystems. Invertebrate guilds inhabiting freshwater and marine ecosystems. Plant populations and vegetation communities, floristics and structure including urban environments. Human impact on flora and fauna.

■ SE622 ENVIRONMENTAL ETHICS AND PHILOSOPHY

CREDIT POINTS 15

OFFERED One Semester

The unit will consider the following concepts: the history of environmental philosophy, ethics and environmental values, land and resource ethics; eco-feminism, animal ethics, social ecology, Gaia, environmental philosophy in relation to interpretation of resource management issues.

■ SE630 POPULATION & COMMUNITY ECOLOGY

CREDIT POINTS 15

OFFERED One Semester

The unit will consider the following concepts: population growth, demography and dynamics, the roles of abiotic factors, natural regulation, competition, predation and herbivory on the distribution and abundance of consumers and producers; factors influencing community relationships, community structure, function, diversity, equilibrium and non-equilibrium models.

■ **SE640 AUSTRALIAN FAUNA**

CREDIT POINTS 15

OFFERED One Semester

Origins and distribution of major groups of the Australian vertebrate fauna. Biology of major groups including Australian representatives of amphibians, birds and mammals. Aspects of behaviour relevant to ecological studies. Social systems and resource allocation. An introduction to fauna survey and field survey of small mammals and bats in the Otway National Park.

■ **SE653 WETLANDS**

CREDIT POINTS 15

OFFERED One Semester

Introduction to freshwater ecology. Factor affecting primary and secondary productivity in freshwater ecosystems and an introduction to water nutrient flow. Significance of freshwater flora and fauna and related management issues. Management of catchments as integral ecological units.

■ **SE662 PESTS PLANTS AND ANIMALS**

CREDIT POINTS 15

OFFERED One Semester

Principles and practice in pest species management; integrated pest management. Biology, ecology and control of a range of pest and weed species. Factors influencing their distribution and abundance. Native herbivorous pests. Introduced vertebrates including fox, cat, rabbit, goat, pig, fish, birds, Cane Toad. Determining predator impact using scat analysis. Diseases and invertebrate pests of plants. Woody weeds, pasture grasses and weeds of cultivation.

■ **SE670 SOIL SCIENCE**

CREDIT POINTS 15

OFFERED One Semester

Soil description and sampling in the field; preparation of soil for analysis. Soil forming factors and soil forming processes: the variability of soils in the landscape. Soil biology; general composition of soil materials and methods for analysis. Soil structure; soil-water relations: water retention and water movement.

■ **SE672 GEOGRAPHIC INFORMATION SYSTEMS**

CREDIT POINTS 15

OFFERED One Semester

The unit will consider aspects of GIS including: the range and types of GIS. Construction and manipulation of geographic data bases. Application of a GIS to assist with the solution of natural resource management problems.

■ **SE680 AUSTRALIAN FLORA**

CREDIT POINTS 15

OFFERED One Semester

Essential characteristics of the Australian flora, its origins and major influential environmental factors. The major dicot and monocot plant families; gymnosperms; cryptogams and cryptogamic crusts. Variations in the reproductive and vegetative characteristics of plants. Use of taxonomic keys and floral formulae. Major floral communities. Adaptations that characterise each community. Forest, heath and coastal communities. Plants of disturbed communities.

■ **SE721 PROTECTED AREA MANAGEMENT**

CREDIT POINTS 15

OFFERED One Semester

The unit will consider the following concepts: environmental policy and structure of government environmental agencies in Australia at local, State and National levels; environmental risk analysis; decision-making models; precautionary principle; landscape evaluation and recreation planning, heritage conservation, EIA processes; environmental economics land use planning and classification.

■ **SE722 RESERVE MANAGEMENT**

CREDIT POINTS 15

OFFERED One Semester

The unit will consider the management planning process including: consultation with management authority officers and the interested public; evaluation of information in a planning context; assessment of problem issues; development of management actions to manage the problem issues. Students will undertake a practicum placement.

■ **SE741 FAUNA MANAGEMENT**

CREDIT POINTS 15

OFFERED One Semester

The effects of human influence on fauna when utilised as a biological resource. Habitat management for a range of species in urban, rural and natural environments. Fauna survey, endangered species management and conservation genetics. Sustainable management and biodiversity issues in a management context.

■ **SE751 FLORA MANAGEMENT**

CREDIT POINTS 15

OFFERED One Semester

Flowering plant taxonomy; characteristics of specific flowering plant families. Endangered species management; the role of remnant vegetation. Roadside management. The ecology of saline lakes and playas; coastal and mangrove vegetation. Heathlands. Fire ecology.

■ **SE752 FOREST MANAGEMENT**

CREDIT POINTS 15

OFFERED One Semester

Forest vegetation types - closed forest, tall open forest, open forest. Silvicultural systems. Forest planning and management. Plantation forestry. Timber properties and uses. Forest economics. Multiple use concepts in forest management. Forest assessment techniques.

■ **SE753 RANGELAND MANAGEMENT**

CREDIT POINTS 15

OFFERED One Semester

Definition and extent of the arid zone of Australia. Geology, soils, hydrology and climate of arid Australia. Major rangeland vegetation types. Pastoral industries of the rangelands. Impact of feral animals. Kangaroo management. Pastoral leases and land tenure. Threats to rangelands. Conservation reserves. Biological survey in remote areas.

■ SE761 AQUATIC ECOSYSTEM MANAGEMENT

CREDIT POINTS 15

OFFERED One Semester

Aquatic ecosystem function, dysfunction and management with an emphasis on Australian freshwater ecosystems. Links between riparian vegetation and stream energetics, geomorphology, nutrient dynamics and biota. The central role of retention capacity and large woody debris in controlling stream and river structure and function. Links between catchment land use and freshwater ecosystem characteristics and functions. Discussion of Integrated Catchment Management and Ecosystem Management; their role, limitations and future needs.

■ SE762 SOIL CONSERVATION

CREDIT POINTS 15

OFFERED Block

Wind and water erosion processes; soil structure management; waterlogging and drainage design practices; land salinisation, interpretation and management. Catchment management strategies and the private landholder.

■ SE771 SURVEY AND ASSESSMENT

CREDIT POINTS 15

OFFERED One Semester

Survey and assessment process including the planning and conduct of field surveys. Vegetation survey and survey of all major faunal groups will be considered. The unit also provides the opportunity for planning, preparation and piloting of the major research project to be conducted in SE781, Environmental Management Project.

■ SE781 ENVIRONMENTAL MANAGEMENT PROJECT

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SE771

This unit provides an opportunity to conduct original research in a selected field of biological resource management.

■ SF431 FOOD PROCESSING SYSTEMS

CREDIT POINTS 15

OFFERED Both Semesters

The unit will provide students with foundation studies in the chemical, physical and biological principles of food preservation and control of food spoilage. The following material will be presented during this unit:

- What is a food processing system?
- What are the important properties of a processing system?
- Food composition and control;
- The Australian food processing industry – scope and diversity;
- Control of storage variables in raw materials used in food processing;
- Physical, chemical and biological methods of food preservation; and
- Preparation of food for preservation and post-preservation packaging and labelling;

■ SF432 FOOD SAFETY

CREDIT POINTS 15

OFFERED Both Semesters

The aim of this unit is to provide a sound practical and theoretical basis in food microbiology and sanitation/hygiene practices. This is essential to the application of appropriate control measures in food processing, quality control, food hygiene and the handling and distribution of food products. Topics to be covered will include: introduction to microbiology; factors affecting microbial growth; properties of the food; properties of the environment; control of micro-organisms; death kinetics; effect of the physical environment on micro-organisms; food-borne illnesses and food spoilage; types of food poisoning; food spoilage; sanitation programs; introduction to management of sanitation; HACCP, ISO 9000.

■ SF433 FOOD SCIENCE

CREDIT POINTS 15

OFFERED Both Semesters

The unit introduces the student to the range of biological materials used in the food processing industry. The commodity groups overviewed will include tissue and non-tissue foods. The unit will also introduce the principles of maintaining these food materials in a satisfactory manner such that physiological and chemical/biochemical and nutritional changes that are inherently disadvantageous to food quality are minimised. The content will emphasise the value of an integrated approach to commodities and their treatments. Adequate information on the physiological, physical, chemical, biochemical and nutritional status of food commodity groups will be gained.

■ SF434 FOOD QUALITY MANAGEMENT

CREDIT POINTS 15

OFFERED Both Semesters

The unit introduces the student to a blend of theoretical information, generated through discussions and inquiry and a series of group based workshops in which participants explore the application of the theory of quality assurance to practical situations. The general philosophies and evolution of quality management and its impact on organisations domestically and globally will be studied. This will be followed by an overview of the terminology used and, importantly, the types of initiatives undertaken as part of quality management. The general practicalities of preparing a quality manual will be undertaken as part of the introduction to ISO systems.

■ SF480 BREWING RAW MATERIALS

CREDIT POINTS 15

OFFERED One Semester

The unit will describe the raw materials which are used to produce beer and related products (eg. stout, ale, porter). It will include the structure and chemical composition of barley and its conversion to malt; cereal and sugar adjuncts; hop science and technology; brewing water chemistry; process aids; and, how raw materials influence flavour active compounds.

■ SF481 THE BREWING PROCESS

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF480

The unit will present a description of the production of beer and related products. It will include the chemical, biochemical and physical principles of unit operations, as applied in the brewhouse. This will include: physical principles of milling; mashing technology and biochemistry; wort extraction and boiling; and wort cooling and aeration.

■ SF482 YEAST AND FERMENTATION

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF480

The unit will describe the processes which occur during the fermentation of beer and related products. Qualitative and quantitative aspects of physical, chemical and biological changes during fermentation will be covered, including: yeast characteristics, requirements, maintenance, propagation and handling; fermenter design and operation; yeast kinetics; and fermentation biochemistry, flavour formation pathways and sensory evaluation.

■ SF483 MALT AND BEER QUALITY

CREDIT POINTS 15
OFFERED Any Semester (Off campus)
PREREQUISITES SF480, SF481, SF482

The unit will present a general introduction to quality management and total quality control. It includes a broad overview of the terminology used and importantly the types of initiatives undertaken as part of quality management. It will also cover the recommended methods of analysis (EBC, ASBC & IOB) to determine quality parameters of raw materials, worts, yeast and beer.

■ SF484 PACKAGING AND QUALITY

CREDIT POINTS 30
OFFERED Both Semesters

The unit will present a broad overview of packaging and quality control in the brewing industry. It covers the different processes required for packaging beer in a variety of containers including kegs, cans and bottles. The principles of quality assurance/quality control of the beer at the pre- and post-packaging stages and the recording, reporting and interpretation of data is discussed.

■ SF485 ENGINEERING AND DOWNSTREAM PROCESSING

CREDIT POINTS 30
OFFERED Both Semesters

The unit will present a broad overview of the downstream processes that occur after fermentation and the engineering principles behind them. It will include the theory and practice of processes such as: clarification, sedimentation and filtration; carbonation and the behaviour of gasses; fluids and fluid handling; and heat and energy transfer.

■ SF511 CHEMISTRY I

CREDIT POINTS 15
OFFERED One Semester

General Chemistry: states of matter; units of measurement; elements and compounds; symbols; atomic structure and bonding; relative molecular mass and the mole concept. Organic Chemistry: What is organic chemistry? Why is carbon unique? hydrocarbons and isomerism; functional groups; some representative reactions; polymers.

■ SF512 CHEMISTRY II

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF511

General Chemistry: solutions and concentration terms; concept of equilibria and equilibrium constants; acids and bases, solubility of substances and the properties of water; the nature of radiation; the interaction of molecules with radiation; types of spectroscopic techniques and their application in analytical chemistry. Organic Chemistry: functional group chemistry; enantiomers and chirality; carbohydrates, their structures and physical and chemical properties; lipids, their structure and properties; amino acids and proteins; the four structural levels of proteins; the denaturation of proteins.

■ SF514 NATURE OF FOOD

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF511

This unit will introduce the physicochemical phenomena of importance in foods. The unit emphasises the measurement and analysis of physicochemical behaviour in foods and the role that these play in creating and upgrading food products and processes. Topics such as colligative properties, food dispersions, emulsifiers, surfactants, bonding, gelation, and thermodynamics will be discussed.

■ SF532 INTRODUCTORY MICROBIOLOGY

CREDIT POINTS 15
OFFERED One Semester

History and scope of microbiology; microscopy; microbial diversity, including microbial taxonomy, differences between prokaryotes and eukaryotes, bacteria, fungi, viruses, algae, and protozoa; microbial growth and metabolism, including microbial nutrition and culture media, microbial growth conditions, and basic microbial metabolism; microbial interactions: microbes as components of the environment; applications of micro-organisms in food, geological and environmental industries; introduction to medical microbiology.

This unit will develop basic laboratory techniques in the isolation, cultivation, observation and identification of micro-organisms, and establishes a solid foundation for further microbiological studies.

■ SF552 FOOD SCIENCE & NUTRITION

CREDIT POINTS 15
OFFERED One Semester

The unit introduces the student to a range of biological materials used in the food processing industry. The commodity groups studied will include muscle products, fruit, vegetables and cereals, milk and dairy products, non-tissue foods. The unit will also introduce the principles of maintaining these food materials in a satisfactory manner such that physiological and chemical/biochemical and nutritional changes that are inherently disadvantageous to food quality are minimised. The content will emphasise the value of an integrated approach to commodities and their treatments.

Adequate information on the physiological, physical, chemical, biochemical and nutritional status of food commodity groups will be gained to enable the student to satisfactorily complete the Food Processing Systems stream.

■ SF553 FOOD IN SOCIETY

CREDIT POINTS 15
OFFERED One Semester

The unit will present a comprehensive overview of the sociology of food and eating. The unit will draw on various interdisciplinary sources to explore the issue of food as a cultural symbol and a fundamental item of consumption. Topics such as cultural shaping of food choice, food prohibitions and aversions, food and religion, ceremonial foods and vegetarianism will be discussed.

■ SF621 FOOD PROCESSING SYSTEMS 1

CREDIT POINTS 15
OFFERED One Semester

The unit introduces the student to food processing systems and forms the basis for the following units (Food Processing Systems 2, 3 and Product/Process Development). The emphasis in the unit is on physical methods of food preservation and how these are used to control spoilage. The unit will provide students with an overview of the fruit, vegetable and juice processing industries. The following material will be presented during this unit:

- What is a food processing system?
- Food composition and control;
- The fruit, vegetable and juice industries; and
- Physical methods of food preservation (thermal processing including canning, determination of F_0 values, water activity, concentration and drying, refrigeration, chilling and freezing, controlled/modified atmosphere).

■ SF622 FOOD PROCESSING SYSTEMS 2

CREDIT POINTS 15
OFFERED One Semester

The unit will concentrate on the chemical preservation of foods and an analysis of the functionality of biological systems and the components of biological materials used as food. Exposure to basic knowledge and skills will continue using the cereals industry and the confectionery industry as the primary learning vehicles. The following material will be presented during this unit:

- Chemical preservation of foods;
- The structure, legal uses and limitations of the major classes of food additives;
- Functionality - what is it?
- Functionality of the major classes of food additives;
- Food additives and the Food Standards Code;
- Dietary guidelines and their implications for the food industry and the consumer;
- Hydrocolloids and rheology (effects of processing and processing conditions on the physico-chemical properties of biopolymers);
- Sugar and confectionery; and
- Sensory evaluation of food systems.

■ SF631 FOOD MICROBIOLOGY 1

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF532

History and significance of micro-organisms in foods, incidence and types of micro-organisms; control of micro-organisms via chemical agents, physical agents, and antimicrobial chemotherapy; microbial growth and death, including growth kinetics and measurement and kill kinetics; advanced isolation and identification techniques, including culture, microscopic, and sampling methods; physical, chemical, and immunologic methods; bioassay and related methods. This unit will develop advanced laboratory techniques in the isolation, cultivation, observation and identification of micro-organisms.

■ SF632 FOOD MICROBIOLOGY 2

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF631

Importance of micro-organisms in foods with respect to food spoilage and food-borne disease; food preservation techniques including chemical, radiation, and physical methods, and the principles of fermentation for preservation; microbiological safety of foods covering: indicators of microbial quality and safety; testing and sampling plans; HACCP; microbiological criteria; and Government regulations.

■ SF641 FOOD ANALYSIS

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF512

Sampling and sampling techniques; assessment of analytical methods and data; recording and reporting data; quality of data; principles of general techniques used in food analysis; spectroscopic techniques used in food analysis including UV/VIS methods, atomic absorption and flame emission; an introduction to chromatographic methods including applications of chromatography; gas-chromatography and high-performance liquid chromatography; applications of paper chromatography, thin-layer chromatography and column chromatography in food analysis.

■ SF642 FOOD CHEMISTRY

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF641

Properties and function of water in food; carbohydrates; functions of monosaccharides, disaccharides and polysaccharides in foods; amino acids, polypeptides and proteins in foods including functional properties and changes with processing and storage; lipids, lipolysis, autoxidation and thermal decomposition of lipids; composition and nutritional aspects of minerals in foods; enzymes in foodstuffs.

■ SF651 APPLIED BIOCHEMISTRY

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE Normally SF512

This unit provides an introduction to the basic principles and applications of biochemistry, with emphasis on the food science and nutritional aspects. The unit covers: Structure and functions of cells and organelles; Small molecules as building blocks for macromolecules such as sugars and carbohydrates, amino acids and proteins, and fatty-acids and lipids; Protein structure and function; Enzymes – kinetics, regulation and applied aspects; Purification and analysis of proteins; Antibodies – structure, function and applied aspects; Cellular membranes and transport of molecules and ions across membranes.

■ SF653 NUTRITION AND METABOLISM

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF651

This unit provides an introduction to the basic principles of nutrition and metabolism. It describes the path of food from its digestion, absorption into the body, transport to specific cells and utilization of nutrients via metabolic pathways. The unit covers: Nutritional requirements and their recommended dietary intakes; Digestion and absorption of basic nutrients, ie. proteins, carbohydrates and fats; The role of vitamins and inorganic minerals in metabolism; Major metabolic pathways which generate energy; The role of fats and cholesterol in nutrition; Protein and amino acid metabolism; Distribution of nutrients in the well fed state, between meals and in starvation; The metabolic functions of adipose (fat) tissue, muscle, liver, kidney, and pancreas; Alcohol as a nutrient; Common nutritional disorders.

■ SF721 FOOD PROCESSING SYSTEMS 3

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SF622

The unit will examine the latest developments in the food processing, preservation operations, packaging operations, manufacturing and control of change in biological materials. The dairy and meat processing industries will be used to develop case studies and exemplars. The following material will be presented during this unit:

- Dairy chemistry and technology;
- Meat technology;
- Membrane processing techniques;
- Minimally processed foods;
- Ultra high temperature processing;
- Advances in pasteurisation techniques;
- Developments in packaging technology to extend the high quality storage life of foods; and
- Formulated foods.

■ SF722 PRODUCT AND PROCESS DEVELOPMENT

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITES SF721, SF632
COREQUISITE SF761

The unit applies and reinforces basic principles learnt in the first 5 semesters of the program while concentrating on team work and leadership. This is achieved by working in small groups involved in product and process development. Groups will be balanced with respect to gender and skill levels. The primary learning vehicle will be formulated foods. The following material will be presented during this unit:

- The environment for product and process development in the food processing industry;
- The product development process;
- Developing the product concept;
- Product design and the consumer;
- The mechanics of product development and food formulation;
- Profitability in food product development;
- Old and new plants for manufacturing new food products;
- Transfer of the product from the bench top through commercial production into the marketplace;
- Global product development;
- Regulation compliance; and
- Intellectual property protection.

■ SF731 FERMENTATION TECHNOLOGY

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITES SF631, SF632

History of fermentation processes and products; importance of yeasts in food fermentations; batch, fed-batch, and continuous culture systems; strain preservation, inoculum preparation and development; types of fermenters, mixing and aeration, vessel configuration, instrumentation and control, sterilisation; estimating microbial growth parameters, fermentation modelling, Monod growth equation, growth patterns and kinetics in batch and continuous culture; recovery and purification, separation of insoluble products, cell disruption, separation of insoluble products, finishing steps for purification; example fermentations including winemaking, brewing, biological waste treatment, and selected food fermentations.

■ SF732 MALTING AND BREWING SCIENCE

CREDIT POINTS 15

OFFERED One Semester

The unit will describe the complex natural processes found in the production of barley malt and the conversion of the barley malt to beer and related products (eg stout, ale, porter). The primary learning vehicle will be the production of barley (and wheat) malts using the pilot scale malting unit and the production of beer from the malts using the pilot scale brewery.

The following material will be presented during this unit:

- Water balance in malting and brewing;
- Malting technology and biochemistry;
- Mashing technology and biochemistry;
- Hop science and technology;
- Wort boiling;
- Properties of brewer's yeast;
- Fermentation technology and biochemistry;
- Maturation and conditioning;
- Post-fermentation techniques; and
- Beer quality and flavour.

■ SF741 ADVANCED FOOD CHEMISTRY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SF642

Review of proximate analysis of foods and experimental methods; chemistry of vitamins in foods including recommended dietary allowances and the affects of storage and processing; advanced instrumental analysis techniques including GC/MS, NIR, ICP, super-critical fluid extraction; flavour chemistry and analysis; colour and texture measurements; chemistry and analysis of food contaminants.

■ SF752 FOOD BIOTECHNOLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SF651

This unit provides an introduction to the principles and practice of recombinant DNA technology with emphasis on its applications in the food industry. The basic principles of the structure of DNA and its role as the store of biological information, and the processes involved in transfer of the information are covered. The unit also describes the major methods in recombinant DNA technology including the polymerase chain reaction, and their practical applications including diagnostics, production of proteins (eg vaccines) and transgenic animals and plants. The ethical, moral and safety issues of recombinant DNA technology, and the legislation which regulates recombinant DNA technology are also discussed.

■ SF761 FOOD QUALITY MANAGEMENT

CREDIT POINTS 15

OFFERED One Semester

The unit introduces the student to a blend of theoretical information, generated through discussions and inquiry and a series of group based workshops in which participants explore the application of the theory to practical situations. The general philosophies and evolution of quality management and its impact on organisations domestically and globally will be studied. This will be followed by an overview of the terminology used and importantly the types of initiatives undertaken as part of quality management. The general theories of preparing a quality manual will be undertaken as part of the introduction to ISO9000 systems, and participants will be required to use their Product Development projects as a model for the development of a quality manual. The following material will be presented during the unit:

- The philosophies of quality management and definitions of terminologies commonly used;
- Preparation and auditing of quality manuals;
- The requirements of ISO-9000 certification;
- Establishing and managing a quality system;
- Defining what to manage as part of the quality system;
- Coordinating a team approach QA/QC;
- The components of a QA/QC system;
- Implementation and management of a QA system;
- Quality planning and appraisal;
- QA/QC constraints (market, cost, legislation, organisation);
- QA/QC interfaces (product-process development, materials purchasing, QA-production-productivity interface, distribution and the consumer);
- Principles of food safety; and
- Food laws.

■ SF771 RESEARCH PROJECT

CREDIT POINTS 15

OFFERED Both Semesters

PREREQUISITES Normally, Semester 1 - 5 of the course

The incorporation of an individual research project within the course provides a challenging learning environment in which a student will be able to extend individual and independent learning skills. The project will involve an in-depth study in an area of interest developed through the course, and will require the student to carry out an extensive literature review in the area related to the project; formulate a specific research problem with defined objectives; carry out experimental work consistent with the defined objectives of the study; collate, evaluate, and interpret experimental results; present a dissertation in an appropriate format summarising the aims, objectives, results, conclusions, and recommendations of the research project; present a poster and seminar to peers and staff summarising the principle features of the project.

■ SX511 EARTH SCIENCES

CREDIT POINTS 15

OFFERED One Semester

Geologic time, its measurement and its significance in the development of our environment. The theories associated with the development of our solar system. The rock cycle (mineral and rock formation). Methods of representing and interpreting geological data. The mechanisms which shape our planet including plate tectonics, weathering and human induced effects. Understanding the role of geology in the development and modification of our environment.

■ SX521 PLANET EARTH

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES SX511 or EI535

This course aims to develop an understanding of the earth and its workings. It provides basic knowledge and skills in earth science to be used as a foundation for further studies in geology or for related subjects such as engineering. Content includes crystallography, mineral and rock identification, structures and geological maps, plate tectonics, earthquakes and Earth's internal structure, ore deposits.

■ SX522 LANDSCAPE EVOLUTION

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SX511 or EI535

Landscape evolution on the global scale. The role of plate tectonics in shaping continental landscape components. The interrelatedness between geology and geomorphology. The role of rivers in shaping components of the landscape. The role of other forces (wind, glacial, groundwater) in modifying landscapes. Regolith evolution and its importance in landscape evaluation. The unit aims to develop an appreciation of the processes which shape the Earth's natural landscapes; an awareness of the impact of mankind on natural landscapes and an appreciation of the environmental and economic values of natural landscapes.

■ SX523 EARTH'S LIVING HISTORY

CREDIT POINTS 15

OFFERED One Semester

A broad survey of some of the main developments in the history of life as discerned from the rock record spanning nearly four billion years, including earliest evidence, the transition from prokaryotes to eukaryotes, the Cambrian explosion, Phanerozoic mass extinctions, possible causes and recovery, the transition of animals from the sea to the land and human evolution. Aspects of the global environment through time. How fossils are preserved. Evolution - fact and theory. The importance of the palaeontological record and ecology for public policy.

■ SX601 REGOLITH SCIENCE

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES SX521 and SX522 or equivalents

This unit addresses a need in mineral exploration and in environmental geology or greater understanding of the weathered and transported mantle that covers most of the land surface of Australia. It covers the recognition, description, classification and mapping of regolith materials, regolith processes and applications to mineral exploration and environmental geology.

■ SX617 OPTICAL MINERALOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SX521

The course is an introduction to the study of optical mineralogy: the theory of polarised light; the polarising microscope; the optical properties of the rock forming minerals' and the paragenesis of the common rock forming minerals.

■ SX618 STRUCTURAL GEOLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES SX511, SX521

This unit is designed to introduce participants to concepts governing the deformation of rock materials from a microscopic to a global scale. This will be achieved mainly through a series of tutorial and practical sessions, some of which are computer-based and others which will involve short excursions to view outcrops and diamond drill core in the Ballarat region. Topics to be covered include the concepts of stress and strain, use of stereonet to solve geometric problems, structural mapping, core logging techniques, and global tectonics.

■ SX619 SEDIMENTOLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES SX521, SX522, SX523

Topics to be covered will be drawn from the following: textural analysis (grain size, shape, rounding, sorting, fabric), sedimentary structures, mechanisms of sedimentary transport and deposition, major groups of sedimentary rocks (sandstones, mudrocks, carbonates, evaporites, volcanics), sedimentary facies analysis and depositional, provenance, stable isotopes (sedimentological applications) and sedimentation and tectonics.

■ SX627 ECONOMIC GEOLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES SX511, SX521

This unit is designed to familiarise the student with the genesis of a variety of common ore deposits through a mixture of theoretical and practical exposure. The unit will cover research techniques used to understand the formation of ore fluids, ore deposit models, metallogeny and plate tectonics, and the evolution of ore deposits through time. The ore deposit types to be discussed include: stratiform base metal deposits of both sedimentary and volcanic affiliation, Mississippi Valley-type base metal deposits, mesothermal and epithermal gold deposits, porphyry Cu-Au deposits, orthomagmatic nickel deposits, and the Olympic Dam Cu-Au deposit. Emphasis will be placed on the identification of common ore-forming minerals and the description of ore specimens.

■ SX628 HYDROLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SX522

This unit provides the student with an understanding of the terminology, concepts and principles of physical hydrology. The unit is designed to provide a background for a career in the environmental science or environmental engineering industries. Surface water hydrology: precipitation, evaporation, soil moisture; infiltration; porosity, runoff, stream measurement and hydrographs, storm flow and floods, baseflow. Groundwater hydrology: specific yield, specific retention, capillarity, hydraulic heads and gradients, Darcy's law, geology of groundwater flow, regional flow, recharge and discharge, aquifers, aquifer characteristics, homogeneity and isotropy.

Groundwater movement, flow nets, flow to a well. Transmissivity, storativity, aquifer tests and their analysis. Principles of numerical modelling. Water and catchment management issues, water quality and supply.

■ SX629 FIELD WORK PRINCIPLES & PRACTICE

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES SX521, SX522

COREQUISITES SX618, SX619

This unit introduces students to the field practice of geology, upon which all other branches of geology are built. They will learn the use of a geological compass, the use of topographic maps and aerial photographs, the meaning of map symbols, the preparation of cross sections, section measurement, field mapping techniques and standard geological report writing. A minimum of 12 days will be spent in the field.

■ SX630 GEOLOGICAL DATA ANALYSIS

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITES Basic computing skills, SX511

This unit is designed to introduce participants to the use of various methods of geographic data analysis commonly used in the geological sciences. Emphasis will be placed on the development of computer skills relevant to the minerals industry through a series of tutorials and practical sessions in the computer laboratory. Topics to be covered include geological resources on the World Wide Web, the use of spreadsheets to solve geological problems, an introduction to Geographic Information Systems (GIS), use of Global Positioning Systems (GPS) for field location, contouring and gridding of spatial data, Computer Assisted Drafting (CAD), geostatistical packages, the image analysis as applied to the field of remote sensing. Assessable tasks will include practical assignments, a research paper and a major research project.

■ SX631 PALAEOBIOLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SX523

Topics covered will be drawn from the following: palaeobiology, including palaeoecology, functional morphology, ichnology; systematics, including principles, protists, sponges, brachiopods, bryozoans, molluscs, arthropods, echinoderms, graptolites, conodonts, vertebrates; and applications, including biostratigraphy and palaeoenvironmental interpretation.

■ SX717 PETROLOGY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SX617

The variety of igneous rocks found in the Earth's crust. Rock classification and nomenclature. Origins of magma and lava. Magmatic processes. Igneous rock associations. Tectonic setting of igneous rocks. Igneous petrography. The physical conditions of the Earth's crust. The nature of metamorphic processes. Metamorphic reactions. Metamorphic petrology and petrography.

■ SX718 APPLIED GEOCHEMISTRY

CREDIT POINTS 15

OFFERED One Semester

PREREQUISITE SX521

Basic chemical principles such as pH, Eh, solubility, dispersion, standards, precision/accuracy, contamination, speciation and chemical data presentation of specific purpose will be reviewed. Analytical methods will be described and cost benefits evaluated for exploration, environmental and material use. A variety of survey methods, including stream sediment, soil, rock, biogeochemistry, gas and water and questionnaire will be introduced and evaluated for purpose. Sampling theory and statistical analysis of geochemical survey data will be also covered. A variety of environmental issues related to the mining industry and extractive industries will also be discussed with a view toward understanding chemical dispersion of toxic compounds. Landfill and site remediation will be used to illustrate geochemical problems facing our community.

■ SX719 FIELDWORK

CREDIT POINTS 15
OFFERED Both Semesters
PREREQUISITES SX629, SX618
COREQUISITE SX717

This unit aims to introduce students to the skills and techniques of mapping and interpretation of a region of the Earth's crust of complex structural and metamorphic history. An extended field camp of 9 to 10 days duration forms the major learning experience. Assessment will be based on the production and interpretation of a geological map.

■ SX726 APPLIED STRATIGRAPHY

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITES SX523, SX619

Topics covered will be drawn from the following: fundamentals of stratigraphy (lithostratigraphy, biostratigraphy, chronostratigraphy, sequence stratigraphy, magnetostratigraphy), correlation, geochronology, petroleum geology, coal geology, evolution of the Australian continent.

■ SX728 APPLIED GEOPHYSICS

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITE SX627

This unit provides the student with an understanding of the terminology, concepts and principles of geophysical exploration. The unit is designed to provide a background for a career in either the exploration/mining or the environmental geology/science industries. Gravity method; Magnetic method; Radiometric method; Resistivity method; Induced Polarisation method; Electromagnetic method; Seismic method.

■ SX729 PROJECT

CREDIT POINTS 15
OFFERED Both Semesters
PREREQUISITES A minimum of four of the following units which the supervisor considers appropriate to the project topic: SX617, SX618, SX619, SX627, SX628, SX629, SX630, SX631.

This unit aims to develop concepts of individual research and investigation, literature research, collection, collation and presentation of field and laboratory data and report writing. All students will undertake a project involving geological research, supervised by one or more staff members, and will submit a report on their work. The project work will include data collection and compilation, computation and presentation, and report writing.

■ SX730 ANALYTICAL TECHNIQUES

CREDIT POINTS 15
OFFERED One Semester
COREQUISITE SX717

Principles of electron microscopy, x-ray diffraction, atomic absorption spectrometry, incident light microscopy, fluid inclusion geothermometry, quantitative microscopy and other laboratory techniques. Practical applications and laboratory sessions.

■ SX731 EXPLORATION AND MINING GEOLOGY

CREDIT POINTS 15
OFFERED One Semester
PREREQUISITES SX627, SX718
COREQUISITE SX728

This unit is designed to introduce the student to methods and approaches used in mineral exploration and mining, and to familiarise them with design and implementation of mineral exploration strategies based on a sound and practical knowledge of ore deposit models. The development of geological problem-solving skills and team work will be emphasised. Topics to be covered include economic and environmental aspects of mining, mining legislation and its relationship to exploration outcomes, simple grade and tonnage calculations, ore reserve estimation, exploration techniques such as drilling and sampling, and mining geology. This unit will emphasise the development of problem-solving skills. Practical exercises of direct relevance to industry will include underground and open pit mapping excursions, and logging of diamond drill core and RC rock chips. A major, team-based exploration project will also be carried out.

■ SX732 ADVANCED FIELD WORK

CREDIT POINTS 15
OFFERED Block mode
PREREQUISITE SX719

This unit is designed to introduce students to advanced aspects and techniques in field geology. Content varies with the field region selected, but generally includes: geomorphology, regional geology, tectonics, sedimentary, igneous and/or metamorphic studies, economic geology, environmental geology, palaeontology, field mapping and mine geology. Field locations may be outside of Australia.

■ SX733 ENGINEERING GEOLOGY

CREDIT POINTS 15
OFFERED One Semester

This unit covers the application of geological knowledge to engineering infrastructure and planning. Appropriate land-use planning is assessed through the study of the occurrence, effects and prediction of geological hazards, such as earthquakes and landslides. Assessments of the capability of particular landscape units to sustain agricultural, civil or mining project are made. Mechanical properties of soils and rocks are examined, including in the field and laboratory projects. Engineering Geology applications include slope stability, foundations, dams, mines and quarries, coastal structures, offshore structures, site selection, and subdivision.