Supplement to Outcome P8

MAPPING OF THE ABE PROGRAMME OF STUDIES IN OCEANIA

developed by Working Group 1
UNIVERSITIES IN OCEANIA OFFERING PROGRAMS OF STUDIES IN ABE OR RELATED DISCIPLINES

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### AUSTRALIAN UNIVERSITIES

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A. SCOPE OF PROGRAM OF STUDIES

A1. Major in Agricultural Engineering (Southern Queensland University)

Southern Queensland University (USQ) is the centre of agricultural engineering in Australia, offering a solid and practical education, which is highly respected by employers. USQ is the only institution in Australia offering a degree specialising in agricultural engineering. In fact, USQ offers the major in Agricultural Engineering, which provides students with the knowledge to address problems related to the sustainable agricultural production, the environmental impacts of agriculture and the post-harvest handling of agricultural and other primary products. Students also acquire an understanding of the biological implications, which allows them to work with specialists in agricultural science and biology. The related graduates can obtain job positions in the areas of design, development, research and management in agriculture, irrigation, intensive livestock, processing, transport, forestry, water supply, soil conservation, environmental protection and water conservation, both in Australia and overseas. Moreover, USQ offers Master and PhD programs in Agricultural Engineering and, above all, houses the National Centre for Engineering in Agriculture (NCEA), a joint venture between USQ itself and the Queensland Government Natural Resources, Mines and Water (NRM & W).

Bachelor in Agricultural Engineering

USQ's Agricultural Engineering programs prepare students to find solutions to problems related to the sustainable agricultural production, the environmental impacts of intensive agriculture, and the post-harvest handling of agricultural and other primary products. The related graduates might:

- design a machine to peel and slice a mango;
- predict the odour emanating from a feedlot;
- eliminate road dust from a cattle trailer;
- remotely guide a tractor along a set path;
- use weather forecasts to manage the harvest of a cereal crop;
- design a computer model of a mobile irrigation machine;
- control the respiration rate of a stored apple;
- assess the environmental impact of a piggery development.

The related graduates have many career opportunities in the areas of research, design, development and management. They could work in private industry or a consulting firm or in the public sector, in state government water supply, agriculture, forestry, soil conservation and environment protection agencies. There are also many career opportunities overseas, both in developed and underdeveloped nations. The wide range of employment areas open to Agricultural Engineers include:

- agricultural hydrology (e.g. irrigation, drainage, salinisation, micrometeorology);
- agricultural machinery (e.g. tractors, tillage, seeding and harvesting equipment, spray technology, machinery);
- terramechanics (e.g. traction, tillage, soil compaction);
- environmental management (e.g. soil conservation, environmental impact assessment, catchment management, agricultural waste disposal);
- controlled environments (e.g. intensively housed livestock, greenhouses, nurseries);
- post-harvest technology (e.g. grading, processing, packaging, storage, handling and transport of produce);
- electronics and instrumentation (e.g. computer, robotics and measurement applications).
B. UNDERGRADUATE CURRICULA

B1. Bachelor of Engineering (Southern Queensland University)

Core courses

The courses included in the core of the B.Eng. study program are shown in the following table.

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MAT1502 Engineering Mathematics 2 (FOSCI)

Semester 2 (ONC) Toowoomba (EXT) Toowoomba

Units 1.0 (Mathematics) Band 6

Synopsis

It is assumed that students entering this course already have well-established algebra, function, graphing and trigonometry competencies, and have already developed introductory level skills in matrices, vectors and calculus.

This course advances conceptual and technical competencies in these fields by investigating limits, continuity, inverse functions, compositions, rational functions and implicit functions. Differentiation and integration are advanced and used in engineering applications and problem-solving. Vector algebra is extended and applied to the description of lines and planes in space. Matrix algebra is extended to determinants, and used for modelling and to solve
systems of linear equations in a range of settings. Euler notation is used to represent complex numbers and functions.

MAT2500 Engineering Mathematics 3 (FOSCI)

Semester 2 (ONC) Toowoomba (EXT) Toowoomba
Units 1.0 (Mathematics) Band 6
Pre-requisite: MAT1102 or MAT1502 or Students must be enrolled in one of the following Programs: MSBI or GCEN or GDET or METC

Synopsis

This course covers multivariable calculus including representation of functions of several variables, surfaces and curves in space, partial differentiation, optimisation, directional derivatives, gradient, divergence and curl, line integrals, iterated integrals, Green's theorem. Students are introduced to differential equations including direction fields, Euler's method, first order separable, first order linear and second order linear with constant coefficients. Linear algebra concepts are extended to systems of linear equations, projections, transformations, eigenvalues and eigenvectors, diagonalisation, and applications are explored.

ENG1001 Principles of Professional Engineering and Surveying (FOENS)

Semester 1 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba
Semester 2 (ONC) Toowoomba (EXT) Toowoomba
Units 1.0 (EnginTech not classified) Band 2

Synopsis

The purpose of this course is to introduce students to the engineering and surveying profession, and to provide them with relevant understanding and skills to effectively study the relevant courses, and also to progressively develop the relevant graduate attributes required of their profession throughout their tertiary studies.
Areas covered are the nature of engineering and surveying, the interaction of engineering and surveying with society and the environment, and exposure to a range of professional skills, including self-management, communications, information literacy, information technology, and project management. These areas are covered by a selection of case studies and a number of modules on simple engineering planning and effective communication. Additionally, a self-managed learning module in engineering fundamentals will be covered. ENG1101 Engineering Problem-Solving 1 will be introducing to the students the principles of multi-disciplinary team-oriented projects in engineering & surveying.
MAT1500 Engineering Mathematics 1 (FOSCI)

Semester 1 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba  
Units 1.0 (Mathematics) Band 6  
Current skills at the level of Queensland Senior Secondary School Studies Mathematics B

Synopsis

Assuming current skills at the level of Queensland Senior Secondary School Studies Mathematics B, this course strengthens and further develops algebra, function, trigonometric, exponential, logarithm and graphing competencies, and introduces matrices, vectors and calculus. Emphasis is placed on developing strong foundation skills in these areas for use in Engineering studies, and on exploring and applying these skills to a range of engineering and surveying contexts.

ENG2002 Technology and Society (FOENS)

Semester 1 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba  
Semester 3 (EXT) Toowoomba  
Units 1.0 (EnginTech not classified) Band 2

Synopsis

Students of engineering and surveying need to understand and be convinced that through their future professional work they will relate to the rest of society. Throughout their careers they will need to strive to ensure that this relationship is meaningful and successful. Only then will they earn respect for themselves and their profession, and ensure their work will be valued and recognised. For engineers and surveyors to meet their responsibilities towards society they must be able to appreciate how politics, culture, economics and the law affect their work and how their work impacts on different sections of the community and the physical environment. They must also be prepared to deal with the issue of long-term sustainability. The goal of this course is to provide students with the opportunity to develop skills and attitudes that would help them promote and defend their work within their profession and within society at large.

ENG1101 Engineering Problem Solving 1 (FOENS)

Semester 1 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba  
Semester 2 (ONC) Springfield (EXT) Toowoomba  
Units 1.0 (EnginTech not classified) Band 2
Synopsis

This course introduces the student to some important engineering tools that will provide the basis for future work. The student will be introduced to the concept of a system and to the need for multidisciplinary teamwork in most engineering activities. Aspects of physical properties and conceptual designs are investigated and both these are applied to the analysis of complex real world projects. The course is presented as an initial introduction to problem based learning, and the use of virtual teamwork is emphasized throughout. All students are expected to contribute and to interact in a positive manner with other team members. This interaction is assessed. Students are expected to work both independently and as part of a team to provide solutions to projects which demonstrate use of appropriate technology and cultural sensitivity.

ENG2102 Engineering Problem Solving 2 (FOENS)

Semester 2 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba
Units 1.0 (EnginTech not classified) Band 2
Pre-requisite: ENG1101

Synopsis

This course will increase a student's ability to work as part of an engineering team. It presents a range of engineering theory and applications through engineering design concepts that are learnt within the context of solving a range of real world problems. This course focuses primarily on the use of statistical analysis to analyse data, propose solutions, solve problems and to evaluate possible solutions. In addition the student is required to further develop their computer skills (especially Excel) to illustrate and present the results of their work.

ENG3103 Engineering Problem Solving 3 (FOENS)

Semester 2 (ONC) Toowoomba (EXT) Toowoomba
Units 1.0 (EnginTech not classified) Band 2
Pre-requisite: (ENG2102 and MAT1502) or Students must be enrolled in one of the following Programs: GCEN or GDET or METC or MEPR
Recommended prior or concurrent study: MAT2500

Synopsis

This is the third in a sequence of four courses that use a 'problem based learning approach' to extend the students knowledge of the complex world of engineering. In this course the student will build on the problem solving skills developed in earlier courses whilst acquiring, mastering and assimilating new knowledge and techniques into their chosen field of study.
Of particular importance to the engineer is the ability to develop an appropriate model to describe the behavior of an engineering system, and then to analyse that behaviour and apply engineering judgement in the interpretation of the results of that model. Often this model will be of a mathematical nature and the engineer requires the ability to solve such numerical problems. The student will be required to develop skills in programming using a scripting language. The student will undertake a range of numerical computation exercises using a scripting language. As in the previous courses of this strand, the student is to develop skills in problem solving within an engineering context. A number of real world problems and case studies provide the basis for meeting this objective.

ENG4104 Engineering Problem Solving 4 (FOENS)

Semester 2 (ONC). Toowoomba (EXT). Toowoomba
Units 1.0 (EnginTech not classified) Band 2
Pre-requisite: ENG3103 or Students must be enrolled in one of the following Programs: GCEN or GDET or METC or MEPR

Synopsis

This course introduces the student to the treatment of real world engineering systems. Advanced numerical techniques and programming skills for the handling of non linearity and partial differential equations will be learnt. In addition, the student is required to explore the philosophical approaches to engineering problem solving and evaluate the "downstream" consequences of specific solutions to the problems.

ENG4111 Research Project Part 1 (FOENS)

Semester 1 (ONC). Toowoomba (EXT). Toowoomba
Units 1.0 (EnginTech not classified) Band 2
Recommended prior study: ENG3902 Recommended concurrent study: ENG4903

Synopsis

The project (comprising ENG4111 Research Project Part 1 immediately followed by ENG4112 Research Project Part 2) is intended to integrate and augment the student's total formal knowledge by means of its application to a real problem at the appropriate professional level.
This course (being the first half of the project) will comprise firstly the selection, negotiation and approval of a project topic appropriate to the student's major study. Following this the student will (i) research the background, context and literature, (ii) develop an appropriate methodology, (iii) demonstrate a sound appreciation of the overall task and its constraints by formal reporting, and (iv) make substantial progress in the execution of the work.
ENG4112 Research Project Part 2 (FOENS)

Semester 2 (ONC) Toowoomba (EXT) Toowoomba
Units 1.0 (EnginTech not classified) Band 2
Pre-requisite: ENG4111
Recommended prior study: ENG3902 Recommended concurrent study: ENG4903

Synopsis

Following satisfactory progress in ENG4111 Research Project Part 1 in the preceding semester of offer, and with the continuing guidance of supervisor/s, the student will further develop skills spanning both the technical and non-technical dimensions of engineering and spatial science at the professional level. The student will study and replicate the rationale, style and format of the academic dissertation and present the total project work (comprising ENG4111 Research Project Part 1 and ENG4112 Research Project Part 2) as a dissertation.

ENG3003 Engineering Management (FOENS)

Semester 1 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba
Semester 3 (EXT) Toowoomba
Units 1.0 (EnginTech not classified) Band 2
Recommended prior or concurrent study: ENG2002

Synopsis

Engineers have a sound educational base in the theory and application of technology, and they are well placed to play important roles as managers in manufacturing, construction and other engineering industries. Many engineers take on managerial roles during their careers, some within a short time of graduation. It is therefore essential that graduate engineers have an understanding of the basic principles of management and their application in engineering organisations. Graduates also need an appreciation of the social environment within which they will practice, particularly those aspects of the law and ethics pertaining to the engineering profession.

ENG1100 Introduction to Engineering Design (FOENS)

Semester 1 (ONC) Toowoomba (EXT) Toowoomba
Semester 2 (ONC) Toowoomba (ONC) Springfield (EXT) Toowoomba
Units 1.0 (Computer Graphics) Band 2
Synopsis

The rationale for this course is to motivate students by fostering creativity and introducing conceptual design, computer aided design and drafting early in the course.
Early training and practice in the engineering design method, the introduction to engineering handbooks and commercial catalogues is necessary for a foundation to which students can relate future studies in the more advanced courses of the program. Engineers need skills in graphical communication and spatial vision in the practice of their profession.

ENG1901 Engineering Practice 1 (FOENS)

Semester 1 (ONC) Toowoomba (ONC) Springfld
Semester 2 (ONC) Toowoomba (EXT) Toowoomba
Semester 3 (EXT) Toowoomba
Units 0.0 (EnginTech not classified) Band 2

Synopsis

This course is the first of a series of Practice courses that are intended to enable students to acquire engineering and professional practice skills. Engineering practice skills, such as the ability to perform practical and project work, innovation, problem identification and solution, and engineering judgement, will be developed as students progress through their programmes of study through activities such as laboratory and field work, engineering problem solving and design and project work.
Students will generally work in teams to assist with the building of group interaction skills such as negotiation and interactive thinking. The development of other professional practice skills, such as written and oral communication, is also encouraged in the engineering practice courses. In this introductory course, external students will attend a residential school and undertake practical work primarily in the areas of instrumentation and measurement, or engineering materials and manufacturing. They will be required to prepare a comprehensive report and to present a seminar on one aspect of this work. Students will be introduced to the library and computing facilities of the University and are expected to utilise these resources in the compilation of their reports and seminars. A series of keynote addresses will be staged to assist students with their task. On campus students will also undertake practical work in the areas of instrumentation and measurement, or engineering materials and manufacturing, and will be required to prepare a comprehensive report and to present a seminar. For these students, the practical work will be performed throughout the semester. All students will be introduced to the Workplace Health and Safety Act and will undertake a preliminary workplace health and safety exercise. ENG1901 Engineering Practice 1 is intended primarily to cater for the needs of recent school leavers and people with limited working experience in engineering industry. If you have a trade certificate and have been employed in industry for some time, you will probably be able to claim exemption from the course.
ENG3902 Professional Practice 1 (FOENS)

Semester 2 (ONC) Toowoomba (EXT) Toowoomba
Units 0.0 (EnginTech not classified) Band 2

Synopsis

This is the first of two courses which address, in a generic sense, the practice of professional engineering and professional spatial science. The course is concerned largely with non-technical matters, generally independent of the specific disciplines, which involve the particular work undertaken, performance and responsibilities borne by the professional engineer and spatial scientist. The major manifestations of this professional practice is the participation in professional development activities and the planning, execution and reporting of project work. Hence a major portion of this course is directed at the preparation for the commencement of your final year ENG4111 Research Project Part 1 and ENG4112 Research Project part 2. This preparation includes consulting with supervising staff, a lecture and attendance at the annual "Project Conference" in which ENG4903 Professional Practice 2 students present their completed project work to other students, staff and members of various professions. Students will also participate in, and report on, a range of laboratory sessions, demonstrations, seminars and workshops provided by staff of the Faculty, the wider university and by industry representatives. Students are required to choose and self organise the completion of one or two similar activities off campus. These activities (labeled "Booths") seek to provide the student with some insight into the "cutting edge" of current engineering and surveying practice.

ENG4903 Professional Practice 2 (FOENS)

Semester 1 (ONC) Toowoomba
Semester 2 (EXT) Toowoomba
Units 0.0 (EnginTech not classified) Band 2
Pre-requisite: ENG3902
Recommended prior or concurrent study: ENG4111 and ENG4112

Synopsis

This is the second of two courses which address, in a generic sense, the work undertaken, the performance required and responsibilities borne by the practices of professional engineering and spatial science. As the final practice course in the Bachelor of Engineering and Bachelor of Spatial Science, this course is particularly concerned with interaction with the professions at large. It is also concerned with developing an awareness of professional ethics, environmental responsibilities and sustainability principles. A major part of all engineering and spatial science project work is the appropriate communication of the outcome. This course provides guidance and experience in both verbal (seminar) and written reporting skills and is
undertaken to complement the courses ENG4111 Research Project Part 1 and ENG4112 Research Project Part 2 in the final year of the Bachelor Degree. The presentation of a major seminar on the work undertaken during the final year project is a requirement for the completion of this course.
C. GRADUATE STUDIES

C1. PhD programs (Melbourne University)

The Melbourne School of Land and Environment offers PhD programs in the following areas:

- Agriculture and Resource Management;
- Agribusiness;
- Geography;
- Food Science (Food and Dairy Chemistry; Food Process Engineering; Food Production Development and Processing; Marketing, International Trade and Policy; Food and Dairy Microbiology);
- Forest and Ecosystem Science (Agro-forestry; Biotechnology; Community Management; Conservation; Ecology; Ecophysiology; Economics; Greenhouse Balance; Harvesting; Human Values; Fire; Hydrology; Pest Management; Soils and Nutrients; Genetics; Remote Sensing; Restoration Ecology; Silviculture; Tree Physiology; Wildlife Interactions; Wood and Processing Science);
- Horticulture (Urban Vegetation Establishment and Management; Plant Production Technology; Amelioration and Management of Problems of Growing Plants in Urban Soils; Revegetation and Habitat Reconstruction; Heritage Studies in Environmental Horticulture; Plant Selection and Breeding for Urban Landscapes; Sustainable Management Practices; Effective Water Management Practices and Technologies).

In order to help candidates in searching for interesting research areas, the University provides a comprehensive Research Report at:

http://www.research.unimelb.edu.au/rpag/reports/research/

The PhD program is administered by the Melbourne School of Graduate Research on behalf of the University of Melbourne.

Information about the applications for the PhD program can be found at:

http://www.gradresearch.unimelb.edu.au/