

Civil and environmental engineering

Civil engineering

Civil engineering has been taught at the University of Melbourne since 1860. From an initial certificate course, the demands of the profession have seen the development of not only a single degree in civil engineering in 1893, but also combined degrees: civil engineering with commerce, science, arts or law.

Civil engineering is a diverse and broad-ranging discipline concerned with designing and constructing the national infrastructure. Civil engineers are concerned with sustainable development and environmental management, and in most activities they work as part of an interdisciplinary team, often as the team leader, utilising their project management skills. Civil engineers may work as 'general practitioners' or they may specialise in the sub-disciplines of structural, geotechnical, water resources, coastal, transport engineering or construction.

The BE degree in civil engineering comprises a core of compulsory subjects complemented by electives in each year of the course. First and second years concentrate on developing an understanding of engineering sciences aspects of engineering. This is done through subjects that include mathematics, computing, solid mechanics, geomechanics and material behaviour. These subjects are supported with introductory courses in design and engineering management.

In third and fourth years the primary focus is on the application of engineering theory in the areas of hydraulics, water resources, geotechnical engineering, structures and transport. Studies in management and construction engineering are also mandatory.

Environmental engineering

Following a long tradition in teaching and research of land and water management and environmental issues, the Department of Civil and Environmental Engineering has consolidated its undergraduate offerings in this important area by offering a degree stream in environmental engineering.

The objective of the course in environmental engineering is to graduate professional engineers with leadership qualities in engineering aspects of land and water management and environmental assessment, and skills in surface and groundwater hydrology, hydrogeology, irrigation engineering and water supply, land reclamation and sediment, nutrient and solute transport. Such engineers should be able to converse scientifically with biologists, ecologists and resource managers, have analytical, synthesis and numerical skills, and have experience in computing, field and laboratory techniques relating to natural resources. With these skills, graduates will be able to play a leading role in developing engineering solutions with an ecologically sustainable context.

The first year of the environmental engineering stream is flexible, but contains a solid grounding in mathematics, chemistry and basic engineering science. Engineering projects are introduced as a vehicle to discover the diverse nature of engineering inputs and the relationship of engineering to the natural environment and a sustainable world. Second year develops themes from first year to introduce basic engineering. The environmental engineering emphasis is introduced through the specialist subjects environmental engineering and engineering geomorphology. Management principles applicable to the natural environment are also introduced.

In third year the course has an emphasis on hydraulics, hydrology and design. A practical course covering techniques for gathering the data required for design appears at this level.

At fourth-year level, in addition to design and a major research project, four themes are developed in management and communication, hydrology, water management and land management.

Attributes of our graduates

The undergraduate degree streams are accredited by the Institution of Engineers, Australia. In order to achieve this accreditation we aim to develop the following attributes in our graduates:

- ability to apply knowledge of basic science and engineering fundamentals;
- ability to communicate effectively, not only with engineers but also with the community at large;
- in-depth technical competence in at least one engineering discipline;
- ability to undertake problem identification, formulation and solution;
- ability to utilise a systems approach to design and operational performance;
- ability to function effectively as an individual and in multi-disciplinary and multicultural teams, with the capacity to be a leader or manager as well as an effective team member;

- understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development;
- understanding of the principles of sustainable design and development;
- understanding of and commitment to professional and ethical responsibilities; and
- expectation and capacity to undertake life-long learning.

Undergraduate degree course structures

Bachelor of Engineering (Civil) (BE)

The course structure below represents the core content for the BE (Civil) degree. All students should check that they have taken the listed subjects, or equivalent. For further information and up-to-date course advice students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen such that departmental guidelines on electives are satisfied (see <<http://www.civag.unimelb.edu.au/undergraduate>>). Students should also avoid timetable clashes in choosing their electives. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

	Points
First year	
Semester 1	
421-101 The Art & Science of Civil Engineering (<i>p.7</i>)	12.5
421-103 Engineering Statics (<i>p.7</i>)	12.5
433-151 Introduction to Programming (Advanced) (<i>p.15</i>)	12.5
or	
433-171 Introduction to Programming (<i>p.15</i>)	12.5
620-121 Mathematics A (Advanced) (<i>p.4</i>)	12.5
or	
620-141 Mathematics A (<i>p.5</i>)	12.5
Semester 2	
421-102 Dynamics and Measurement Systems (<i>p.7</i>)	12.5
421-104 Case Studies in Engineering (<i>p.7</i>)	12.5
620-123 Applied Mathematics (Advanced) (<i>p.4</i>)	12.5
or	
620-143 Applied Mathematics (<i>p.5</i>)	12.5
Elective	12.5
Second year	Points
Semester 1	
431-201 Engineering Analysis A (<i>p.9</i>)	12.5
421-208 Mechanics of Solids (<i>p.8</i>)	12.5
421-255 Management for Engineers 1 (<i>p.8</i>)	12.5
451-201 Geomatics for Engineers (<i>p.5</i>) ¹	12.5
Semester 2	
431-202 Engineering Analysis B (<i>p.9</i>)	12.5
421-207 Introduction to Design (<i>p.8</i>)	12.5
421-209 Geomechanics 1 (<i>p.8</i>)	12.5
Elective	12.5
1. Or elective approved by the Department of Civil and Environmental Engineering.	
Third year	Points
Semester 1	
421-305 Engineering Hydraulics 1 (<i>p.8</i>)	12.5
421-306 Geotechnical Engineering (<i>p.8</i>)	12.5
421-307 Structural Engineering 1 (<i>p.8</i>)	12.5
421-355 Management for Engineers 2 (<i>p.10</i>)	12.5
Semester 2	
421-316 Engineering Hydraulics & Hydrology (<i>p.9</i>)	12.5
421-317 Structural Engineering 2 (<i>p.9</i>)	12.5
421-318 Construction Engineering (<i>p.9</i>)	12.5
625-023 Geology (Engineering Course) (<i>p.4</i>) ¹	12.5
1. Or elective approved by the Department of Civil and Environmental Engineering.	

Fourth year

	Points
Semester 1	
421-401 Techniques of Research and Investigation (<i>p.10</i>)	6.25
421-405 Management for Engineers 3 (<i>p.10</i>)	12.5
421-410 Structural Steel Theory & Design (<i>p.10</i>)	6.25
421-447 Transport Engineering (<i>p.11</i>)	12.5
Civil engineering elective ¹	12.5
Semester 2	
421-411 Concrete Theory & Design (<i>p.10</i>)	6.25
421-420 Hydraulic Engineering Design (<i>p.11</i>)	6.25
Civil engineering electives ²	37.5

1. Or elective approved by the Department of Civil and Environmental Engineering
2. Or electives approved by the Department of Civil and Environmental Engineering

Bachelor of Arts/Bachelor of Engineering (Civil) (BA/BE)

Students studying the BE/BA degree should consult the BE single degree course structure for a current list of core engineering subjects. For further information and up-to-date course advice students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web at <<http://www.civag.unimelb.edu.au/undergraduate>>/.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen such that departmental guidelines on electives are satisfied (see: <<http://www.civag.unimelb.edu.au/undergraduate/>>). Students should also avoid timetable clashes in choosing their electives. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

	Points
First year	
Semester 1	
421-103 Engineering Statics (<i>p.7</i>)	12.5
620-121 Mathematics A (Advanced) (<i>p.4</i>)	12.5
or	
620-141 Mathematics A (<i>p.5</i>)	12.5
Arts subjects as required	25
Semester 2	
421-104 Case Studies in Engineering (<i>p.7</i>)	12.5
620-123 Applied Mathematics (Advanced) (<i>p.4</i>)	12.5
or	
620-143 Applied Mathematics (<i>p.5</i>)	12.5
Arts subjects as required	25
Second year	
Semester 1	
431-201 Engineering Analysis A (<i>p.9</i>)	12.5
433-151 Introduction to Programming (Advanced) (<i>p.15</i>)	12.5
or	
433-171 Introduction to Programming (<i>p.15</i>)	12.5
Arts subjects as required	25
Semester 2	
421-102 Dynamics and Measurement Systems (<i>p.7</i>)	12.5
431-202 Engineering Analysis B (<i>p.9</i>)	12.5
Arts subjects as required	25
Third year	
Semester 1	
421-208 Mechanics of Solids (<i>p.8</i>)	12.5
421-255 Management for Engineers 1 (<i>p.8</i>)	12.5
Arts subjects as required	25
Semester 2	
421-207 Introduction to Design (<i>p.8</i>)	12.5
421-209 Geomechanics 1 (<i>p.8</i>)	12.5
Arts subjects as required	25
Fourth year	
Semester 1	
421-305 Engineering Hydraulics 1 (<i>p.8</i>)	12.5
421-306 Geotechnical Engineering (<i>p.8</i>)	12.5
421-307 Structural Engineering 1 (<i>p.8</i>)	12.5
421-355 Management for Engineers 2 (<i>p.10</i>)	12.5
Semester 2	

Fourth year

	Points
421-316 Engineering Hydraulics & Hydrology (<i>p.9</i>)	12.5
421-317 Structural Engineering 2 (<i>p.9</i>)	12.5
421-318 Construction Engineering (<i>p.9</i>)	12.5
Arts subject as required	12.5

Fifth year

	Points
Semester 1	
421-401 Techniques of Research and Investigation (<i>p.10</i>)	6.25
421-405 Management for Engineers 3 (<i>p.10</i>)	12.5
421-410 Structural Steel Theory & Design (<i>p.10</i>)	6.25
421-447 Transport Engineering (<i>p.11</i>)	12.5
Arts subject as required	12.5
Semester 2	
421-411 Concrete Theory & Design (<i>p.10</i>)	6.25
421-420 Hydraulic Engineering Design (<i>p.11</i>)	6.25
Civil engineering elective(s)	12.5
Arts subjects as required	25

Bachelor of Engineering (Civil)/Bachelor of Commerce (BE/BCom)

Students studying the BE/BCom degree should consult the BE single degree course structure for a current list of core engineering subjects. For further information and up-to-date course advice students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen such that departmental guidelines on electives are satisfied (see <<http://www.civag.unimelb.edu.au/undergraduate/>>). Students should also avoid timetable clashes in choosing their electives. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

	Points
First year	
Semester 1	
316-102 Introductory Microeconomics (<i>p.1</i>)	12.5
421-103 Engineering Statics (<i>p.7</i>)	12.5
620-121 Mathematics A (Advanced) (<i>p.4</i>)	12.5
or	
620-141 Mathematics A (<i>p.5</i>)	12.5
Commerce subject as required	12.5
Semester 2	
316-101 Introductory Macroeconomics (<i>p.1</i>)	12.5
316-130 Quantitative Methods 1 (<i>p.1</i>)	12.5
421-104 Case Studies in Engineering (<i>p.7</i>)	12.5
620-123 Applied Mathematics (Advanced) (<i>p.4</i>)	12.5
or	
620-143 Applied Mathematics (<i>p.5</i>)	12.5
Second year	
Semester 1	
316-205 Introductory Econometrics (<i>p.1</i>)	12.5
431-201 Engineering Analysis A (<i>p.9</i>)	12.5
433-151 Introduction to Programming (Advanced) (<i>p.15</i>)	12.5
or	
433-171 Introduction to Programming (<i>p.15</i>)	12.5
Commerce subject as required	12.5
Semester 2	
421-102 Dynamics and Measurement Systems (<i>p.7</i>)	12.5
431-202 Engineering Analysis B (<i>p.9</i>)	12.5
Commerce subjects as required	25
Third year	
Semester 1	
421-208 Mechanics of Solids (<i>p.8</i>)	12.5
421-255 Management for Engineers 1 (<i>p.8</i>)	12.5
Commerce subjects as required	25
Semester 2	
421-207 Introduction to Design (<i>p.8</i>)	12.5
421-209 Geomechanics 1 (<i>p.8</i>)	12.5
Commerce subjects as required	25

Fourth year	Points	Third year	Points
Semester 1		Year long	
421-305 Engineering Hydraulics 1 (p.8)	12.5	730-301 Constitutional and Administrative Law (p.2)	25
421-306 Geotechnical Engineering (p.8)	12.5	730-304 Property (p.2)	25
421-307 Structural Engineering 1 (p.8)	12.5	Semester 1	
421-350 Engineering Management 2 (p.9)	6.25	421-208 Mechanics of Solids (p.8)	12.5
Civil engineering elective	6.25	421-255 Management for Engineers 1 (p.8)	12.5
Semester 2		Semester 2	
421-316 Engineering Hydraulics & Hydrology (p.9)	12.5	421-207 Introduction to Design (p.8)	12.5
421-317 Structural Engineering 2 (p.9)	12.5	421-209 Geomechanics 1 (p.8)	12.5
421-318 Construction Engineering (p.9)	12.5	Fourth year	Points
Commerce subject as required	12.5	Semester 1	
Fifth year	Points	421-305 Engineering Hydraulics 1 (p.8)	12.5
Semester 1		421-306 Geotechnical Engineering (p.8)	12.5
421-401 Techniques of Research and Investigation (p.10)	6.25	421-307 Structural Engineering 1 (p.8)	12.5
421-405 Management for Engineers 3 (p.10)	12.5	421-355 Management for Engineers 2 (p.10)	12.5
421-410 Structural Steel Theory & Design (p.10)	6.25	Semester 2	
421-447 Transport Engineering (p.11)	12.5	421-316 Engineering Hydraulics & Hydrology (p.9)	12.5
Commerce subject as required	12.5	421-317 Structural Engineering 2 (p.9)	12.5
Semester 2		421-318 Construction Engineering (p.9)	12.5
421-411 Concrete Theory & Design (p.10)	6.25	730-462 Equity and Trusts (p.2)	12.5
421-420 Hydraulic Engineering Design (p.11)	6.25	Fifth year	Points
Civil engineering elective(s)	12.5	Semester 1	
Commerce subjects as required	25	421-401 Techniques of Research and Investigation (p.10)	6.25
Bachelor of Laws/Bachelor of Engineering (Civil) (LLB/BE)		421-405 Management for Engineers 3 (p.10)	12.5
Students studying the BE/LLB degree should consult the BE single degree course structure for a current list of core engineering subjects. For further information and up-to-date course advice students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web at < http://www.civag.unimelb.edu.au/undergraduate >.		421-410 Structural Steel Theory & Design (p.10)	6.25
When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen such that departmental guidelines on electives are satisfied (see < http://www.civag.unimelb.edu.au/undergraduate/ >). Students should also avoid timetable clashes in choosing their electives. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.		421-447 Transport Engineering (p.11)	12.5
First year	Points	Law subject as required	12.5
Year long		Semester 2	
730-104 Torts and the Process Of Law (p.1)	25	421-411 Concrete Theory & Design (p.10)	6.25
Semester 1		421-420 Hydraulic Engineering Design (p.11)	6.25
421-103 Engineering Statics (p.7)	12.5	Civil engineering elective(s)	12.5
620-121 Mathematics A (Advanced) (p.4)	12.5	Law subjects as required	25
or		Sixth year	Points
620-141 Mathematics A (p.5)	12.5	Law subjects to meet requirements of LLB (total of 300 points)	100
730-105 History and Philosophy of Law I (p.1)	12.5	Bachelor of Engineering (Civil)/Bachelor of Science (BE/BSc)	
Semester 2		Students studying the BE/BSc degree should consult the BE single degree course structure for a current list of core engineering subjects. For further information and up-to-date course advice students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web at < http://www.civag.unimelb.edu.au/undergraduate >.	
421-104 Case Studies in Engineering (p.7)	12.5	When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen such that departmental guidelines on electives are satisfied (see < http://www.civag.unimelb.edu.au/undergraduate/ >). Students should also avoid timetable clashes in choosing their electives. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.	
620-123 Applied Mathematics (Advanced) (p.4)	12.5	First year	Points
or		Semester 1	
620-143 Applied Mathematics (p.5)	12.5	421-103 Engineering Statics (p.7)	12.5
730-115 History and Philosophy of Law II (p.1)	12.5	620-121 Mathematics A (Advanced) (p.4)	12.5
Second year	Points	or	
Year long		620-141 Mathematics A (p.5)	12.5
730-202 Contracts (p.1)	25	Science subjects as required	25
730-260 Criminal Law and Procedure (p.1)	25	Semester 2	
Semester 1		421-104 Case Studies in Engineering (p.7)	12.5
431-201 Engineering Analysis A (p.9)	12.5	620-123 Applied Mathematics (Advanced) (p.4)	12.5
433-151 Introduction to Programming (Advanced) (p.15)	12.5	or	
or		620-143 Applied Mathematics (p.5)	12.5
433-171 Introduction to Programming (p.15)	12.5	Science subjects as required ¹	25
Semester 2		1. Students intending to take 200-level Faculty of Science mathematics subjects are strongly recommended to take 620-160 Experimental Design and Data Analysis as part of the BSc.	
421-102 Dynamics and Measurement Systems (p.7)	12.5		
431-202 Engineering Analysis B (p.9)	12.5		

Second year Points

Semester 1		
433-151	Introduction to Programming (Advanced) (p.15)	12.5
or		
433-171	Introduction to Programming (p.15) ¹	12.5
431-201	Engineering Analysis A (p.9)	12.5
or		
620-231	Vector Analysis (p.7)	12.5
	Science subjects as required ²	25

Semester 2		
421-102	Dynamics and Measurement Systems (p.7)	12.5
431-202	Engineering Analysis B (p.9)	12.5
or		
620-232	Mathematical Methods (p.7)	12.5
	Science subjects as required	25

1. Students planning to undertake computer science as the science major in the combined degree will be required to complete 433-172 Algorithmic Problem Solving or 433-152 Algorithmic Problem Solving (Advanced) for science points prior to commencing second-year computer science subjects.
2. Students intending to take 200-level Faculty of Science mathematics subjects should include in their science subject selection 620-122 Mathematics B (Advanced) or 620-142 Mathematics B in order to meet prerequisite requirements.

Third year Points

Semester 1		
421-208	Mechanics of Solids (p.8)	12.5
421-255	Management for Engineers 1 (p.8)	12.5
	Science subject as required	25

Semester 2		
421-207	Introduction to Design (p.8)	12.5
421-209	Geomechanics 1 (p.8)	12.5
	Science subjects as required	25

Fourth year Points

Semester 1		
421-305	Engineering Hydraulics 1 (p.8)	12.5
421-306	Geotechnical Engineering (p.8)	12.5
421-307	Structural Engineering 1 (p.8)	12.5
421-355	Management for Engineers 2 (p.10)	12.5

Semester 2		
421-316	Engineering Hydraulics & Hydrology (p.9)	12.5
421-317	Structural Engineering 2 (p.9)	12.5
421-318	Construction Engineering (p.9)	12.5
	Science subject as required	12.5

Fifth year Points

Semester 1		
421-401	Techniques of Research and Investigation (p.10)	6.25
421-405	Management for Engineers 3 (p.10)	12.5
421-410	Structural Steel Theory & Design (p.10)	6.25
421-447	Transport Engineering (p.11)	12.5
	Science subject as required	12.5

Semester 2		
421-411	Concrete Theory & Design (p.10)	6.25
421-420	Hydraulic Engineering Design (p.11)	6.25
	Civil engineering elective(s)	12.5
	Science subjects as required	25

Bachelor of Engineering (Environmental) (BE)

The course structure below represents the core content for the BE degree. All students should check that they have taken the listed subjects, or equivalent. Some common exceptions are listed below.

- 620-141 Mathematics A and 620-143 Applied Mathematics can be replaced by 620-121 Mathematics A (Advanced) and 620-123 Applied Mathematics (Advanced) with permission from the Department of Mathematics and Statistics.
- Students who commenced first year prior to 1998 need to seek individual advice on subject equivalence in old course structures.
- Year levels 1-4 show the approximate order in which combined course students should do subjects to avoid violating prerequisite requirements.

Students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web for additional information and up-to-date course advice at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify

course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen such that departmental guidelines on electives are satisfied (see <<http://www.civag.unimelb.edu.au/undergraduate/>>). Students should also avoid timetable clashes in choosing their electives. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

First year Points

Semester 1		
421-101	The Art & Science of Civil Engineering (p.7) ¹	12.5
433-151	Introduction to Programming (Advanced) (p.15)	12.5
or		
433-171	Introduction to Programming (p.15)	12.5
610-141	Chemistry (p.2)	12.5
620-121	Mathematics A (Advanced) (p.4)	12.5
or		
620-141	Mathematics A (p.5)	12.5

Semester 2		
421-103	Engineering Statics (p.7)	12.5
421-104	Case Studies in Engineering (p.7)	12.5
610-142	Chemistry (p.2)	12.5
620-123	Applied Mathematics (Advanced) (p.4)	12.5
or		
620-143	Applied Mathematics (p.5)	12.5

1. Or elective approved by the Department of Civil and Environmental Engineering

Second year Points

Semester 1		
121-018	Geomorphology (p.3)	12.5
431-201	Engineering Analysis A (p.9)	12.5
421-210	Environmental Engineering (p.8)	12.5
421-255	Management for Engineers 1 (p.8)	12.5

Semester 2		
421-209	Geomechanics 1 (p.8)	12.5
431-202	Engineering Analysis B (p.9)	12.5
610-280	Environmental Chemistry (p.5)	12.5
	Elective	12.5

Third year Points

Semester 1		
121-021	Environmental Politics and Management (p.4)	12.5
421-305	Engineering Hydraulics 1 (p.8)	12.5
421-322	Environmental Engineering Design 1 (p.9)	12.5
421-355	Management for Engineers 2 (p.10)	12.5

Semester 2		
421-316	Engineering Hydraulics & Hydrology (p.9)	12.5
421-325	Field Data Acquisition and Analysis (p.9)	12.5
421-326	Structural Design - Environmental (p.9)	12.5
	Elective	12.5

Fourth year Points

Semester 1		
421-456	Engineering Management 3E (p.12)	6.25
421-453	Engineering Systems Management (p.12)	6.25
421-480	Quantification of Physical Processes (p.12)	25
411-334	Biochemical/Environmental Engineering 1A (p.6) ¹	6.25
411-335	Biochemical/Environmental Engineering 1B (p.6) ¹	6.25

Semester 2		
421-476	Environmental Engineering Design 2 (p.12)	12.5
421-477	Research Project (Environmental) (p.12) ²	12.5
421-482	Analysis & Design-Environmental Systems (p.12)	12.5
	Elective ³	12.5

1. Or elective(s) totalling 12.5 points approved by Department of Civil and Environmental Engineering
2. This subject may be taken in Semester 1 or year long in exceptional circumstances.
3. Electives should be chosen from the list approved and published on the Department web site. Requests to take subjects in addition to this can be made to the Head of Department.

Bachelor of Arts/Bachelor of Engineering (Environmental) (BA/BE)

Students studying the BA/BE degree should consult the BE single degree course structure for a current list of core engineering subjects. The following exceptions are applicable to the BA/BE degree.

- 421-104 Case Studies in Engineering - exempt for students studying the BA/BE.
- 620-141 Mathematics A and 620-143 Applied Mathematics may be replaced by 620-121 Mathematics A (Advanced) and 620-123 Applied Mathematics (Advanced) with permission of Department of Mathematics and Statistics
- Students who commenced first year prior to 1998 should seek individual advice on subject equivalence in old course structure
- 121-021 Environmental Politics and Management and 121-018 Geomorphology may be counted as arts points.

Students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web for additional information and up-to-date course advice at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

	Points
First year	
Semester 1	
610-141 Chemistry (p.2)	12.5
620-121 Mathematics A (Advanced) (p.4)	12.5
or	
620-141 Mathematics A (p.5)	12.5
Arts subjects as required	25
Semester 2	
610-142 Chemistry (p.2)	12.5
620-123 Applied Mathematics (Advanced) (p.4)	12.5
or	
620-143 Applied Mathematics (p.5)	12.5
Arts subjects as required	25
Second year	
Semester 1	
431-201 Engineering Analysis A (p.9)	12.5
433-151 Introduction to Programming (Advanced) (p.15)	12.5
or	
433-171 Introduction to Programming (p.15)	12.5
Arts subjects as required	25
Semester 2	
421-103 Engineering Statics (p.7)	12.5
431-202 Engineering Analysis B (p.9)	12.5
Arts subjects as required	25
Third year	
Semester 1	
121-018 Geomorphology (p.3)	12.5
421-210 Environmental Engineering (p.8)	12.5
421-255 Management for Engineers 1 (p.8)	12.5
Arts subject as required	12.5
Semester 2	
421-209 Geomechanics 1 (p.8)	12.5
610-280 Environmental Chemistry (p.5)	12.5
Arts subjects as required	25
Fourth year	
Semester 1	
121-021 Environmental Politics and Management (p.4)	12.5
421-305 Engineering Hydraulics 1 (p.8)	12.5
421-322 Environmental Engineering Design 1 (p.9)	12.5
421-355 Management for Engineers 2 (p.10)	12.5
Semester 2	
421-316 Engineering Hydraulics & Hydrology (p.9)	12.5
421-325 Field Data Acquisition and Analysis (p.9)	12.5
421-326 Structural Design - Environmental (p.9)	12.5
Arts subject as required	12.5
Fifth year	
Semester 1	
421-456 Engineering Management 3E (p.12)	6.25
421-453 Engineering Systems Management (p.12)	6.25
421-480 Quantification of Physical Processes (p.12)	25

	Points
Fifth year	
Arts subject as required	12.5
Semester 2	
421-476 Environmental Engineering Design 2 (p.12)	12.5
421-482 Analysis & Design-Environmental Systems (p.12)	12.5
421-477 Research Project (Environmental) (p.12)	12.5
Arts subject as required	12.5

Bachelor of Engineering (Environmental)/Bachelor of Commerce (BE/BCom)

Students studying the BE/BCom degree should consult the BE single degree course structure for a current list of core engineering subjects. The following exceptions are applicable to the BE/BCom degree.

- 421-104 Case Studies in Engineering - exempt for students studying the BE/BCom.
- 620-141 Mathematics A and 620-143 Applied Mathematics may be replaced by 620-121 Mathematics A (Advanced) and 620-123 Applied Mathematics (Advanced) with permission of Department of Mathematics and Statistics.
- 421-355 Management for Engineers 2 - exempt for students who complete 732-103 Principles of Business Law and 306-102 Accounting Concepts as part of the BCom. In order to complete the degree in 500 points, this exemption should be used.
- Students who commenced first year prior to 1998 should seek individual advice on subject equivalence in old course structure.

Students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web for additional information and up-to-date course advice at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

	Points
First year	
Semester 1	
316-102 Introductory Microeconomics (p.1)	12.5
610-141 Chemistry (p.2)	12.5
620-121 Mathematics A (Advanced) (p.4)	12.5
or	
620-141 Mathematics A (p.5)	12.5
732-103 Principles of Business Law (p.1) ¹ or other commerce subject	12.5
Semester 2	
316-101 Introductory Macroeconomics (p.1)	12.5
316-130 Quantitative Methods 1 (p.1)	12.5
610-142 Chemistry (p.2)	12.5
620-123 Applied Mathematics (Advanced) (p.4)	12.5
or	
620-143 Applied Mathematics (p.5)	12.5
1. The Department of Civil and Environmental Engineering strongly recommends that BE/BCom students (environmental stream) take this subject as part of the BCom.	
Second year	
Semester 1	
316-205 Introductory Econometrics (p.1)	12.5
431-201 Engineering Analysis A (p.9)	12.5
433-151 Introduction to Programming (Advanced) (p.15)	12.5
or	
433-171 Introduction to Programming (p.15)	12.5
Commerce subject as required	12.5
Semester 2	
306-102 Accounting Concepts (p.1) ¹ or other commerce subject	12.5
421-103 Engineering Statics (p.7)	12.5
431-202 Engineering Analysis B (p.9)	12.5
Commerce subject as required	12.5
1. The Department of Civil and Environmental Engineering strongly recommends that BE/BCom students (environmental stream) take this subject as part of the BCom.	

Third year		Points
Semester 1		
421-210 Environmental Engineering (p.8)		12.5
421-255 Management for Engineers 1 (p.8)		12.5
Commerce subjects as required		25
Semester 2		
421-209 Geomechanics 1 (p.8)		12.5
610-280 Environmental Chemistry (p.5)		12.5
Commerce subjects as required		25
Fourth year		
Semester 1		
121-021 Environmental Politics and Management (p.4)		12.5
421-305 Engineering Hydraulics 1 (p.8)		12.5
421-322 Environmental Engineering Design 1 (p.9)		12.5
Commerce subject as required		12.5
Semester 2		
421-316 Engineering Hydraulics & Hydrology (p.9)		12.5
421-325 Field Data Acquisition and Analysis (p.9)		12.5
421-326 Structural Design - Environmental (p.9)		12.5
Commerce subject as required		12.5
Fifth year		
Semester 1		
421-456 Engineering Management 3E (p.12)		6.25
421-453 Engineering Systems Management (p.12)		6.25
421-480 Quantification of Physical Processes (p.12)		25
Commerce subject as required		12.5
Semester 2		
421-476 Environmental Engineering Design 2 (p.12)		12.5
421-477 Research Project (Environmental) (p.12) ¹		12.5
421-482 Analysis & Design-Environmental Systems (p.12)		12.5
Commerce subject as required		12.5

1. This subject may be taken in Semester 1 in exceptional circumstances.

Bachelor of Laws/Bachelor of Engineering (Environmental) (LLB/BE)

Students studying the BE/LLB degree should consult the BE single degree course structure for a current list of core engineering subjects. The following exceptions are applicable to BE/LLB degree.

- 421-104 Case Studies in Engineering - exempt for students studying the BE/LLB.
- 620-141 Mathematics A and 620-143 Applied Mathematics may be replaced by 620-121 Mathematics A (Advanced) and 620-123 Applied Mathematics (Advanced) with permission of Department of Mathematics and Statistics.
- Students who commenced first year prior to 1998 should seek individual advice on subject equivalence in the old course structure.

Students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web for additional information and up-to-date course advice at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable without clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

First year		Points
Year long		
730-104 Torts and the Process Of Law (p.1)		25
Semester 1		
610-141 Chemistry (p.2)		12.5
620-121 Mathematics A (Advanced) (p.4)		12.5
or		
620-141 Mathematics A (p.5)		12.5
730-105 History and Philosophy of Law I (p.1)		12.5
Semester 2		
610-142 Chemistry (p.2)		12.5
620-123 Applied Mathematics (Advanced) (p.4)		12.5
or		

First year		Points
620-143 Applied Mathematics (p.5)		12.5
730-115 History and Philosophy of Law II (p.1)		12.5
Second year		
Year long		
730-301 Constitutional and Administrative Law (p.2)		25
730-730-260		
Semester 1		
431-201 Engineering Analysis A (p.9)		12.5
433-151 Introduction to Programming (Advanced) (p.15)		12.5
or		
433-171 Introduction to Programming (p.15)		12.5
Semester 2		
421-103 Engineering Statics (p.7)		12.5
431-202 Engineering Analysis B (p.9)		12.5
Third year		
Year long		
730-202 Contracts (p.1)		25
730-304 Property (p.2)		25
Semester 1		
421-210 Environmental Engineering (p.8)		12.5
421-255 Management for Engineers 1 (p.8)		12.5
Semester 2		
421-209 Geomechanics 1 (p.8)		12.5
610-280 Environmental Chemistry (p.5)		12.5
Fourth year		
Semester 1		
421-305 Engineering Hydraulics 1 (p.8)		12.5
421-322 Environmental Engineering Design 1 (p.9)		12.5
421-355 Management for Engineers 2 (p.10)		12.5
Law subject as required		12.5
Semester 2		
421-316 Engineering Hydraulics & Hydrology (p.9)		12.5
421-325 Field Data Acquisition and Analysis (p.9)		12.5
421-326 Structural Design - Environmental (p.9)		12.5
730-462 Equity and Trusts (p.2)		12.5
Fifth year		
Semester 1		
421-456 Engineering Management 3E (p.12)		6.25
421-453 Engineering Systems Management (p.12)		6.25
421-480 Quantification of Physical Processes (p.12)		25
Law subject as required		12.5
Semester 2		
421-476 Environmental Engineering Design 2 (p.12)		12.5
421-477 Research Project (Environmental) (p.12) ¹		12.5
421-482 Analysis & Design-Environmental Systems (p.12)		12.5
Law subject as required		12.5

1. This subject may be taken in Semester 1 in exceptional circumstances.

Sixth year		Points
Law subjects as approved to meet requirements of LLB (total of 300 points)		100

Bachelor of Engineering (Environmental)/Bachelor of Science (BE/BSc)

Students studying the BE/BSc degree should consult the BE single degree course structure for a current list of the core engineering subjects. The following exceptions are applicable to the BE/BSc degree.

- 620-141 Mathematics A and 620-143 Applied Mathematics may be replaced by 620-121 Mathematics A (Advanced) and 620-123 Applied Mathematics (Advanced) with the permission of the Department of Mathematics and Statistics.
- Any subject listed as core for engineering can count towards science points provided that subject is listed in the Faculty of Science section of the Handbook.
- The order of subjects taken may be varied as long as prerequisites are observed.

Students should regularly check the Department of Civil and Environmental Engineering's course advice page on the world wide web for additional information and up-to-date course advice at <<http://www.civag.unimelb.edu.au/undergraduate>>.

When setting the timetable every effort will be made to avoid clashes between the times of classes associated with these sets of subjects. Students should be aware however, that if it proves to be impossible to achieve a timetable with-

out clashes in these sets of subjects, the faculty reserves the right to modify course structures in order to eliminate the conflicts. Students will be advised during the enrolment period of the semester if the recommended courses need to be varied. Where the courses include elective subjects these should be chosen so that timetable clashes are avoided. In particular, students in combined degrees should plan their courses so that the subjects chosen in the other faculty do not clash with those recommended for the engineering component.

First year	Points
Semester 1	
433-151 Introduction to Programming (Advanced) (p.15)	12.5
or	
433-171 Introduction to Programming (p.15)	12.5
610-141 Chemistry (p.2)	12.5
620-121 Mathematics A (Advanced) (p.4)	12.5
or	
620-141 Mathematics A (p.5)	12.5
Science subject as required	12.5
Semester 2	
421-103 Engineering Statics (p.7)	12.5
421-104 Case Studies in Engineering (p.7)	12.5
610-142 Chemistry (p.2)	12.5
620-123 Applied Mathematics (Advanced) (p.4)	12.5
or	
620-143 Applied Mathematics (p.5)	12.5
Second year	Points
Semester 1	
121-018 Geomorphology (p.3)	12.5
421-210 Environmental Engineering (p.8)	12.5
421-255 Management for Engineers 1 (p.8)	12.5
431-201 Engineering Analysis A (p.9)	12.5
or	
620-231 Vector Analysis (p.7) ¹	12.5
Semester 2	
421-209 Geomechanics 1 (p.8)	12.5
431-202 Engineering Analysis B (p.9)	12.5
or	
620-232 Mathematical Methods (p.7)	12.5
610-280 Environmental Chemistry (p.5)	12.5
Science subject as required ²	12.5
<ol style="list-style-type: none"> Students intending to take 200-level Faculty of Science mathematics subjects should include in their science subject selection 620-122 Mathematics B (Advanced) or 620-142 Mathematics B in order to meet prerequisite requirements. Students intending to take 200-level Faculty of Science mathematics subjects are strongly recommended to take 620-160 Experimental Design and Data Analysis as part of the BSc. 	
Third year	Points
Semester 1	
121-021 Environmental Politics and Management (p.4)	12.5
421-305 Engineering Hydraulics 1 (p.8)	12.5
421-322 Environmental Engineering Design 1 (p.9)	12.5
421-355 Management for Engineers 2 (p.10)	12.5
Semester 2	
421-316 Engineering Hydraulics & Hydrology (p.9)	12.5
421-325 Field Data Acquisition and Analysis (p.9)	12.5
421-326 Structural Design - Environmental (p.9)	12.5
Science subject as required	12.5
Fourth year	Points
Semester 1	
421-456 Engineering Management 3E (p.12)	6.25
421-453 Engineering Systems Management (p.12)	6.25
421-480 Quantification of Physical Processes (p.12)	25
Science subject as required	12.5
Semester 2	
421-476 Environmental Engineering Design 2 (p.12)	12.5
421-477 Research Project (Environmental) (p.12) ¹	12.5
421-482 Analysis & Design-Environmental Systems (p.12)	12.5
Science subject as required	12.5
<ol style="list-style-type: none"> This subject may be taken in Semester 1 in exceptional circumstances. 	
Fifth year	Points
Science subjects as required	100

Subject descriptions

121-018 Geomorphology

See full subject details on page 3.

121-021 Environmental Politics and Management

See full subject details on page 4.

145-126 Effective Communication for Engineering

See full subject details on page 1.

306-102 Accounting Concepts

See full subject details on page 1.

316-101 Introductory Macroeconomics

See full subject details on page 1.

316-102 Introductory Microeconomics

See full subject details on page 1.

316-205 Introductory Econometrics

See full subject details on page 1.

316-130 Quantitative Methods 1

See full subject details on page 1.

421-101 The Art & Science of Civil Engineering

Credit points: 12.5

HECS-band: 2

Coordinator: Prof G Hutchinson

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

Description: Topics include the history of civil engineering; the relationship between science and engineering; environmental constraints on engineering projects; technical communication; and physical principles.

Assessment: Five assignments (50%) and a 3-hour written examination (50%).

421-102 Dynamics and Measurement Systems

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof N Haritos

Contact: Twenty-five hours of lectures, 15 hours of practice classes, eight hours of laboratory (*Semester 2*).

Description: Topics covered include the basic principles and design of measurement transducers (strain gauges, LVDTs, pressure transducers, accelerometers, etc.) and other systems of measurement; principles and techniques for data acquisition and data logging using measurement transducers; the design of experiments using measurement systems; the response of undamped and damped single-degree-of-freedom systems to a variety of input and/or initial conditions using classical and numerical modelling techniques; and introduction to multi-degree-of-freedom systems and experimental modal analysis testing techniques.

Assessment: One written examination not exceeding three hours (50%), three assignments or work requirements of up to a maximum of 2000 words each, or equivalent (35%), and practice classes and laboratory work (15%)

421-103 Engineering Statics

Credit points: 12.5

HECS-band: 2

Coordinator: Mr J Styles

Contact: Forty-eight hours of lectures and tutorials (*Semester 1, repeat 2*).

Description: Topics covered include force systems; resolution of forces including moments of a force, couples, moments of distributed forces; equilibrium, support systems; shear force, bending moments in beams; forces in pin-connected trusses; equilibrium concepts via virtual work; stress, strain, elasticity in one and two dimensions; stress transformation; stress and deflection due to bending and torsion; and indeterminate systems.

Assessment: A 3-hour written examination (70%) and two assignments of not more than 2000 words each (30%).

Prescribed texts: J L Meriam and L G Kraige, *Engineering Statics, Vol 1 - Statics*, 4th edition, Wiley, 1992.

421-104 Case Studies in Engineering

Credit points: 12.5

HECS-band: 2

Coordinator: Dr.N.Lam

Contact: Forty-eight hours of lectures, case study presentations and site visits (*Semester 2*).

Description: Topics covered include the components of a civil or environmental engineering project; standard methods of measurement; case study description of a project; lessons from unsuccessful projects; the relationship between structural form and material behaviour; the relationship between material properties and micro-structure as applied to civil engineering materials and the engineering properties of masonry, steel, timber and reinforced concrete.

Assessment: Two assignments of up to 3000 words each, or equivalent (40%) and a written examination not exceeding 3 hours (60%).

Prescribed texts: J S Scott, *A Dictionary of Civil Engineering*, 4th edition, Penguin, 1991. • J M Ilston, *Construction Materials, Their Nature and Behaviour*, E and FM Spon.

421-207 Introduction to Design

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr G Moore

Prerequisites: 421-103 Engineering Statics

Contact: Forty-eight hours of lectures and tutorials (*Semester 2*).

Description: The subject content is as follows: techniques for problem definition; nature of infrastructure systems and their sub-systems; conceptual modelling of systems; conceptual design and creative thinking; planning methodology; function; and performance, failure and reliability, communication by reports, plans.

Infrastructure and natural systems; economy and life cycles costs; planning and designing; design objectives: function, aesthetics, costs, serviceability, safety; analysis and synthesis; conceptual design; uncertainties: variability, inaccuracy, mistakes; standardisation of materials, load calculations and procedures; government and other regulation; philosophies of design: allowable stress design, limit states design; and detailing and documentation: computations and iterative design, design and CAD packages, drawing conventions.

Assessment: One 3-hour examination paper, minor reports of approximately 4000-word equivalent; one computer graphics assignment of not more than two hours.

421-208 Mechanics of Solids

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr H Goldsworthy

Prerequisites: 421-103 Engineering Statics or equivalent

Contact: Thirty-three hours of lectures, 10 hours of tutorials and five hours of laboratory classes (*Semester 1*).

Description: Topics include 3-D transformation of stress and strain, flexural deflections, reciprocity, properties of sections and unsymmetrical bending, shear centre, indeterminacy, long columns, plastic behaviour of structures, uniform and non-uniform torsion, and lateral torsional buckling of beams.

Assessment: One 3-hour written examination (75%) and practice classes and laboratory work (25%).

421-209 Geomechanics 1

Credit points: 12.5 **HECS-band:** 2

Coordinator: Mr.J.Styles/ Dr.S.Yuen

Prerequisites: 421-103 Engineering Statics

Contact: Forty-two hours of lectures and tutorials, six hours of laboratory classes (*Semester 2*).

Description: Topics include soil and rock identification, mineral composition and classification; discontinuities in rock masses; water in soil; principle of effective stress; stress transmission; confined and unconfined flow of water through soils; Darcy's law, seepage; dispersive and swelling soils; compressibility of soil and settlement of structures; consolidation; strength of soils and rocks; earth pressure; and active, passive and at-rest earth pressures. Applications in environmental engineering and civil engineering.

Assessment: An assignment of up to 2000 words (10%); a 3-hour written examination (80%); laboratory work (10%).

421-210 Environmental Engineering

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr G Moore

Contact: Twenty-two hours of lectures, seven hours of project and practical work, 12 hours of design and a full-day excursion (7 hours) (*Semester 1*).

Description: The subject content is as follows: the role of engineering in land and water development; historical, environmental and technical factors; land and water degradation, including salinity and soil erosion; stream rehabilitation; soil conservation; relevance to international protocols eg. Ramsar, Kyoto, Rio; and relationship of engineering to sustainable development.

An introduction to structure, function and reproduction of living cells, tissues and organisms. Plant physiology. Techniques for problem definition in environmental engineering; nature of environmental infrastructure systems and their sub-systems; conceptual modelling of systems; conceptual design and creative thinking; planning methodology; function; performance, failure and reliability, communication by reports plans. Economy and life cycles costs. Planning and design.

Assessment: One examination of no more than three hours; four essays of no more than 1000 words each; two practical reports of no more than 500 words each. Attendance at excursions is compulsory.

421-255 Management for Engineers 1

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr C F Duffield

Contact: Thirty hours of lectures, 18 hours of practice classes (*Semester 1*).

Description: On completion of this subject students should understand the discipline of management, its relevance to engineering and some core techniques of project management and team operation.

Topics covered include the management process, embracing planning, organisation, leadership and control, of human, physical and financial resources; public and private sector engineering management including responsibility, authority, human relations, industrial relations, quality management; CPM, PERT network techniques for planning, resource scheduling, coding and the use of work breakdown structures; and an introduction to systems management, systems analysis, mathematical and linear programming.

Assessment: One written examination not exceeding three hours (70%) and two assignments up to a maximum of 2000 words each or equivalent (30%).

421-305 Engineering Hydraulics 1

Credit points: 12.5 **HECS-band:** 2

Coordinator: Assoc Prof R.L.Hughes

Prerequisites: 421-103 Engineering Statics

Contact: Thirty-three hours of lectures, 11 hours of tutorials and four hours of laboratory (*Semester 1*).

Description: At the conclusion of this subject students should have acquired an appreciation of problems involving fluids at rest and in motion and have developed a sound understanding of engineering hydraulics as applied to environmental and civil engineering situations.

Topics covered include fluid statics and kinematics of fluid motion; Bernoulli's equation, application of physical laws in solving flow problems via control volumes (involving the conservation equations of mass and momentum, the energy equation); dynamic similitude, dimensional analysis and physical scale modelling; flow in pipes, rotodynamic pumps, simple pipeline systems, pressure surges in pipes, discharge measurements in pipes; and flow past immersed bodies (introduction to boundary layer theory, lift and drag on immersed bodies).

Assessment: One written examination not exceeding three hours (85%) and assignments relating to course work and laboratory classes (15%).

421-306 Geotechnical Engineering

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr.S.Yuen/Mr.J.Styles

Prerequisites: 421-209 Geomechanics 1

Contact: Thirty hours of lectures, 18 hours of tutorials and problem solving sessions (*Semester 1*).

Description: Students completing this unit should understand how to make simplifications to complex soil conditions, how to establish strength/deformation characteristics of the soil and how to apply fundamental geomechanics knowledge learned in earlier units to solve problems involving the stability of an earth mass.

Topics covered include design of earth retaining structures; stability of slopes, seepage analysis, settlement and bearing capacity of shallow footings; site investigation and limit state design in geotechnical engineering.

Assessment: One 3-hour written examination (60%), together with three assignments of 2000 words each (40%). A pass of 40% out of the 60% written examination must be attained in order to pass the subject.

421-307 Structural Engineering 1

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr N Lam

Prerequisites: 421-208 Mechanics of Solids or equivalent

Contact: Twenty-six hours of lectures, 18 hours of tutorial design sessions and four hours of laboratory work (*Semester 1*).

Description: At the conclusion of this subject students should be able to analyse for internal actions and deformations in simple truss and frame structure members arising from a variety of loading states. In addition, students will be

able to carry out designs of reinforced and prestressed concrete frames consisting of beams and columns.

Topics covered include elements of structural behaviour; basic modes of structural action; analysis of statically determinate systems and stability using a variety of approaches; flexural strength theory of structural concrete members with passive and/or active reinforcement, shear, deflection, anchorage and stress development; strength theory of reinforced concrete columns, including the use of interaction diagrams and loading lines to deal with slenderness effects; and concrete design project.

Assessment: One written examination not exceeding three hours (80%), practice classes, laboratory and design work (20%)

421-316 Engineering Hydraulics & Hydrology

Credit points: 12.5

HECS-band: 2

Coordinator: Professor J.D.Fenton

Prerequisites: 421-305 Engineering Hydraulics 1

Contact: Thirty-one hours of lectures, 14 hours of practice classes and three hours of laboratory work (*Semester 2*).

Description: At the conclusion of this subject students should be capable of solving a wide range of commonly encountered hydraulic problems in rivers and canals and will have acquired a user-oriented knowledge in engineering hydrology with sufficient theory to allow them to pursue further study in the field.

Topics covered include the energy momentum principles and their application to a variety of open channel flow problems, uniform flow; unsteady flow in open channels, including the long wave equations and flood propagation by diffusion and kinematic routing; steady gradually-varied flow and the numerical calculation of surface profiles; rigid-boundary and erodible channels and sediment transport in rivers and canals; measurement of discharge; risk probability in hydrology and engineering works; the hydrologic cycle; streamflow and its measurement; flood frequency analysis; estimating flood hydrographs; estimating yield; stochastic data generation; design rainfalls and the 'rational method' with particular application to urban drainage systems and their design; and groundwater, with confined and unconfined aquifers and steady and unsteady well hydraulics.

Assessment: One written examination not exceeding three hours (85%) and assignments of up to 3000 words in total, relating to coursework and laboratory classes (15%).

421-317 Structural Engineering 2

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof N Haritos

Prerequisites: 421-307 Structural Engineering 1

Contact: Thirty hours of lectures, 15 hours of practice classes and 3 hours of laboratory work (*Semester 2*).

Description: At the conclusion of this subject students should be able to analyse for internal actions and deformations in both determinate and indeterminate truss and frame structure members arising from a variety of loading states. On completion of the design component students will be able to apply techniques previously introduced to the design of members and connections for a variety of steel structures.

Topics covered include an introduction to computer analysis of determinate and indeterminate truss and frame structures using matrix methods; introduction to the finite element technique; modelling of the basic modes of structural action; and behaviour (first order and second order) of ties, columns, beams, beam-columns, simple frames, bolts, welds and fasteners groups including yielding, fracture, buckling and warping.

Assessment: One written examination not exceeding three hours (80%) and practice classes, design and laboratory work (20%)

421-318 Construction Engineering

Credit points: 12.5

HECS-band: 2

Coordinator: Prof D Young

Prerequisites: 421-207 Introduction to Design, 421-209 Geomechanics 1 and 421-305 Engineering Hydraulics 1

Contact: Thirty hours of lectures and 18 hours of practice classes and field-work (*Semester 2*).

Description: At the completion of this subject students should have an understanding of the roles of design, investigation and construction practices in the field of construction engineering.

Topics covered include site investigation; construction systems including foundations, cofferdams, earthwork, ground support, falsework and scaffolding, formwork, plant and equipment; design aspects of construction systems, pavements and temporary works; plant selection including earthmoving equipment, tunnelling, cranes; and survey control methods for engineering construction above and below ground and water.

Assessment: One written examination not exceeding three hours (60%) and two 3000 word assignments or equivalent (40%)

421-322 Environmental Engineering Design 1

Credit points: 12.5

HECS-band: 2

Coordinator: Dr G Moore

Prerequisites: 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B) and 421-210 Environmental Engineering

Contact: A 1-day excursion (four hours), eight hours of lectures and 36 hours of tutorial/practical classes (*Semester 1*).

Description: The objective of this subject is to have students experience solving a substantial and realistic environmental engineering design problem working in groups and as individuals.

Topics covered include general issues relating to environmental engineering design including engineering design methodology; systems and optimisation; application of economic analysis; environmental and social considerations; sustainable development; environmental impact statements and assessments; public participation; international protocols, eg. Ramsar, Kyoto, Rio; and design projects, analysis and presentation of large data sets.

Assessment: One written report not exceeding 50 pages (60%). Up to six minor reports, assignments or multimedia presentations not exceeding 20 pages (40%).

421-325 Field Data Acquisition and Analysis

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof R Grayson

Prerequisites: 421-103 Engineering Statics, 421-210 Environmental Engineering, 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B)

Contact: A 4-day field camp totalling 28 hours, which may be held in mid-year or mid-semester break), eight hours of lectures and 12 hours of tutorial/practical classes (*Semester 2*).

Description: At the conclusion of this subject students should be able to select, commission and use a range of electronic data acquisition devices. They should be familiar with some important instrumentation and field techniques and have an appreciation of how to use and interpret environmental measurements.

Topics covered include sampling principles, electric circuit laws, calibration and errors, standards, transducer physics, transducer selection, fault diagnostics, digital signal processing, measurement system design including environmental, occupational health, social, data quality control, management and technical considerations, stream gauging, water quality evaluation, meteorological observation, spatial land surface measurement, and streamside and in-stream condition assessment.

Assessment: Three assignments of not more than 2000 words each. Participation in field activities and a report on these activities not to exceed 40 pages. The relative weighting of each component of assessment will be advised at the commencement of the subject.

421-326 Structural Design - Environmental

Credit points: 12.5

HECS-band: 2

Coordinator: Dr P Mendis

Prerequisites: 421-103 Engineering Statics

Corequisites: 421-209 Geomechanics 1

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

Description: At the end of this course, a student should be able to identify different forms of structural action and be able to carry out basic designs for simple manufactured and natural structures encountered by environmental engineers, in accordance with appropriate standards.

Topics covered include analysis of determinate and simple indeterminate structures; structural properties of steel, concrete and timber; codes of practice; design of beams, slabs, columns, connections and trusses as applied to small buildings and hydraulic structures.

Assessment: One written examination not exceeding three hours (75%) and practical/design work (25%)

421-350 Engineering Management 2

Note: This subject is for BE/BCom students only

Credit points: 6.25

HECS-band: 2

Coordinator: Prof.D.Young

Contact: Twenty hours of lectures and four hours of practice classes (*Semester 1*).

Description: Topic modules: 1. Introduction to law, contract, tort, project delivery systems and engineering contracts, liability and intellectual property, corporations law, environmental law.

2. Origins and development of Australian engineering organisations, the engineer and professional practice, professional ethics and engineers, the functions of the professional societies, engineers in government - national, state and local, environmental management systems including consideration of the ISO 14 000 series requirements.

Assessment: One written examination not exceeding two hours (70%) and two 2000-word assignments or equivalent (30%)

421-355 Management for Engineers 2

Credit points: 12.5

HECS-band: 2

Coordinator: Professor D.Young

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

Description: On completion of this subject students should have an appreciation of the legal, social, economic and financial framework within which engineers must practice.

Topic modules: 1. Introduction to law, contract, tort, project delivery systems and engineering contracts, liability and intellectual property, corporations law, environmental law.

2. Origins and development of Australian engineering organisations, the engineer and professional practice, professional ethics and engineers, the functions of the professional societies, engineers in government - national, state and local, environmental management including consideration of the ISO 14 000 series requirements.

3. Macro and micro economics, supply and demand, budgetary and monetary policy.

4. Financial evaluation and analysis, and accounting principles, ledgers, profit and loss statements, balance sheets.

Assessment: One written examination not exceeding three hours (70%) and assignments totalling not more than 5000 words, or equivalent (30%)

421-401 Techniques of Research and Investigation

Credit points: 6.25

HECS-band: 2

Coordinator: Prof D Young

Prerequisites: Successful completion of all core BE 3rd-year level subjects

Contact: Eight hours of lectures and 16 hours of independent research (*Semester 1*).

Description: At the conclusion of this subject students should have the skills required to carry out the initial investigation required for a later more detailed research project or design.

Topics covered include the research process; sources of information; written and oral presentation of research.

Assessment: Written report (up to 40 pages inclusive of diagrams and tables) or equivalent.

421-405 Management for Engineers 3

Credit points: 12.5

HECS-band: 2

Coordinator: Prof D Young

Prerequisites: 421-255 Management for Engineers 1 and 421-355 Management for Engineers 2, or equivalents

Corequisites: 421-410 Structural Steel Theory and Design

Contact: Thirty-six hours of lectures, four hours of practice classes and eight hours of tutorials (*Semester 1*).

Description: On completion of this subject, students should have gained an understanding of the project management and construction aspects involved with the delivery of an engineering structure.

Topic modules: 1. Project management concepts including feasibility studies, project financing, strategic planning, cash flow and cost control; quality assurance principles, standards and practice.

2. Human behavioural and organisational theories; modern industrial and human relations motivational and communication skills.

3. Preparation of a detailed project management plan for the delivery of an engineering structure.

Assessment: One 2-hour examination (70%) and one 5000-word assignment or equivalent (30%).

421-408 Construction Management

Credit points: 6.25

HECS-band: 2

Coordinator: Prof D Young

Prerequisites: 421-318 Construction Engineering

Contact: Sixteen hours of lectures and eight hours of practice classes (*Semester 2*).

Description: On completion of this unit students should have an appreciation of the major components required for the construction of an engineering project to be completed on time, on budget and to quality.

Topics covered include estimating and tendering civil engineering construction works, including work breakdown structures, work method statements, risk identification and tendering principles; detailed study of contract documents for design and construction including various party responsibilities and authorities; and contract administration and project control functions and techniques including time and money negotiations and cash flow management.

Assessment: One 2-hour examination (60%) and one 4000-word assignment or equivalent (40%).

421-410 Structural Steel Theory & Design

Credit points: 6.25

HECS-band: 2

Coordinator: Assoc Prof J Wilson

Prerequisites: 421-317 Structural Engineering 2

Contact: Five hours of lectures, three hours of tutorials and 16 hours of supervised sessions (*Semester 1*).

Description: The major objective of this unit is to develop an understanding of the procedures and processes involved in the design of steel structures.

Topics covered include theory behind brittle fracture and fatigue of steel structures, design of steel connections; and a major design project involving a steel structure.

Assessment: One 2-hour examination (50%) and a design project of approximately 40 pages (50%). Students must pass both the examination and the design project to pass this subject.

421-411 Concrete Theory & Design

Credit points: 6.25

HECS-band: 2

Coordinator: Dr H Goldsworthy

Prerequisites: 421-307 Structural Engineering 1

Contact: Eight hours of lectures, three hours of tutorials, 12 hours of supervised design sessions and a 1-hour practical (*Semester 2*).

Description: At the conclusion of this unit students should have developed advanced skills enabling them to analyse and design reinforced and pre-stressed concrete structures.

Topics include idealised frame method of slab design; flat plates and slabs; punching shear; partially pre-stressed beams and slabs; and major design project.

Assessment: One written examination of two hours duration (70%). Design project of approximately 15 pages (25%) and practical report (5%).

421-413 Computer Aided Design

Credit points: 6.25

HECS-band: 2

Coordinator: Assoc Prof N Haritos

Pre or Corequisites: 421-317 Structural Engineering 2

Contact: Eight hours of lectures and 16 hours of tutorials/practice classes (*Semester 2*).

Description: The objective of this unit is to make students aware of the mathematical basis of a variety of structural analysis software programs and develop an competence in the use of such programs.

Topics covered include the theory of finite element analysis; an introduction to non-linear frame analysis; critical evaluation and 'hands-on' experience with a number of software packages using a number of practical case studies; and analytical aspects of new and heritage structures.

Assessment: One 2-hour examination (50%) and three assignments of 1000 words each or equivalent (50%).

421-414 General Structural Design

Credit points: 6.25

HECS-band: 2

Coordinator: Assoc Prof J Wilson

Prerequisites: 421-317 Structural Engineering 2

Contact: Eighteen hours of lectures and six hours of tutorials (*Semester 1*).

Description: On the completion of this unit students should have developed an ability to design structures constructed from timber, masonry, aluminium and cold formed steel and fabric.

Topics covered include structural design using timber, masonry, composite aluminium beams and columns, cold formed and thin walled materials and synthetic materials; and design of membrane and cable structures.

Assessment: One 2-hour examination (70%) and two assignments of 1500 words each or equivalent (30%).

421-415 High Rise Structures

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc.Prof.P.Mendis

Prerequisites: 421-317 Structural Engineering 2

Contact: 28 hours of lectures and 20 hours of tutorials/supervised design sessions (*Semester 2*).

Description: The objective of this unit is to make students aware of the special requirements necessary to the successful design of high-rise structures

Topics covered include structural systems including floor systems, framing systems and foundation systems; environmental actions such as wind, earthquake and thermal; wind tunnel testing; effect of time dependent actions such as creep and shrinkage; and analytical aspects including computer-aided analysis and design, state-of-the-art construction techniques, special structural elements, case studies of high-rise buildings and towers.

Assessment: One 3-hour examination (70%) and two assignments of 3000 words each or equivalent (30%)

421-416 Concrete Design: State-of-The-Art

Credit points: 6.25

HECS-band: 2

Coordinator: Assoc.Prof.P.Mendis

Prerequisites: 421-317 Structural Engineering 2

Contact: Sixteen hours of lectures and eight hours of tutorials (*Semester 2*).

Description: On the completion of this unit students should be aware of, and be competent in, the use of advanced techniques in the design of complex concrete structures.

Topics covered include concrete technology and good detailing practice including high-strength concrete, fire engineering, torsion, strut and tie modelling, introduction to seismic design, and reinforced concrete walls.

Assessment: One 2-hour written examination (70%). Two assignments of 1500 words each, or equivalent (30%)

421-420 Hydraulic Engineering Design

Credit points: 6.25

HECS-band: 2

Coordinator: Mr W Robertson

Prerequisites: 421-316 Engineering Hydraulics and Hydrology

Contact: Ten hours of lectures and 14 hours of supervised design sessions and practice classes (*Semester 2*).

Description: On completion of this unit students should have gained an understanding of the hydraulics of water supply/treatment/disposal and applied this knowledge to the design of common hydraulic structures.

Topics covered include urban stormwater drainage systems; urban water supply, treatment and distribution systems; water supply pipeline design and surge protection; sewerage, wastewater collection and treatment; and hydraulic design of common hydraulic structures.

Assessment: One 2-hour written examination (50%), practice classes, design report and assignments (up to a total of 25 pages inclusive of diagrams, tables, computations and computer output) (50%).

421-421 Coast & Harbour Engineering

Credit points: 6.25

HECS-band: 2

Coordinator: Professor J.D.Fenton

Prerequisites: 421-316 Engineering Hydraulics and Hydrology

Contact: Eighteen hours of lectures and six hours of practice classes (*Semester 1*).

Description: At the conclusion of this unit students should have an understanding of wave theory and forces associated with waves and the effect of these forces on natural and built coastal structures.

Topics covered include overview of oceanography, El Nino phenomenon, gravity and capillary wave theories; shoaling and breaking of waves; reflection, refraction and diffraction of waves; the transition from seas to swell wave states; tides, beach profiles; beach erosion processes, beach and coastal stabilisation techniques; hydraulic structures such as breakwaters, groynes and sea walls used for beach and harbour protection; hydrodynamic forces on structures; wave forecasting; oil spills; and coastal engineering models.

Assessment: One 2-hour written examination (85%). An assignment up to 1000 words or equivalent (15%).

421-423 River Hydraulics

Credit points: 6.25

HECS-band: 2

Coordinator: Prof J.D.Fenton

Prerequisites: 421-316 Engineering Hydraulics and Hydrology

Contact: Twenty-four hours of lectures and practice classes (*Not Offered*).

Description: At the conclusion of this unit, students should be able to describe the nature of streamflow, fluvial processes and fluvial morphology and understand management issues relating to rivers and flood plains.

Topics covered include streamflow measurement and characteristics, water surface modelling in irregular channels, river channel morphology, fluvial processes, initiation of sediment motion, sediment transport, channel stability, and modelling of river channel changes.

Assessment: One 2-hour written examination (85%). An assignment up to 1000 words or equivalent (15%).

421-425 Earthquake Engineering

Credit points: 6.25

HECS-band: 2

Coordinator: Assoc Prof John Wilson

Prerequisites: 421-317 Structural Engineering 2

Contact: Twenty lectures, four tutorials and four practical classes (*Semester 1*).

Description: Topics covered include seismic activity, earthquake accelerograms, earthquake response of structures, response spectra, force and displacement-based design, initial design considerations, ductile design and detailing, passive energy dissipation.

Assessment: Two-hour examination (70%) and assignments (2000-word equivalent) (30%)

421-426 Structural Dynamics

Credit points: 6.25

HECS-band: 2

Coordinator: Assoc Prof N. Haritos

Prerequisites: 421-317 Structural Engineering 2

Contact: Sixteen lectures, eight tutorial/practical classes (*Semester 1*).

Description: Topics covered include introduction to structural dynamics and modelling techniques for single and multi-degree-of-freedom systems; response to a variety of dynamic loading including wind, fluid, machine induced, impulse and other loads; and the assessment of serviceability and ultimate limit states for dynamic loading.

Assessment: Two-hour examination (70%) and assignments (2000-word equivalent) (30%)

421-439 Geotechnical Applications

Credit points: 12.5

HECS-band: 2

Coordinator: Mr J R Styles/Dr S Yuen

Prerequisites: 421-306 Geotechnical Engineering

Contact: Thirty-two hours of lectures and 16 hours of tutorials (*Semester 2*).

Description: On completion of this unit students should be able to analyse for both the bearing capacity and settlement characteristics of footings subjected to both static and dynamic loading; and have an understanding of the application of geotechnical engineering principles to solid and liquid waste disposal and management.

Topics covered include shallow footings, bearing capacity solutions, settlement on sand and clays; Skempton-Bjerrum, Lambe and Davis Poulos methods, raft foundations, compensated foundations, expansive clays, machinery foundations, deep foundations, capacity and settlement of single piles and pile groups; properties of waste materials, contaminated soils, effects of chemicals on soil properties, waste disposal systems, regulations governing waste disposal and management, site assessment/site selection, groundwater contamination, remediation techniques, liners, leachate collection systems, use of slurry trenches, rock mass behaviour, and design of tunnels and rock slopes.

Assessment: Two assignments of not more than 3000 words each (30%) and a 3-hour open-book examination (70%).

421-447 Transport Engineering

Credit points: 12.5

HECS-band: 2

Coordinator: Dr R Thompson

Contact: Twenty-four hours of lectures, 12 hours of design and 12 hours of practice classes (*Semester 1*).

Description: At the conclusion of this subject students should have an understanding of fundamentals of traffic engineering; an appreciation of the role of engineering in the transport planning process an awareness of processes involved in the design of road and transport networks; and an ability to perform such designs.

Topics covered include transport systems, the transport planning process, traffic survey methods, traffic flow theory, capacity of unsignalised intersections, traffic management and transport models; and residential area design, traffic signal timing analysis and geometric design of roads.

Assessment: One 3-hour written examination (60%), two written assignments each with a maximum of 3000 words or equivalent (40%).

421-448 Transport Systems

Credit points: 12.5

HECS-band: 2

Coordinator: Dr R Thompson

Contact: Twenty-four hours of lectures and 24 hours of practice classes (*Semester 2*).

Description: On completion of this unit students should have an understanding of the prediction of demand and systems available to meet this demand for both motorised and non-motorised traffic; the theory and practice of transportation planning; and an ability to apply this knowledge to design and manage transport systems.

Topics covered include traffic management, traffic simulation modelling, travel demand management, non-motorised transport, road safety, parking, environmental impacts of traffic, geographic information systems, travel surveys, travel behaviour modelling, intelligent transport systems, city logistics, and public transport system design.

Assessment: One 3-hour written examination (60%) two written assignments each with a maximum of 3000 words or equivalent (40%)

421-453 Engineering Systems Management

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr R Thompson

Prerequisites: 421-355 Management for Engineers 2

Contact: Twelve hours of lectures and 12 hours of practice classes (*Semester 1*).

Description: At the conclusion of this course students should have acquired a knowledge of the role of systems analysis techniques as aids to decision making for planning, design and management of engineering systems

Topics covered include demand forecasting, risk analysis and management, network analysis, artificial intelligence and multi-objective decision-making techniques, simulation modelling and dynamic programming.

Assessment: One 2-hour written examination (60%) and two written assignments each with a maximum of 1250 words or equivalent (40%).

421-456 Engineering Management 3E

Note: Credit cannot be gained for both 421-456 Engineering Management 3E and 421-405 Management for Engineers.

Credit points: 6.25 **HECS-band:** 2

Coordinator: Dr. J. Walker

Prerequisites: 421-355 Management for Engineers 2 or 421-350 Engineering Management 2

Contact: Sixteen hours of lectures and eight hours of practical classes (*Semester 1*).

Description: As part of this subject, students undertake the Personnel Skills module from 421-405. At the completion of this subject, students should be able to: (i) apply management principles to the development of an environmental management system based on the ISO 1400 Standard, for an environmental engineering project; (ii) appreciate the dynamics of small group interactions and teamwork in making presentations to, and in preparing reports (including a non-technical summary) for, senior management; and (iii) recognise the need for and practice of personnel skills ranging from making personal presentations, undertaking interviews and performance appraisals, providing good communication and managing human resources.

Assessment: One 1.5-hour written examination (70%) and one written assignment with a maximum of 4000 words or equivalent (30%).

421-460 Research Project (Civil)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Prof.D.Young

Prerequisites: A grade of H2A or above in 421-401 Techniques of Research and Investigation

Contact: Forty-eight hours of laboratory/research work (*Semester 2*).

Description: On conclusion of their project students should have an appreciation of procedures involved in conducting research and have gained experience in technical report writing and oral presentation.

Topic chosen from a list circulated during Semester 1.

Assessment: Written report of up to 5000 words with no more than 20 pages of supporting material (appendices, diagrams, tables, computations and computer output) (80%) and an oral presentation of major findings before an audience of students and teaching staff (20%).

421-476 Environmental Engineering Design 2

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr J Walker

Prerequisites: Successful completion of all core BE 300-level subjects, plus 421-480 Quantification of Physical Processes

Contact: Two hours of lectures, 46 hours design classes (*Semester 2*).

Description: Students completing this unit should have an ability to carry out a substantial investigation or design of a water and/or land related problem as part of a small team.

Topics covered include investigation/design projects associated with a contemporary environmental engineering problem or opportunity.

Assessment: Written reports and assignments up to a total of 60 pages (inclusive of diagrams, tables, computations and computer output) (80%). An oral assessment of up to 30 minutes (20%).

421-477 Research Project (Environmental)

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr.G.Moore

Prerequisites: Successful completion of all core BE 300-level subjects.

Contact: One-hour lecture, 2-hour seminars, 45 hours of laboratory/research work (*Semester 1, repeat 2*).

Description: On conclusion of their project, students should have an appreciation of procedures involved in conducting research and have gained experience in technical report writing and oral presentation.

Topics covered include guided supervision of project specification, literature review, methodology development, analysis and reporting of a theoretical or practical investigation on a topic in the area of environmental engineering.

Assessment: Written reports and assignments up to a total of 60 pages (inclusive of diagrams, tables, computations and computer output) (80%) and two seminar presentations (20%).

421-480 Quantification of Physical Processes

Credit points: 25 **HECS-band:** 2

Coordinator: Dr.J.Walker

Prerequisites: 421-316 Engineering Hydraulics and Hydrology, 421-325 Field Data Acquisition and Analysis and 421-205 Engineering Analysis B or equivalents.

Contact: Seventy hours of lectures and 26 hours of practical classes (*Semester 1*).

Description: At the conclusion of this subject students should be capable of undertaking quantitative analyses of physical processes related to the water, energy and carbon cycles and covering atmospheric, surface and sub-surface processes. Emphasis will be placed on the application of fundamental principles of mathematics and physics to the conceptualisation and analysis of the complex interactions that are the hallmark of environmental systems. Students should also be able to build computer models of these interactions and interpret the output from such models.

Topics covered include local and global energy, water and carbon balances; remote sensing; boundary layer meteorology; space time analysis of precipitation; evapotranspiration; runoff processes; shallow overland flow hydraulics; saturated and unsaturated porous media flow; erosion and transport of soil by wind and water; diffusive and advective contaminant transport in surface and subsurface flows; and surface and ground water interactions, computer modelling of physical processes, model calibration and testing

Assessment: One 2-hour written mid-semester test (25%), one 3-hour written end-of-semester examination (40%) and practical class assignments and quizzes of not more than 5000 words or equivalent (35%).

421-482 Analysis & Design-Environmental Systems

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr.J.Walker

Prerequisites: 421-480 Quantification of Physical Processes, 421-322 Environmental Engineering Design 1.

Contact: Twelve hours lectures, 36 hours of design classes and site visits (*Semester 2*).

Description: At the conclusion of this subject the student should be able to identify the processes in the environment that impinge on a range of practical problems they will encounter in their career. With this skill and foundation theory of physical hydrology, design and management, they will be able to develop solutions to these problems.

Typical problems may include irrigation and drainage design, hydro-geological problems such as landfill containment, catchment management, stream rehabilitation, rehabilitation of degraded land such as mine sites.

Assessment: Four written reports not exceeding a total of 60 pages (inclusive of diagrams, tables, computations and computer output).

421-629 Energy Efficiency Technology

Credit points: 12.5 **HECS-band:** 2

Coordinator: Dr L Aye

Contact: Twenty-four hours of lectures and 12 hours of set tasks (*Semester 1*).

Description: On completion students should understand the basic issues in energy efficient technologies and their implementation; the current possibilities for improving the ratio of energy used per unit of output in the main sectors of society, ie. transportation, manufacturing, commercial, domestic, energy supply industries; the economic and environmental implications for the adaptation of these technologies; potential for improvements in energy efficiency in gasoline and diesel vehicle, oil refinery system; energy efficiency technologies for the manufacturing, commercial and domestic sectors; demand side management; integrated resource planning; energy auditing; and economics and environmental impacts.

Assessment: One 2-hour examination (50% weighting) and one assignment of up to 2000 words or equivalent (50% weighting).

431-201 Engineering Analysis A

See full subject details on page 9.

431-202 Engineering Analysis B

See full subject details on page 9.

433-171 Introduction to Programming

See full subject details on page 15.

451-201 Geomatics for Engineers

See full subject details on page 5.

610-141 Chemistry

See full subject details on page 2.

610-142 Chemistry

See full subject details on page 2.

610-280 Environmental Chemistry

See full subject details on page 5.

620-121 Mathematics A (Advanced)

See full subject details on page 4.

620-123 Applied Mathematics (Advanced)

See full subject details on page 4.

620-141 Mathematics A

See full subject details on page 5.

620-143 Applied Mathematics

See full subject details on page 5.

620-231 Vector Analysis

See full subject details on page 7.

620-232 Mathematical Methods

See full subject details on page 7.

625-023 Geology (Engineering Course)

See full subject details on page 4.

730-104 Torts and the Process Of Law

See full subject details on page 1.

730-105 History and Philosophy of Law I

See full subject details on page 1.

730-115 History and Philosophy of Law II

See full subject details on page 1.

730-202 Contracts

See full subject details on page 1.

732-103 Principles of Business Law

See full subject details on page 1.
