

Geomatics

Department of Geomatics

Geomatic engineering is a multi-faceted discipline which offers both men and women a wide variety of professional career paths in modern measurement science and spatial information management.

Geomatic engineering is suitable for students who have an interest in management of the environment, high technology, computers and computer graphics, mathematics and the outdoors.

One of the attractions of a geomatic engineering degree is the wide range of career options available. Professional geomatic engineering graduates find employment in land development and management; resource and environmental management; computer mapping; hydrographic, land and engineering surveying; applied computing; geographic information systems and industrial quality inspection; as well as in related areas dealing with spatial information science.

First year students receive a good base in mathematics, statistics and computing as well as a sound introduction to a broad range of geomatic engineering activities. The first year includes a one-week residential field course which offers practical experience in measurement science techniques. This complements practical sessions during the year.

In second year, students continue with measurement science studies and mathematics and also take ecology, information science, land law and management, professional development, and planning and design. This year also includes a second field course.

Third year adds advanced measurement science, together with land and geographic information systems, spatial analysis, computer graphics and land economy. The final year develops the professional subjects to a greater extent and includes a comprehensive project.

The geomatic engineering degree is accredited by the Surveyors Board of Victoria, the Institution of Engineers Australia and the Institution of Surveyors Australia, thus allowing graduate registration as professional engineers and professional surveyors.

Graduate research programs are also available in all areas taught in the undergraduate courses.

Department of Geomatics: undergraduate degree course structures

Bachelor of Geomatic Engineering (BGeomE)

The recommended or standard course structures are listed below. 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 |
|--|--------|
| Semester 1 | |
| 433-171 Introduction to Programming (p.554) | 12.5 |
| 451-100 Geomatics Science 1A (p.515) | 12.5 |
| 451-113 Intro to Computer Systems and Graphics (p.516) | 12.5 |
| 620-141 Mathematics A (p.840) | 12.5 |
| Semester 2 | |
| 451-101 Geomatics Science 1B (p.515) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| 620-142 Mathematics B (p.840) | 12.5 |
| 620-160 Experimental Design & Data Analysis (p.841) | 12.5 |
| Second year | Points |
| Semester 1 | |
| 451-203 Planning, Property & Surveying Law (p.516) | 12.5 |
| 451-204 Professional Development (p.516) | 12.5 |
| 451-207 Information Science & Programming (p.517) | 12.5 |
| 451-208 Computational Methods in Geomatics (p.517) | 12.5 |
| Semester 2 | |
| 121-013 Global Ecology and Biogeography (p.180) | 12.5 |
| 451-200 Geomatics Science 2 (p.516) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| 451-206 Least Squares & Network Analysis (p.517) | 12.5 |

| Third year | Points |
|--|--------|
| Semester 1 | |
| 421-255 Management for Engineers 1 (p.506) | 12.5 |
| 451-331 Spatial Analysis (p.517) | 12.5 |
| 451-332 Imaging in the Geosciences (p.517) | 12.5 |
| 451-333 Cadastral Surveying & Land Development (p.518) | 12.5 |
| Semester 2 | |
| 451-334 Environmental Visualisation & Mapping (p.518) | 12.5 |
| 451-335 Application and Development of GIS (p.518) | 12.5 |
| 451-336 Applications of Remote Sensing (p.518) | 12.5 |
| 451-337 Satellite Positioning and Geodesy (p.518) | 12.5 |
| Fourth year | Points |
| Semester 1 | |
| 121-021 Environmental Politics and Management (p.181) | 12.5 |
| 451-418 Land Administration (p.518) | 12.5 |
| 451-422 Residential Subdivision Design (p.518) | 12.5 |
| 451-449 Professional and Research Studies (p.519) | 12.5 |
| Semester 2 | |
| 451-450 Research Project (p.519) | 25 |
| 451-447 Photogrammetry (p.519) | 12.5 |
| 451-446 Integrated Systems in Geomatics (p.519) | 12.5 |

Bachelor of Arts/Bachelor of Geomatic Engineering (BA/BGeomE)

Students taking combined degree courses who intend to overlap third and later year subjects, should consult with a course adviser to ensure all core geomatic engineering requirements are met.

The recommended or standard course structures are listed below. 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 |
|--|--------|
| Semester 1 | |
| 433-171 Introduction to Programming (p.554) | 12.5 |
| 451-100 Geomatics Science 1A (p.515) | 12.5 |
| 451-113 Intro to Computer Systems and Graphics (p.516) | 12.5 |
| Arts subject as required | 12.5 |
| Semester 2 | |
| 451-101 Geomatics Science 1B (p.515) | 12.5 |
| 620-141 Mathematics A (p.840) | 12.5 |
| Arts subjects as required | 25 |
| Second year | Points |
| Semester 1 | |
| 620-142 Mathematics B (p.840) | 12.5 |
| 620-160 Experimental Design & Data Analysis (p.841) | 12.5 |
| Arts subject as required | 25 |
| Semester 2 | |
| 451-200 Geomatics Science 2 (p.516) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| Art subjects as required | 25 |
| Third year | Points |
| Semester 1 | |
| 451-203 Planning, Property & Surveying Law (p.516) | 12.5 |
| 451-204 Professional Development (p.516) | 12.5 |
| 451-208 Computational Methods in Geomatics (p.517) | 12.5 |
| Arts subject as required | 12.5 |
| Semester 2 | |
| 451-206 Least Squares & Network Analysis (p.517) | 12.5 |
| 451-334 Environmental Visualisation & Mapping (p.518) | 12.5 |
| Arts subjects as required | 25 |
| Fourth year | Points |
| Semester 1 | |
| 451-333 Cadastral Surveying & Land Development (p.518) | 12.5 |
| 451-332 Imaging in the Geosciences (p.517) | 12.5 |
| 451-207 Information Science & Programming (p.517) | 12.5 |
| Arts subjects as required | 12.5 |
| Semester 2 | |

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| Fourth year | Points |
| 451-337 Satellite Positioning and Geodesy (p.518) | 12.5 |
| Choose one of: | |
| 451-335 Application and Development of GIS (p.518) | 12.5 |
| 451-446 Integrated Systems in Geomatics (p.519) | 12.5 |
| 451-447 Photogrammetry (p.519) | 12.5 |
| Art subjects as required | 25 |

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|---|--------|
| Fifth year | Points |
| Semester 1 | |
| 451-418 Land Administration (p.518) | 12.5 |
| 451-422 Residential Subdivision Design (p.518) | 12.5 |
| 451-449 Professional and Research Studies (p.519) | 12.5 |
| Arts subject as required | 12.5 |
| Semester 2 | |
| 451-450 Research Project (p.519) | 25 |
| Arts subjects as required | 25 |

Bachelor of Laws/Bachelor of Geomatic Engineering (LLB/BGeomE)

Details of this course structure are available from the Department of Geomatics.

Bachelor of Geomatic Engineering/Bachelor of Science (BGeomE/BSc)

Students taking combined degree courses and who intend to overlap third and later year subjects, should consult with a course adviser to ensure all core geomatic engineering requirements are met. Students can elect any science major within the BSc program.

The recommended or standard course structures are listed below. 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.

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|--|--------|
| First year | Points |
| Semester 1 | |
| 433-141 Computing Fundamentals A (p.554) | 12.5 |
| or | |
| 433-171 Introduction to Programming (p.554) | 12.5 |
| 451-100 Geomatics Science 1A (p.515) | 12.5 |
| 451-113 Intro to Computer Systems and Graphics (p.516) | 12.5 |
| 620-141 Mathematics A (p.840) | 12.5 |
| Semester 2 | |
| 451-101 Geomatics Science 1B (p.515) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| 620-142 Mathematics B (p.840) | 12.5 |
| 620-160 Experimental Design & Data Analysis (p.841) | 12.5 |

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| Second year | Points |
| Semester 1 | |
| 451-203 Planning, Property & Surveying Law (p.516) | 12.5 |
| 451-204 Professional Development (p.516) | 12.5 |
| 451-208 Computational Methods in Geomatics (p.517) | 12.5 |
| Science subject as required | 12.5 |
| Semester 2 | |
| 451-200 Geomatics Science 2 (p.516) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| 451-206 Least Squares & Network Analysis (p.517) | 12.5 |
| Science subject as required | 12.5 |

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|--|--------|
| Third year | Points |
| Semester 1 | |
| 421-255 Management for Engineers 1 (p.506) | 12.5 |
| 451-331 Spatial Analysis (p.517) | 12.5 |
| 451-332 Imaging in the Geosciences (p.517) | 12.5 |
| 451-333 Cadastral Surveying & Land Development (p.518) | 12.5 |
| Semester 2 | |
| 451-337 Satellite Positioning and Geodesy (p.518) | 12.5 |
| Choose two of: | |
| 451-334 Environmental Visualisation & Mapping (p.518) | 12.5 |
| 451-335 Application and Development of GIS (p.518) | 12.5 |

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|--|--------|
| Third year | Points |
| 451-336 Applications of Remote Sensing (p.518) | 12.5 |
| Science subject as required | 12.5 |

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|--|--------|
| Fourth year | Points |
| Semester 1 | |
| 451-418 Land Administration (p.518) | 12.5 |
| 451-422 Residential Subdivision Design (p.518) | 12.5 |
| Science subjects as required | 25 |

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|---|------|
| Semester 2 | |
| 451-446 Integrated Systems in Geomatics (p.519) | 12.5 |
| 451-447 Photogrammetry (p.519) | 12.5 |
| Science subjects as required | 25 |

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|---|--------|
| Fifth year | Points |
| Semester 1 | |
| 451-449 Professional and Research Studies (p.519) | 12.5 |
| Science subjects as required | 37.5 |
| Semester 2 | |
| 451-450 Research Project (p.519) | 25 |
| Science subjects as required | 25 |

Bachelor of Geomatic Engineering/Bachelor of Information Systems (BGeomE/BIS)

Students taking combined degree courses and who intend to overlap third and later year subjects, should consult with a course adviser to ensure all core engineering requirements are met.

The recommended or standard course structures are listed below. 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.

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|--|--------|
| First year | Points |
| Semester 1 | |
| 451-100 Geomatics Science 1A (p.515) | 12.5 |
| 451-113 Intro to Computer Systems and Graphics (p.516) | 12.5 |
| 620-141 Mathematics A (p.840) | 12.5 |
| Information Systems subject as required | 12.5 |
| Semester 2 | |
| 451-101 Geomatics Science 1B (p.515) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| 620-142 Mathematics B (p.840) | 12.5 |
| 620-160 Experimental Design & Data Analysis (p.841) | 12.5 |

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|--|--------|
| Second year | Points |
| Semester 1 | |
| 451-203 Planning, Property & Surveying Law (p.516) | 12.5 |
| 451-204 Professional Development (p.516) | 12.5 |
| 451-208 Computational Methods in Geomatics (p.517) | 12.5 |
| Information systems subject as required | 12.5 |
| Semester 2 | |
| 451-200 Geomatics Science 2 (p.516) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (p.516) | 12.5 |
| 451-206 Least Squares & Network Analysis (p.517) | 12.5 |
| Information systems subject as required | 12.5 |

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|--|--------|
| Third year | Points |
| Semester 1 | |
| 451-333 Cadastral Surveying & Land Development (p.518) | 12.5 |
| Choose one of: | |
| 451-331 Spatial Analysis (p.517) | 12.5 |
| 451-332 Imaging in the Geosciences (p.517) | 12.5 |
| Information Systems subject as required | 25 |

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|---|------|
| Semester 2 | |
| 451-337 Satellite Positioning and Geodesy (p.518) | 12.5 |
| Choose one of: | |
| 451-334 Environmental Visualisation & Mapping (p.518) | 12.5 |
| 451-335 Application and Development of GIS (p.518) | 12.5 |
| 451-336 Applications of Remote Sensing (p.518) | 12.5 |
| Information systems subjects as required | 25 |

| Fourth year | Points |
|--|--------|
| Semester 1 | |
| 451-418 Land Administration (<i>p.518</i>) | 12.5 |
| 451-422 Residential Subdivision Design (<i>p.518</i>) | 12.5 |
| Information systems subjects as required | 25 |
| Semester 2 | |
| Choose one of: | |
| 451-446 Integrated Systems in Geomatics (<i>p.519</i>) | 12.5 |
| 451-447 Photogrammetry (<i>p.519</i>) | 12.5 |
| Information systems subjects as required | 37.5 |
| Fifth Year | Points |
| Semester 1 | |
| 451-449 Professional and Research Studies (<i>p.519</i>) | 12.5 |
| Information systems subjects as required | 37.5 |
| Semester 2 | |
| 451-450 Research Project (<i>p.519</i>) | 25 |
| Information systems subjects as required | 25 |

Bachelor of Geomatic Engineering/Bachelor of Planning and Design (Property and Construction) (BGeomE/BPD)

The recommended or standard course structures are listed below. 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 |
|---|--------|
| Semester 1 | |
| 433-171 Introduction to Programming (<i>p.554</i>) | 12.5 |
| 451-100 Geomatics Science 1A (<i>p.515</i>) | 12.5 |
| 451-113 Intro to Computer Systems and Graphics (<i>p.516</i>) | 12.5 |
| 702-137 Construction Technology 1A (<i>p.23</i>) | 12.5 |
| Semester 2 | |
| 451-101 Geomatics Science 1B (<i>p.515</i>) | 12.5 |
| 620-141 Mathematics A (<i>p.840</i>) | 12.5 |
| 702-117 Management of Construction 1 (<i>p.28</i>) | 12.5 |
| 702-138 Construction Technology 1B (<i>p.23</i>) | 12.5 |
| Second year | Points |
| Semester 1 | |
| 620-160 Experimental Design & Data Analysis (<i>p.841</i>) | 12.5 |
| 620-142 Mathematics B (<i>p.840</i>) | 12.5 |
| 705-173 Shaping the Metropolis (<i>p.31</i>) | 12.5 |
| or | |
| 702-102 City in History (<i>p.22</i>) | 12.5 |
| 702-237 Construction Technology 2A (<i>p.23</i>) | 12.5 |
| Semester 2 | |
| 451-200 Geomatics Science 2 (<i>p.516</i>) | 12.5 |
| 451-205 Introduction to GIS and Remote Sensing (<i>p.516</i>) | 12.5 |
| 702-115 Property 1 (<i>p.30</i>) | 12.5 |
| 702-238 Construction Technology 2B (<i>p.24</i>) | 12.5 |
| Third year | Points |
| Semester 1 | |
| 451-203 Planning, Property & Surveying Law (<i>p.516</i>) | 12.5 |
| 451-204 Professional Development (<i>p.516</i>) | 12.5 |
| 451-208 Computational Methods in Geomatics (<i>p.517</i>) | 12.5 |
| 702-216 Introduction to Cost Management (<i>p.26</i>) | 12.5 |
| Semester 2 | |
| 306-102 Accounting Concepts (<i>p.395</i>) | 12.5 |
| 451-206 Least Squares & Network Analysis (<i>p.517</i>) | 12.5 |
| 451-334 Environmental Visualisation & Mapping (<i>p.518</i>) | 12.5 |
| 702-219 Built-Environment Sciences (<i>p.22</i>) | 12.5 |
| Fourth year | Points |
| Semester 1 | |
| 451-207 Information Science & Programming (<i>p.517</i>) | 12.5 |
| 451-332 Imaging in the Geosciences (<i>p.517</i>) | 12.5 |
| 451-333 Cadastral Surveying & Land Development (<i>p.518</i>) | 12.5 |
| 121-006 Urban Economic Geography (<i>p.180</i>) | 12.5 |

| Fourth year | Points |
|---|--------|
| Semester 2 | |
| 451-337 Satellite Positioning and Geodesy (<i>p.518</i>) | 12.5 |
| 702-211 Property 2 (<i>p.30</i>) | 12.5 |
| 705-219 Planning and Development Management (<i>p.29</i>) | 12.5 |
| Choose one of: | |
| 451-335 Application and Development of GIS (<i>p.518</i>) | 12.5 |
| 451-446 Integrated Systems in Geomatics (<i>p.519</i>) | 12.5 |
| 451-447 Photogrammetry (<i>p.519</i>) | 12.5 |
| Fifth Year | Points |
| Semester 1 | |
| 451-418 Land Administration (<i>p.518</i>) | 12.5 |
| 451-422 Residential Subdivision Design (<i>p.518</i>) | 12.5 |
| 451-449 Professional and Research Studies (<i>p.519</i>) | 12.5 |
| 702-353 Property 3 (<i>p.30</i>) | 12.5 |
| Semester 2 | |
| 451-450 Research Project (<i>p.519</i>) | 25 |
| 702-355 Property Management (<i>p.31</i>) | 12.5 |
| 702-361 Construction Cost Planning (<i>p.23</i>) | 12.5 |
| 702-319 Construction Law (<i>p.23</i>) | 12.5 |

Subject descriptions

121-013 Global Ecology and Biogeography

See full subject details on page 180.

121-021 Environmental Politics and Management

See full subject details on page 181.

145-009 Effective Communication for Engineering

See full subject details on page 117.

306-102 Accounting Concepts

See full subject details on page 395.

421-255 Management for Engineers 1

See full subject details on page 506.

433-141 Computing Fundamentals A

See full subject details on page 554.

433-142 Computing Fundamentals B

See full subject details on page 554.

433-171 Introduction to Programming

See full subject details on page 554.

451-100 Geomatics Science 1A

Credit points: 12.5

HECS-band: 2

Coordinator: Mr C Ogleby

Contact: 24 hours of lectures and 24 hours of practical classes (*Semester 1*).

Description: Upon completion of this subject students should have an appreciation of the diverse variety of geomatics-related science and technology that can be applied to current geomatics engineering practices. Students should also have an understanding of the basic theory of plane surveying, including instrument calibration and presentation of technical information. In addition, by participation in a mentoring (transition) program, students should be better able to undertake and complete their university studies.

Topics covered include coordinate systems and maps; satellite navigation and positioning systems; land titles, land acquisition and subdivision; hydrographic surveying; geographic information systems; remote sensing; environmental visualization; photogrammetry; and high precision industrial measurement. The transition program will cover aspects of improving students' study and communication skills, types of written and oral communication and the use of library resources.

Assessment: Not more than 2 hours of written examinations and tests (30%), and written assignments not exceeding 60 pages of computations, diagrams and written work (70%).

451-101 Geomatics Science 1B

Credit points: 12.5

HECS-band: 2

Coordinator: Mr C Ogleby

Prerequisites: 451-100 Geomatics Science 1A

Contact: 24 hours of lectures and 24 hours of practical classes plus attendance at a residential field course (*Semester 2*).

Description: Upon completion of this subject students should have an understanding of the data acquisition techniques of plane surveying, and practical experience with computer packages for spatial information reduction and plotting.

This unit includes the use of basic surveying equipment such as theodolites, levels and total stations, as well as the techniques of linear distance measurement, levelling, traversing, tacheometry, and field-to-office surveying. It includes the reduction of measurement data, and the presentation of this information on plans and computer graphics systems. A residential field course, usually of five days duration, forms a component of this subject. The field course is typically held at Creswick in November and its aims are to consolidate practical skills and to gain experience in working as a team in a realistic workplace environment.

Assessment: Not more than 3 hours of written examinations and tests (20%), and written assignments not exceeding 100 pages of computations, diagrams and written work (45%). The field camp forms a compulsory component of the assessment (35%).

451-102 Introduction To Surveying (B.P.D.)

Credit points: 12.5

HECS-band: 2

Coordinator: Dr A Kealy

Contact: 24 hours of lectures and 24 hours of tutorial and practice classes (*Semester 2*).

Description: The objective of this subject is to introduce the basic surveying techniques which are involved in the development of building sites and building construction.

Topics covered include linear measurement; the level and differential levelling; angular measurement and the theodolite; computations in surveying; traverse calculations; tacheometry; detail surveying; area and volumetric calculations; introduction to geographic information systems; cadastral surveying, land tenure and subdivision principles; and surveying as applied to building and civil setting out works.

Assessment: Not more than 3 hours of written examinations and tests and not more than the equivalent of 80 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject

451-113 Intro to Computer Systems and Graphics

Credit points: 12.5

HECS-band: 2

Coordinator: Mr C Ogleby

Contact: 24 hours of lectures and 24 hours of tutorials (*Semester 1*).

Description: The objective of this subject is to provide students with a clear understanding of a range of computer hardware, operating systems and network software applicable to later coursework and professional activities.

Topics covered include: introduction to basic computer hardware components and configurations; an introduction to the Windows, Unix and Macintosh operating systems; presentation managers, window systems and graphical user interfaces; computer networks and internet applications; World Wide Web authoring and web page design; aspects of physical and cognitive ergonomics; and CAD software with particular emphasis on geomatics applications.

Assessment: Not more than 3 hours of written examinations and tests, and not more than the equivalent of 60 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject.

451-200 Geomatics Science 2

Credit points: 12.5

HECS-band: 2

Coordinator: Dr A Kealy & Assoc Prof M Shortis

Prerequisites: 451-100 Geomatics Science 1A, 451-101 Geomatics Science 1B and 620-142 Intermediate Mathematics B or an equivalent subject

Contact: 24 hours of lectures and 24 hours of tutorials and laboratory sessions, plus attendance at a residential field course (*Semester 2*).

Description: The objective of this subject is to present advanced concepts in surveying, including precise positioning.

The content includes introduction to GIS; operational and QA aspects of electronic distance measurement; trigonometric and precise levelling; aspects of road design; and an introduction to practices in control, underground engineering and industrial surveying. A residential field course, usually of five days duration, forms a component of this subject. The field course is typically held at Creswick in November and its aims are to consolidate practical skills and to gain experience in working as a team in a realistic workplace environment.

Assessment: Not more than 3 hours of written examinations and tests, and not more than 100 pages of written assignments and reports on practical

work. The field camp forms a compulsory component of the assessment. The relative weighting of the assessment components will be published at the commencement of the subject.

451-201 Geomatics for Engineers

Credit points: 12.5

HECS-band: 2

Coordinator: Prof I Williamson & Dr A Kealy

Contact: 24 hours of lectures and 24 hours of practical classes (*Not Offered*).

Description: The objective of this subject is to develop an appreciation of the diverse variety of geomatics-related science and technology as applied to current engineering practices.

Topics covered include coordinate systems and maps; satellite navigation and positioning systems; land titles, land acquisition and subdivision; hydrographic surveying; geographic information systems; remote sensing; environmental visualization; photogrammetry; and high precision industrial measurement.

Assessment: Not more than 3 hours of written examination, and not more than 30 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject.

451-203 Planning, Property & Surveying Law

Credit points: 12.5

HECS-band: 2

Coordinator: Dr G Hunter & Dr M Raff

Contact: 48 hours of lectures and tutorials (*Semester 1*).

Description: This subject gives students a basic understanding of the history and operation of urban planning in Victoria; the origin and background of the land laws affecting our community; and the statute laws that affect surveying practice in Victoria.

Topics include the economic and social significance of land and buildings; urban planning and its role in the process of urban development; the concept, substance and practice of development regulation, land use zoning and comprehensive planned development; planning schemes and the Planning and Environment Act; law of property in land; reception of English law into Australia; real and personal property; land tenure and its history; estates in land; interests of other persons; qualifications of the rights of ownership; land as a security; mortgages; transfer of land; the common law and the Transfer of Land Act; the extinction of interests in land; adverse possession; legal persons, corporations and partnerships; law relating to surveying; history of Victorian surveying law; introduction to current survey law; Surveyors Act 1978 and regulations; Survey Coordination Act 1958 and regulations; and introduction to relevant provisions of the Land Act 1958, Property Law Act 1958 and the Fences Act 1968.

Assessment: Not more than 3 hours of written examinations and tests, and not more than 60 pages of written assignments and reports. The relative weighting of the assessment components will be published at the commencement of the subject.

451-204 Professional Development

Credit points: 12.5

HECS-band: 2

Coordinator: Mr C Ogleby

Contact: 24 hours of lectures and 24 hours of tutorials (*Semester 1*).

Description: The objective of this subject is to develop skills for effective written and verbal presentations, team building, and to improve interview and meeting skills.

The content comprises requirements of effective writing including structure, style, vocabulary, citations and references; requirements and purposes of technical reports; literature searches; editing a report; use of graphics in reports; preparation of reports specifically for: tribunals, government committees, contract proposals, appeals, environmental impact statements; preparation of a curriculum vitae; verbal presentations; study of personality types, group dynamics and team building; use of audio-visual equipment; conduct of meetings and rules of business; and interviewing techniques.

Assessment: Assessment based on two reports of no more than 4000 words, two seminar presentations, and tutorial work of no more than 24 pages. The relative weighting of the assessment components will be published at the commencement of the subject.

451-205 Introduction to GIS and Remote Sensing

Credit points: 12.5

HECS-band: 2

Coordinator: Dr J Leach & Dr C Smith

Contact: 24 hours of lectures and 24 hours of practicals and tutorials (*Semester 2*).

Description: The objective of this subject is to introduce students to remote sensing and geographic information systems. By the end of the subject students should have an understanding of the acquisition of remotely sensed imagery and be familiar with the basic principles and procedures of digital

image processing. They should have developed practical skills in the interpretation and use of remotely sensed data. They should also have an introductory knowledge of the range of GIS applications; understand the fundamental role of GIS in decision making; be familiar with the basic principles and procedures associated with GIS; and have developed basic practical skills in the use of GIS software.

Assessment: Not more than 3 hours of written examinations and tests, and not more than the equivalent of 40 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject.

451-206 Least Squares & Network Analysis

Credit points: 12.5

HECS-band: 2

Coordinator: Prof C Fraser

Prerequisites: 451-208 Computational Methods in Geomatics

Contact: 36 hours of lectures and 12 hours of tutorials (*Semester 2*).

Description: The objective of this subject is to develop an understanding of the principles and techniques of least-squares estimation and network adjustment in geomatics.

Contents include the mathematical model and linearisation; types and classification of models; the covariance law and concept of weight; over-determined models and the application of least-squares estimation; parametric and combined adjustment cases; post-analysis of least-squares adjustment results; constrained and sequential estimation; principles of network design and analysis; network adjustment procedures and software; and 2D and 3D networks in geomatics

Assessment: Not more than 3 hours of written examinations and tests, and not more than the equivalent of 60 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject.

451-207 Information Science & Programming

Credit points: 12.5

HECS-band: 2

Coordinator: Dr A Kealy & Dr R Itami

Prerequisites: 451-113 Introduction to Computer Systems and Graphics, 433-141 Computing Fundamentals A or 433-171 Introduction to Programming

Contact: 24 hours of lectures and 24 hours of tutorials (*Semester 1*).

Description: The objective of this subject is to provide students with competence in scientific programming and the use of information systems and database technology, as well as the ability to apply these tools in practical applications.

The subject will include structure and syntax of a procedural programming language; aspects of design and development of large software packages; software engineering tools and maintenance; management information systems; decision support systems; OLE and data exchange; applications processing; principles and design of databases with emphasis on land and geographic information systems; relational database systems; and structured query language (SQL).

Assessment: Not more than 3 hours of written examinations and tests, and not more than the equivalent of 60 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject.

451-208 Computational Methods in Geomatics

Credit points: 12.5

HECS-band: 2

Coordinator: Dr F Leahy

Prerequisites: 620-142 Mathematics B or equivalent subject and 620-160 Experimental Design and Data Analysis

Contact: 24 hours of lectures and 24 hours of tutorials (*Semester 1*).

Description: The objective of this subject is to apply theories gained in earlier mathematical studies to fundamental problems associated with practice in Geomatics.

Topics covered include spherical trigonometry including properties of spherical triangles, development of fundamental formulae relating elements, area and spherical excess, application in navigation, map projections and positional astronomy; vector geometry for geomatics including vector representation of spatial relationships between points, line and planes, applications in positioning, mining surveying, solid modelling, reference frames and spatial analysis representations of curves on the ellipsoid as vector chains; geometry of the ellipsoid, the ellipsoid as a geodetic reference surface, coordinate systems, geocentric cartesian, curvilinear and universal transverse mercator (UTM), plane curves, loxodromes and geodesics computations on the UTM map grid; transformations between reference frames, rotation matrices for moving vectors between reference frames, properties of orthogonal matrices, conformal transformations in 2 and 3-dimensions; and algorithms for solving simultaneous linear equations, algorithms for general and symmetric matrix

inversion, conditioning matrices for inversion, solutions for redundant linear equations, solutions for non-linear simultaneous equations, applications to curve fitting by least squares methods.

Assessment: Not more than 3 hours of written examinations and tests and not more than the equivalent of 60 pages of written assignments and reports on practical work. The relative weighting of the assessment components will be published at the commencement of the subject.

451-312 GIS & Remote Sensing for Enviro Science

Credit points: 12.5

HECS-band: 2

Coordinator: Dr J Leach & Dr G Hunter

Contact: 24 hours of lectures and 24 hours of tutorials and practicals (*Semester 2*).

Description: The objective of this subject is to develop basic skills in digital data processing and interpretation and geographic information systems.

Remote sensing component content includes principles of remote sensing; electromagnetic radiation; human vision; spaceborne and airborne sensors; and introduction to digital image processing including stretching, digital filters, arithmetic manipulations, image classification, rectification and geocoding.

Geographic Information Systems component content includes introduction to the information society and information management; definition of GIS; the range of GIS applications; the use of GIS for decision making; integration of GIS with other technologies; geographic referencing methods; geographic data structures and models; relationships between geographic features; database definition and modelling; and introduction to the technology associated with GIS.

Assessment: Not more than 3 hours of examinations at the end of the semester. Assignments and practical exercises totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.

451-331 Spatial Analysis

Credit points: 12.5

HECS-band: 2

Coordinator: Dr A Zenger

Prerequisites: 620-160 Experimental Design and Data Analysis, 451-208 Computational Methods in Geomatics (or equivalent subjects).

Contact: 36 hours of lectures and 12 hours of tutorials (*Semester 1*).

Description: At the conclusion of this subject the student should have an understanding of the role of statistical and geometric techniques of spatial analysis for users of Geographic Information Systems (GIS); an understanding of the computational methods of analysis of spatial relationships; and proficiency in the analysis and evaluation of spatial data.

Content includes spatial data types; spatial data structures; point patterns; measures of dispersion; measures of arrangements; patterns of lines; paths, branching, topology and concepts of distance; patterns of area; coverage, assignment, partitioning, spatial scale and spatial aggregation problems, integration of data from various sources, concepts of space; exploratory spatial data analysis; and spatial autocorrelation.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.

451-332 Imaging in the Geosciences

Credit points: 12.5

HECS-band: 2

Coordinator: Prof C Fraser & Dr J Leach

Prerequisites: 620-142 Mathematics B or an equivalent subject

Contact: 36 hours of lectures and 12 hours of tutorial and practice classes (*Semester 1*).

Description: Upon completion of this subject students should have an understanding of the techniques and applications of imaging systems in the geosciences, geomatics, and planetary and natural sciences, and an introductory knowledge of photogrammetry.

Content includes imaging requirements for topographic mapping, meteorology, planetary mapping, remote sensing, oceanography and the earth sciences; digital imaging systems; data visualisation; applications and case studies; geometry of a metric image, sensor interior orientation, perspective distortion and imaging scale; introduction to rectification and orthorectification; and the concept of parallax, stereo restitution, digital mapping, project planning and film scanners.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject

451-333 Cadastral Surveying & Land Development**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr G Hunter**Prerequisites:** 451-203 Introduction to Planning, Property and Surveying Law**Contact:** 24 hours of lectures and 24 hours of practical work (*Semester 1*).**Description:** Upon completion of this subject students should have developed a sound knowledge of the legal and technical requirements for making a cadastral survey in Victoria; the preparation of the corresponding documentation in the form of plans and reports; and the legal and administrative procedures associated with land development in Victoria.

Content includes cadastral surveying; legal obligations and requirements imposed upon cadastral surveyors; history of land settlement in Victoria with respect to surveying; detailed examination of the land tenure systems in Victoria; boundaries, occupation and survey marks; methods of performing cadastral surveys and re-establishing title in urban and rural areas; cadastral survey computations and associated documentation; searching survey and title information; land development; dealings in land; adverse possession, bringing land under the Transfer of Land Act, amendment of title, easements, past practices (stratum/strata/cluster titles), Surveyor-General consents applications; land acquisition and compensation procedures; land subdivision; Subdivision Act 1988 and associated regulations; planning and development controls and procedures; local government practices and documentation; roads: creation; widening; closure; sale; mining tenure in Victoria: survey requirements; extraction industry leases; and law relating to riparian and water rights.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.**451-334 Environmental Visualisation & Mapping****Credit points:** 12.5**HECS-band:** 2**Coordinator:** Assoc Prof I Bishop & Dr A Zerger**Prerequisites:** 451-205 Introduction to GIS and Remote Sensing or an equivalent subject**Contact:** 24 hours of lectures and 24 hours of practical exercises (*Semester 2*).**Description:** Upon completion of this subject students should have developed an understanding of the principles and techniques associated with cartographic sciences and environmental visualisation.

Topics include introduction to cartographic reasoning, introduction to thematic cartography, mapping design and mapping assembly, collect of information (sources, generalisation, scales), graphic expression (visual variables), graphic treatment of data, discreteness (empirical, mathematical, statistical), cartographic representation (symbols, dots, flows, choropleth and isopleth); multi-variable cartography (quadrants: simple, regression, silhouette, taxonomic tree, scalograms, Bertin matrix); introduction to analytical cartography (trend surfaces, spectral analysis, factor analysis, hierarchical classifications); development and application of environmental visualisation; and technical aspects of visualisation, including image manipulation, three dimensional modelling and transformations, the geometry of perspective, hidden line algorithms, shading and rendering, colour, texture capture and mapping, ray tracing.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.**451-335 Application and Development of GIS****Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr A Zerger**Prerequisites:** 451-205 Introduction to GIS and Remote Sensing (or equivalent).**Contact:** 24 hours of lectures and 24 hours of practical work (*Semester 2*).**Description:** Upon completion of this subject students should have a sound understanding of the principles, diversity, system design, development process and implementation of Geographic Information Systems (GIS).

Topics include brief introduction to GIS, application areas, data models in GIS (spatial data models and thematic data structures), vector-based GIS (definition, elements, data bases, specific related problems and analysis), raster-based GIS (definition, data entry, specific related problems and analysis), system design and implementation, management and institutional issues, advanced topics on GIS (multi-criteria evaluation, location/allocation models)

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting

of the assessment components will be provided to students at the beginning of the subject

451-336 Applications of Remote Sensing**Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr J Leach**Prerequisites:** 451-205 Introduction to Remote Sensing and GIS or an equivalent subject**Contact:** 36 hours of lectures and 12 hours of practicals and tutorials (*Semester 2*).**Description:** Upon completion of this subject students should have an understanding of the way in which the principles and techniques of remote sensing can be applied to aid in the solution of resource management and other problems.

The content of the course will include applications of remote sensing in resource mapping and monitoring, in the geosciences and in engineering as well as military and social planning applications. This will include a consideration of the image processing techniques used in each application, the capabilities of current sensor systems, the difficulties of operational implementation and the future potential in each application area.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.**451-337 Satellite Positioning and Geodesy****Credit points:** 12.5**HECS-band:** 2**Coordinator:** Dr P Collier**Prerequisites:** 451-200 Geomatics Science 2 and 451-208 Computational Methods in Geomatics (or equivalent subjects)**Contact:** 24 hours of lectures and 24 hours of tutorial and practical classes (*Semester 2*).**Description:** Upon completion of this subject students should have a basic understanding of the theory and applications of modern geodesy. Space-based positioning systems (such as GPS and GLONASS) are used in conjunction with sophisticated mathematical techniques to solve the problems of determining 3-D position and defining the earth's gravity field. The course will provide an overview of the geodetic problem and a presentation of the techniques used in its solution.

Content includes the theory of satellite geodesy, error modelling, applications of satellite positioning, practical satellite geodesy, advanced data processing techniques, other space-based positioning systems, geodetic datum definition and coordinate systems, physical geodesy and the future of geodesy.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.**451-418 Land Administration****Credit points:** 12.5**HECS-band:** 2**Coordinator:** Prof I Williamson**Pre or Corequisites:** 451-333 Cadastral Surveying and Land Development**Contact:** 48 hours of lectures, tutorials and practical exercises (*Semester 1*).**Description:** Upon completion of this subject students should have an understanding of the need for effective and efficient land administration systems; be able to review the variety of technologies for developing and maintaining such systems; and understand and analyse a range of local and overseas approaches to land administration in both developed and developing countries.

Topics include the concept of land and land as a resource; land administration and land management; the cadastral concept and legal, fiscal and multi-purpose cadastres; cadastral surveying and mapping; principles and concepts of land registration; rights, restrictions and responsibilities related to land; cadastral systems in developing countries including informal cadastres, parallel cadastres and customary tenures; AGENDA 21 and HABITAT II Global Plan of Action; land and geographic information systems; urban information systems; cadastral reform; land administration and spatial information systems in Victoria and associated government policy; institutional arrangements supporting land administration; spatial data infrastructures in Australia; coordinated cadastres; digital cadastral data bases; comparative cadastral studies; modelling and evaluating cadastral and land information systems; and land markets and their relationships to planning, valuation and cadastre.

Assessment: One 3-hour written examination (50%), plus assignments and practical exercise reports totalling not more than 40 pages (50%).**451-422 Residential Subdivision Design****Credit points:** 12.5**HECS-band:** 2

Coordinator: Dr G Hunter

Prerequisites: 451-333 Cadastral Surveying and Land Development

Contact: 48 hours of lectures, tutorials and practical exercises (*Semester 1*).

Description: Upon completion of this subject students should have developed practical skills and knowledge in designing residential subdivisions and preparing the corresponding documentation.

Topics include the land development process, residential subdivision design requirements in Victoria, the subdivision design process, energy efficient subdivisions, planning legislation and environmental controls; the preparation of plans of subdivision and associated documentation; and the use of computer aided design and drafting techniques.

Assessment: Practical design exercises totalling not more than 40 pages. There is no written examination in this subject.

451-446 Integrated Systems in Geomatics

Credit points: 12.5

HECS-band: 2

Coordinator: Dr A Kealy

Prerequisites: 451-200 Geomatics Science 2 (or equivalent).

Contact: 48 hours of lectures, tutorials and practical exercises (*Semester 2*).

Description: Upon completion of this subject students should have gained an understanding of the techniques and technologies used in high-precision, real-time positioning systems and of the application of such systems in fields such as hydrographic surveying, asset mapping, geophysical exploration, structural and crustal monitoring, automatic vehicle location, aircraft landing systems and routine surveying tasks.

Topics include the study of relevant technologies including high-rate, low-latency communications systems (radio, telephone and satellite) linked to positioning systems such as GPS/GLONASS and inertial and dead-reckoning equipment; the integration of hardware components; mathematical techniques for computing positions such as Kalman filtering and neural networks; sources of error and their impact; and quality control measures to ensure integrity of computed positions.

Assessment: One 3-hour written examination, plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.

451-447 Photogrammetry

Credit points: 12.5

HECS-band: 2

Coordinator: Prof C Fraser

Prerequisites: 451-332 Imaging in the Geosciences and 451-206 Least Squares Estimation and Network Analysis

Contact: 36 hours of lectures and 12 hours of tutorials and practical exercises (*Semester 2*).

Description: Upon completion of this subject students should have a thorough understanding of the principles of modern photogrammetry, both topographic and non-topographic.

Topics cover the mathematical foundations of multi-image photogrammetry; bundle adjustment and sensor self-calibration; feature extraction and image matching; digital photogrammetric workstations; orthorectification, automated restitution and DTM extraction in aerial photogrammetry; GPS aerial triangulation; mathematical models, imaging characteristics and mapping products from high-resolution satellite imagery; close-range digital photogrammetry; and industrial and engineering applications of vision metrology.

Assessment: One 3-hour written examination plus assignments and practical exercise reports totalling not more than 40 pages. The relative weighting of the assessment components will be provided to students at the beginning of the subject.

451-449 Professional and Research Studies

Credit points: 12.5

HECS-band: 2

Coordinator: Prof I Williamson and Dr A Kealy

Contact: Lectures, seminars, guided study and research equivalent to 4 hours per week (*Semester 1*).

Description: Upon completion of this subject students should have an understanding of the functions and responsibilities of a geomatics engineering professional, and particularly professional surveyors and geomatics engineers in the community; developed skills in research, communication and writing by either individual or group investigation of a research topic and the subsequent preparation of a verbal presentation of a report; and received experience working both independently and in groups on a project and developed skills in planning and executing a project.

The subject will comprise four components: a) A series of lectures and tutorials covering topics such as the functions and responsibilities of the professional engineer and professional surveyor within the community; professional ethics; the role of the public, private and academic sectors in engineering,

geomatics, surveying, mapping and spatial information industries; strategic planning; Quality Assurance and ISO 9000 certification procedures. b) A review of either a public or private sector organisation from the engineering, geomatics, surveying, mapping or spatial information industries and the preparation of a report on the organisation. c) Attendance and involvement in a 2-day workshop concerned with the operation and management of a private surveying practice organised by the Association of Consulting Surveyors (run outside the teaching semester). d) Lectures on research methods and analytical research techniques leading to the selection of a project topic, formulation of a project work plan, undertaking a literature search and/or background reading, evaluation of literature and commencement of a project. This component of the subject will include the presentation of a progress report on the project and a seminar presentation.

Assessment: Three reports totalling not more than 30 pages (70%). Two seminar presentations (30%).

451-450 Research Project

Credit points: 25

HECS-band: 2

Coordinator: Dr A Kealy

Contact: Guided study and research equivalent to 4 hours per week (*Semester 2*).

Description: Upon completion of this subject students should have developed skills in research, communication and writing by either individual or group investigation of a research topic and the subsequent preparation of a report; received experience in working independently or in groups on a project; and developed skills in planning, executing and managing a project.

The subject will build on the project that was commenced in Professional Studies & Research Methods and will include: supervised individual or group discussions, individual or group investigation and experimental work, project management, and preparation and presentation of a final project report. This subject is considered the culmination of the educational experience within the undergraduate degree program in the Department of Geomatics. The project is designed to consolidate a range of skills which are considered essential in the development of a successful professional.

Assessment: One report of not more than 30 pages with no more than 30 pages of supporting material in the way of appendices, diagrams, tables, computations and computer output (80%). One seminar presentation (20%). Attendance at the seminar is compulsory.

620-141 Mathematics A

See full subject details on page 840.

620-142 Mathematics B

See full subject details on page 840.

620-160 Experimental Design & Data Analysis

See full subject details on page 841.

625-101 Earth Sciences - The Global Environment

See full subject details on page 811.

702-102 City in History

See full subject details on page 22.

702-115 Property 1

See full subject details on page 30.

702-117 Management of Construction 1

See full subject details on page 28.

702-137 Construction Technology 1A

See full subject details on page 23.

702-138 Construction Technology 1B

See full subject details on page 23.

702-211 Property 2

See full subject details on page 30.

702-216 Introduction to Cost Management

See full subject details on page 26.

702-219 Built-Environment Sciences

See full subject details on page 22.

702-237 Construction Technology 2A

See full subject details on page 23.

702-238 Construction Technology 2B

See full subject details on page 24.

705-173 Shaping the Metropolis

See full subject details on page 31.

705-219 Planning and Development Management

See full subject details on page 29.