

## Faculty of Engineering

### A Message from the Dean

This Handbook describes the many undergraduate programs available in the Faculty of Engineering at UNSW. There is a very wide choice of programs, plans and electives and we therefore suggest you spend some time reading the Handbook carefully.

Whatever program you consider, it will be managed by one of our ten schools. Each school will have an advisor who can help you plan your program.

In addition to the individual programs you can broaden your University experience by taking one of the wide range of combined programs which combine the BE with BSc, BA, LLB and BCom degrees. A Master of Biomedical Engineering may be studied concurrently with several of the BE programs.

The Faculty of Engineering is dedicated to scholarship and research and to the facilitation of student learning. The academic staff are engaged in research and engineering practice, most of which is in collaboration with industry. This engagement with the frontiers of engineering and the related sciences ensures that students are familiar with the latest developments. In later years many students are able to participate in the work of the research teams in the Faculty.

The Faculty is a major part of the international dimension of UNSW, we welcome many international students and also encourage local students to take part of their program at an overseas university. We have strong links with major research universities throughout the world.

Students are encouraged to play an active role in all the University has to offer. There are many student led projects and other activities which can enhance your experience as a student at UNSW.

Brendon Parker  
Dean  
Faculty of Engineering

### Contents

#### Faculty Information and Assistance

|                                |     |
|--------------------------------|-----|
| Who Can Help?                  | 182 |
| Faculty of Engineering Website | 182 |
| Entrance Requirements          | 182 |
| General Education Requirements | 182 |
| Re-enrolment Procedures        | 182 |
| Faculty Centres                | 182 |
| Professional Institutions      | 183 |

#### Summary of Programs

|                            |     |
|----------------------------|-----|
| Full-time Programs         | 183 |
| Combined Degree Programs   | 183 |
| Fast-Track Programs        | 184 |
| Concurrent Degree Programs | 184 |
| UNSW Co-op Program         | 185 |
| Transfer Programs          | 185 |

#### Rules for Progression and the Award of Degrees

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| Access to Exam Information                                          | 185 |
| Bachelor of Engineering Program Rules                               | 185 |
| Bachelor of Engineering Bachelor of Science Program Rules           | 185 |
| Bachelor of Engineering Master of Engineering Science Program Rules | 186 |
| Faculty Rules for Progression                                       | 186 |
| Honours                                                             | 186 |
| Industrial Experience Requirements                                  | 186 |
| Program Revision                                                    | 186 |

### Program Rules and Information

#### Faculty of Engineering – All Schools

|                                                   |     |
|---------------------------------------------------|-----|
| 3715 Bachelor of Engineering Bachelor of Commerce | 187 |
|---------------------------------------------------|-----|

#### School of Chemical Engineering and Industrial Chemistry

|                           |     |
|---------------------------|-----|
| 3040 Chemical Engineering | 188 |
|---------------------------|-----|

|                                              |     |
|----------------------------------------------|-----|
| 3050 Chemical Engineering – Part-time        | 189 |
| 3060 Food Science and Technology             | 189 |
| 3065 Food Science and Technology (Honours)   | 190 |
| 3070 Food Science and Technology – Part-time | 190 |
| 3100 Industrial Chemistry                    | 191 |
| 3110 Industrial Chemistry – Part-time        | 192 |

#### Combined/Concurrent Degree Programs

|                                                            |     |
|------------------------------------------------------------|-----|
| 3042 Chemical Engineering/Bachelor of Science              | 192 |
| 3043 Chemical Engineering/Bachelor of Arts                 | 193 |
| 3715 Chemical Engineering/Bachelor of Commerce             | 194 |
| 3048 Chemical Engineering/Master of Biomedical Engineering | 194 |
| 3102 Industrial Chemistry/Bachelor of Science              | 195 |
| 3103 Industrial Chemistry/Bachelor of Arts                 | 196 |
| 3715 Industrial Chemistry/Bachelor of Commerce             | 196 |

#### Fast-Track Programs with Master of Engineering Science

|                                                         |     |
|---------------------------------------------------------|-----|
| 3040 Chemical Engineering/Master of Engineering Science | 196 |
| 3100 Industrial Chemistry/Master of Engineering Science | 197 |

#### School of Civil and Environmental Engineering

|                                |     |
|--------------------------------|-----|
| 3620 Civil Engineering         | 198 |
| 3625 Environmental Engineering | 200 |

#### Combined/Concurrent Degree Programs

|                                                     |     |
|-----------------------------------------------------|-----|
| 3730 Civil Engineering/Bachelor of Science          | 201 |
| 3621 Civil Engineering/Bachelor of Arts             | 202 |
| 3715 Civil Engineering/Bachelor of Commerce         | 203 |
| 4775 Civil Engineering/Bachelor of Laws             | 203 |
| 3146 Civil Engineering/Mining Engineering           | 203 |
| 3631 Civil Engineering/Environmental Engineering    | 204 |
| 3735 Environmental Engineering/Bachelor of Science  | 206 |
| 3626 Environmental Engineering/Bachelor of Arts     | 207 |
| 3715 Environmental Engineering/Bachelor of Commerce | 208 |
| 4777 Environmental Engineering/Bachelor of Laws     | 208 |

#### Fast-Track Programs with Master of Engineering Science

|                                                              |     |
|--------------------------------------------------------------|-----|
| 3620 Civil Engineering/Master of Engineering Science         | 208 |
| 3625 Environmental Engineering/Master of Engineering Science | 208 |

**School of Computer Science and Engineering**

|      |                      |     |
|------|----------------------|-----|
| 3645 | Computer Engineering | 209 |
| 3647 | Bioinformatics       | 211 |
| 3648 | Software Engineering | 212 |
| 3978 | Computer Science     | 213 |

**Combined/Concurrent Degree Programs**

|      |                                                       |     |
|------|-------------------------------------------------------|-----|
| 3726 | Computer Engineering/Bachelor of Science              | 215 |
| 3722 | Computer Engineering/Bachelor of Arts                 | 215 |
| 3715 | Computer Engineering/Bachelor of Commerce             | 216 |
| 3728 | Computer Engineering/Master of Biomedical Engineering | 216 |
| 3755 | Bioinformatics/Bachelor of Science                    | 217 |
| 3756 | Bioinformatics/Bachelor of Arts                       | 218 |
| 3715 | Bioinformatics /Bachelor of Commerce                  | 219 |
| 3757 | Bioinformatics/Master of Biomedical Engineering       | 220 |
| 3651 | Software Engineering/Bachelor of Science              | 221 |
| 3652 | Software Engineering/Bachelor of Arts                 | 222 |
| 3653 | Software Engineering/Bachelor of Commerce             | 223 |
| 3749 | Software Engineering/Master of Biomedical Engineering | 223 |
| 3983 | Computer Science/Bachelor of Science                  | 224 |
| 3968 | Computer Science/Bachelor of Arts                     | 225 |
| 3982 | Computer Science/Bachelor of Digital Media            | 225 |

**Fast-Track Programs with Master of Engineering Science**

|      |                                                       |     |
|------|-------------------------------------------------------|-----|
| 3645 | Computer Engineering/Master of Information Technology | 226 |
| 3647 | Bioinformatics/Master of Information Technology       | 226 |
| 3648 | Software Engineering/Master of Information Technology | 226 |

**School of Electrical Engineering and Telecommunications**

|      |                        |     |
|------|------------------------|-----|
| 3640 | Electrical Engineering | 227 |
| 3643 | Telecommunications     | 228 |
| 3644 | Photonic Engineering   | 230 |

**Combined/Concurrent Degree Programs**

|      |                                                         |     |
|------|---------------------------------------------------------|-----|
| 3725 | Electrical Engineering/Bachelor of Science              | 231 |
| 3720 | Electrical Engineering/Bachelor of Arts                 | 232 |
| 3715 | Electrical Engineering/Bachelor of Commerce             | 233 |
| 3727 | Electrical Engineering/Master of Biomedical Engineering | 233 |
| 3641 | Telecommunications/Bachelor of Science                  | 235 |
| 3646 | Telecommunications/ Bachelor of Arts                    | 236 |
| 3715 | Telecommunications/ Bachelor of Commerce                | 236 |
| 3723 | Telecommunications/Master of Biomedical Engineering     | 236 |
| 3634 | Photonic Engineering/Bachelor of Science                | 237 |
| 3715 | Photonic Engineering/Bachelor of Commerce               | 238 |

**Fast-Track Programs with Master of Engineering Science**

|      |                                                              |     |
|------|--------------------------------------------------------------|-----|
| 3640 | Electrical Engineering/Master of Engineering Science         | 238 |
| 3643 | Telecommunications Engineering/Master of Engineering Science | 238 |

**School of Mechanical and Manufacturing Engineering (incorporating Aerospace Engineering, Mechatronic Engineering and Naval Architecture)**

|             |                                                    |     |
|-------------|----------------------------------------------------|-----|
| <b>3710</b> | <b>Bachelor of Engineering</b>                     |     |
|             | Aerospace Engineering                              | 239 |
|             | Manufacturing Engineering and Management           | 239 |
|             | Mechanical Engineering                             | 239 |
|             | Mechatronic Engineering                            | 239 |
|             | Naval Architecture                                 | 239 |
| <b>3711</b> | <b>Bachelor of Engineering/Bachelor of Science</b> |     |
|             | Aerospace Engineering/Bachelor of Science          | 243 |

|  |                                                               |     |
|--|---------------------------------------------------------------|-----|
|  | Manufacturing Engineering and Management/ Bachelor of Science | 243 |
|  | Mechanical Engineering/Bachelor of Science                    | 243 |
|  | Mechatronic Engineering/Bachelor of Science                   | 243 |
|  | Naval Architecture/Bachelor of Science                        | 243 |

**3712 Bachelor of Engineering/Bachelor of Arts**

|      |                                                            |     |
|------|------------------------------------------------------------|-----|
|      | Aerospace Engineering/Bachelor of Arts                     | 243 |
|      | Manufacturing Engineering and Management/ Bachelor of Arts | 243 |
|      | Mechanical Engineering/Bachelor of Arts                    | 243 |
|      | Mechatronic Engineering/Bachelor of Arts                   | 243 |
|      | Naval Architecture/Bachelor of Arts                        | 243 |
| 3715 | Bachelor of Engineering/Bachelor of Commerce               | 244 |

**Bachelor of Engineering/Master of Biomedical Engineering**

|      |                                                          |     |
|------|----------------------------------------------------------|-----|
| 3683 | Mechanical Engineering/Master of Biomedical Engineering  | 244 |
| 3688 | Mechatronic Engineering/Master of Biomedical Engineering | 245 |

**Fast-Track Programs with Master of Engineering Science**

|      |                                                                              |     |
|------|------------------------------------------------------------------------------|-----|
| 3710 | Manufacturing Engineering and Management/ 8710 Master of Engineering Science | 245 |
| 3710 | Mechanical Engineering/ 8710 Master of Engineering Science                   | 245 |
| 3710 | Mechatronic Engineering/ 8710 Master of Engineering Science                  | 245 |

**School of Mining Engineering**

|      |                    |     |
|------|--------------------|-----|
| 3140 | Mining Engineering | 246 |
|------|--------------------|-----|

**Combined/Concurrent Degree Programs**

|      |                                          |     |
|------|------------------------------------------|-----|
| 3142 | Mining Engineering/Bachelor of Science   | 248 |
| 3144 | Mining Engineering/Bachelor of Arts      | 248 |
| 3715 | Mining Engineering/Bachelor of Commerce  | 249 |
| 3146 | Civil Engineering and Mining Engineering | 249 |

**Fast-Track Programs with Master of Engineering Science**

|      |                                                  |     |
|------|--------------------------------------------------|-----|
| 3140 | Mining Engineering/Master of Engineering Science | 249 |
|------|--------------------------------------------------|-----|

**School of Petroleum Engineering**

|      |                       |     |
|------|-----------------------|-----|
| 3045 | Petroleum Engineering | 250 |
|------|-----------------------|-----|

**Combined/Concurrent Degree Programs**

|      |                                            |     |
|------|--------------------------------------------|-----|
| 3047 | Petroleum Engineering/Bachelor of Science  | 251 |
| 3715 | Petroleum Engineering/Bachelor of Commerce | 251 |

**School of Photovoltaic and Renewable Energy Engineering**

|      |                                |     |
|------|--------------------------------|-----|
| 3642 | Photovoltaics and Solar Energy | 251 |
| 3657 | Renewable Energy Engineering   | 253 |

**Combined/Concurrent Degree Programs**

|      |                                                     |     |
|------|-----------------------------------------------------|-----|
| 3655 | Photovoltaics and Solar Energy/Bachelor of Science  | 254 |
| 3656 | Photovoltaics and Solar Energy/Bachelor of Arts     | 255 |
| 3715 | Photovoltaics and Solar Energy/Bachelor of Commerce | 256 |
| 3658 | Renewable Energy Engineering/Bachelor of Science    | 256 |
| 3715 | Renewable Energy Engineering/Bachelor of Commerce   | 257 |

**School of Surveying and Spatial Information Systems**

|      |                                           |     |
|------|-------------------------------------------|-----|
| 3741 | Surveying and Spatial Information Systems | 257 |
|------|-------------------------------------------|-----|

**Combined/Concurrent Degree Programs**

|      |                                                                |     |
|------|----------------------------------------------------------------|-----|
| 3746 | Surveying and Spatial Information Systems/Bachelor of Science  | 258 |
| 3747 | Surveying and Spatial Information Systems/Bachelor of Arts     | 259 |
| 3715 | Surveying and Spatial Information Systems/Bachelor of Commerce | 260 |

**Fast-Track Programs with Master of Engineering Science**

|      |                                                                                                 |     |
|------|-------------------------------------------------------------------------------------------------|-----|
| 3741 | Bachelor of Engineering (Surveying & Spatial Information Systems)/Master of Engineering Science | 261 |
|------|-------------------------------------------------------------------------------------------------|-----|

## Graduate School of Biomedical Engineering

### Concurrent Degree Programs

|      |                                                                                              |     |
|------|----------------------------------------------------------------------------------------------|-----|
| 3757 | Bachelor of Engineering (Bioinformatics)/<br>Master of Biomedical Engineering                | 261 |
| 3048 | Bachelor of Engineering (Chemical Engineering)/<br>Master of Biomedical Engineering          | 261 |
| 3728 | Bachelor of Engineering (Computer Engineering)/<br>Master of Biomedical Engineering          | 261 |
| 3727 | Bachelor of Engineering (Electrical Engineering)/<br>Master of Biomedical Engineering        | 261 |
| 3138 | Bachelor of Engineering (Materials Science)/<br>Master of Biomedical Engineering             | 261 |
| 3683 | Bachelor of Engineering (Mechanical Engineering)/<br>Master of Biomedical Engineering        | 261 |
| 3688 | Bachelor of Engineering (Mechatronic Engineering)/<br>Master of Biomedical Engineering       | 261 |
| 3749 | Bachelor of Engineering (Software Engineering)/<br>Master of Biomedical Engineering          | 261 |
| 3723 | Bachelor of Engineering (Telecommunications<br>Engineering)/Master of Biomedical Engineering | 261 |

## Faculty Information and Assistance

The entry for the Faculty of Engineering is divided into separate sections for each school/unit. Before reading 'Rules for Progression and the Award of Degrees', you must read the general information at the front of this Faculty entry and then read the opening sections for each of the schools within the Faculty. These sections cover all degrees and diplomas offered by the Faculty. Detailed information on each course then appears under **Course Descriptions** at the end of this Handbook, which includes pre/corequisite details, class hours, units of credit, etc.

You will find that almost any program of study you wish to undertake has courses from other schools, and even other faculties. This means that in your engineering program, courses are listed from other schools in the Faculty of Engineering, each with its own identifying code, as well as from the school in which you are planning to study. If, for example, this is Mechanical and Manufacturing Engineering (MECH), all the courses for Mechanical and Manufacturing Engineering are described in the section for that school. As Mechanical and Manufacturing Engineering also includes Aerospace Engineering (AERO), Manufacturing Engineering and Management (MANF), Mechatronic Engineering (MTRN) and Naval Architecture (NAVL), these courses are also included with the school.

For a full list of courses offered by the University refer to the Online Handbook at [www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au) or visit the Faculty website and refer to the relevant school.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

### Who Can Help?

This section of the Handbook is designed as a detailed source of information in all matters related to the Faculty of Engineering.

If you require advice about enrolment, degree requirements, progression within programs, course content and requirements, contact the appropriate school representative listed below:

#### Faculty of Engineering, Dean's Office

Ms Donna Bailey, Room 605, Building K17  
Tel: (02) 9385 6437

#### School of Chemical Engineering and Industrial Chemistry

Ms Vanessa Werfel, Room 314, Applied Science Building  
Tel: (02) 9385 4777

#### School of Civil and Environmental Engineering

Ms Karenne Irvine, Room 406, Civil Engineering Building  
Tel: (02) 9385 5061

#### School of Computer Science and Engineering

Student Office, Ground Floor, K17 Building  
Tel: (02) 9385 4329 or (02) 9385 4926

#### School of Electrical Engineering and Telecommunications

Ms Gladys Fong, School Office, Electrical Engineering Building  
Tel: (02) 9385 4000

#### School of Mechanical and Manufacturing Engineering

Associate Professor Philip Mathew, Room 107, Mechanical and Manufacturing Engineering Building  
Tel: (02) 9385 4154

#### School of Mining Engineering

Dr Paul Hagan, Room 158, Old Main Building  
Tel: (02) 9385 4514

#### School of Petroleum Engineering

Ms Jennifer Lippiatt, Room LG11, Petroleum Engineering Building  
Tel: (02) 9385 4144

#### School of Photovoltaic & Renewable Energy Engineering

Ms Trichelle Burns, Room LG11, Electrical Engineering Building  
Tel: (02) 9385 6155

#### School of Surveying and Spatial Information Systems

Mr Leon Daras, School Office, Room 426, Electrical Engineering Building  
Tel: (02) 9385 4182

#### Graduate School of Biomedical Engineering

School Office, 5th Floor, Samuels Building  
Tel: (02) 9385 3917

**Important:** As changes may be made to information provided in this Handbook, students should frequently consult the official noticeboards of the schools, the University and the Online Handbook at [www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)

## The Faculty of Engineering Website

[www.eng.unsw.edu.au](http://www.eng.unsw.edu.au)

This Faculty of Engineering website provides information about programs, courses, research interests, news and current events. The website also contains links to all the schools, units, centres and affiliated research institutes of the Faculty, as well as staff and student information resources.

## Entrance Requirements

Students with a UAI (or equivalent) greater than 85 will be considered for admission based on performance in their Australian Year 12 studies and/or tertiary or post-secondary qualifications and/or overseas qualifications equivalent to Australian studies. Students eligible to apply to UNSW via UAC and with ranks in the range 75-84.99 apply for entry through Multiple Criteria Entry (MCE). Other international applicants apply directly to UNSW.

For further details about Multiple Criteria Entry, please refer to the website [www.eng.unsw.edu.au/multiplecriteria/2005](http://www.eng.unsw.edu.au/multiplecriteria/2005)

## General Education Requirements

Students must satisfy the General Education requirements. This is usually 12 UOC taken in the second and third years of their studies. If a student is in a combined degree program with a reduced General Education requirement and then reverts to the single degree program, the usual General Education requirements for that program apply.

Each Faculty has responsibility for deciding what courses can be counted towards the General Education requirement for their students. The Faculty of Engineering is committed to providing the widest range of choice of General Education electives for its students. It strongly encourages students to make the best use of this flexibility. Please contact your School Office for further information on General Education electives available to you.

For a more detailed explanation of the requirements and objectives of General Education and a guide to the choice of specific courses, students should refer to the General Education section in this Handbook or the Online Handbook at [www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au).

## Re-enrolment Procedures

All current students are able to re-enrol via the web using myUNSW. This means that, in most cases, students will be able to enrol and drop classes without the need to fill in forms or attend their program office.

Further information, including details on how and when to enrol for 2006 using myUNSW, is available via myUNSW (<https://my.unsw.edu.au>)

It is the responsibility of students to enrol in a program consistent with the rules governing re-enrolment and admission to the degree.

## Faculty Centres

**ARC Centre of Excellence in Advanced Silicon Photovoltaics and Photonics**

**Director:** Scientia Professor Stuart Wenham

In 2003, the ARC Centre of Excellence in Advanced Silicon Photovoltaics and Photonics was established by the Australian Research Council. This new Centre of Excellence was established to coordinate previously independent world-leading programs conducted under the Key Centre for Photovoltaic Engineering, the PV Special Research Centre, and the Special Research Centre for Third Generation Photovoltaics including all collaborating organisations. This re-organisation aims at increasing the coordination, cross-fertilisation and concentration of effort of the previously separate Centres, as well as launching new initiatives in the commercial application of recent contributions to silicon photonics.

The proposed program of research for the Centre falls into the following strands:

- Silicon wafer-based ('first generation') photovoltaic approaches, applying the group's leadership in both laboratory and commercial technologies to the key issues facing photovoltaics over the coming decade.
- Silicon thin-film ('second generation') approaches.
- 'Third generation' photovoltaic approaches, capable of performance higher than single junctions, continuing the highly assessed program being conducted within the SRC for Third Generation Photovoltaics.
- Silicon photonics, including the development of high-efficiency silicon-based light emitters and high speed modulators for microelectronics.

The first three strands address issues relevant to the PV industry over the next 20 years, while the fourth applies insights and technology developed in our PV work to the broader microelectronics area.

## Professional Institutions

### 1. Institution of Engineers Australia

The professional body for engineering in Australia is Institution of Engineers Australia, which has as its first objective the promotion of the science and practice of engineering in all its branches.

Institution of Engineers Australia has its national headquarters in Canberra and functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession, e.g. civil, mechanical, electrical, engineering management and environmental engineering.

Students of an approved school of engineering may join the Institution as a student member. Student members receive the monthly publications *Engineers Australia* and *Student News* and have access to other publications at preferential rates.

Student members are invited to participate in the Excellence Award for Work Experience, the National Young Engineer of the Year Award and to avail themselves of other Engineers Australia services including the Mentor Scheme and industrial experience guidance.

For more information and membership application forms, contact Institution of Engineers Australia, Sydney Division, 1st Floor, 118 Alfred Street, Milsons Point 2061, telephone (02) 8923 7100, website [www.ieaust.org.au](http://www.ieaust.org.au)

### 2. The Institution of Surveyors, Australia and the Spatial Sciences Institute, Australia

During their undergraduate years, students in the Surveying and Spatial Information Systems program are encouraged to take the first steps in joining in the activities of the professional bodies which represent them: the Institution of Surveyors and the Spatial Sciences Institute. The aims of the bodies are to promote scientific, technical and educational aspects of Surveying and Spatial Information Systems and to maintain high professional standards of practice and conduct. Student members receive the journals of the Institutes and *Azimuth*, which is published by the NSW Division of the Institution. Membership also entitles the student to attend all meetings of the Institution and to attend the annual SSI Congress at a special concessional rate. Membership application forms are available at the office of the School of Surveying and Spatial Information Systems and from the Institution Office, Third Floor, Guild House, 363 Pitt Street, Sydney 2000. Websites [www.isaust.org.au](http://www.isaust.org.au) and [www.spatialsciences.org.au](http://www.spatialsciences.org.au)

### 3. The Association of Professional Engineers, Scientists and Managers, Australia

APESMA is a professional organisation that represents the industrial interests of its members with a major focus on providing advice and assistance on employment related matters, including individual representation and improving salaries and conditions for professional engineers, scientists and managers.

Students are invited to become affiliate members (free of charge) of the Association while they are studying. This membership gives students access to information and advice on industrial experience, salary rates for graduates and contracts of employment. Student members receive *The Student Update*, a publication designed specifically for students, three times a year. This gives students some practical insight into aspects of the workplace to which they may not have given much thought, in particular the employment issues that affect them as professional engineers. More information and student membership application forms can be obtained from APESMA, Level 1, 491 Kent Street, Sydney 2000, telephone: 9263 6500, website [www.apesma.asn.au](http://www.apesma.asn.au)

## Summary of Programs

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

### Full-time Programs

The Faculty of Engineering offers the following full-time undergraduate programs:

#### Bachelor of Engineering BE

|                                           |      |
|-------------------------------------------|------|
| in:                                       |      |
| Aerospace Engineering                     | 3710 |
| Bioinformatics                            | 3647 |
| Chemical Engineering                      | 3040 |
| Civil Engineering                         | 3620 |
| Computer Engineering                      | 3645 |
| Electrical Engineering                    | 3640 |
| Environmental Engineering                 | 3625 |
| Industrial Chemistry                      | 3100 |
| Manufacturing Engineering and Management  | 3710 |
| Mechanical Engineering                    | 3710 |
| Mechatronic Engineering                   | 3710 |
| Mining Engineering                        | 3140 |
| Naval Architecture                        | 3710 |
| Petroleum Engineering                     | 3045 |
| Photonics Engineering                     | 3644 |
| Photovoltaics & Solar Energy              | 3642 |
| Renewable Energy Engineering              | 3657 |
| Software Engineering                      | 3648 |
| Surveying and Spatial Information Systems | 3741 |
| Telecommunications                        | 3643 |

#### Bachelor of Science BSc

|                                       |      |
|---------------------------------------|------|
| Computer Science                      | 3978 |
| Food Science and Technology           | 3060 |
| Food Science and Technology (Honours) | 3065 |

#### Bachelor of Science (Technology) BSc(Tech)

|                             |      |
|-----------------------------|------|
| Chemical Engineering        | 3050 |
| Food Science and Technology | 3070 |
| Industrial Chemistry        | 3110 |

### Combined Degree Programs

Full-time programs are available for the award of the following degrees:

#### Bachelor of Engineering Bachelor of Science BE BSc

(5 years duration) in:

|                                          |      |
|------------------------------------------|------|
| Aerospace Engineering                    | 3711 |
| Bioinformatics                           | 3755 |
| Chemical Engineering                     | 3042 |
| Civil Engineering                        | 3730 |
| Computer Engineering                     | 3726 |
| Electrical Engineering                   | 3725 |
| Environmental Engineering                | 3735 |
| Industrial Chemistry                     | 3102 |
| Manufacturing Engineering and Management | 3711 |
| Mechanical Engineering                   | 3711 |
| Mechatronic Engineering                  | 3711 |
| Mining Engineering                       | 3142 |
| Naval Architecture                       | 3711 |
| Petroleum Engineering                    | 3047 |
| Photonic Engineering                     | 3634 |
| Photovoltaics and Solar Energy           | 3655 |

|                                           |      |
|-------------------------------------------|------|
| Renewable Energy Engineering              | 3658 |
| Software Engineering                      | 3651 |
| Surveying and Spatial Information Systems | 3746 |
| Telecommunications                        | 3641 |

**Bachelor of Engineering Bachelor of Arts BE BA**

(5 years duration) in:

|                                           |      |
|-------------------------------------------|------|
| Aerospace Engineering                     | 3712 |
| Bioinformatics                            | 3756 |
| Chemical Engineering                      | 3043 |
| Civil Engineering                         | 3621 |
| Computer Engineering                      | 3722 |
| Electrical Engineering                    | 3720 |
| Environmental Engineering                 | 3626 |
| Industrial Chemistry                      | 3103 |
| Manufacturing Engineering and Management  | 3712 |
| Mechanical Engineering                    | 3712 |
| Mechatronic Engineering                   | 3712 |
| Mining Engineering                        | 3144 |
| Naval Architecture                        | 3712 |
| Photovoltaics and Solar Energy            | 3656 |
| Software Engineering                      | 3652 |
| Surveying and Spatial Information Systems | 3747 |
| Telecommunications                        | 3646 |

**Bachelor of Engineering Bachelor of Commerce BE BCom**

(5 years duration) in:

|                      |      |
|----------------------|------|
| Software Engineering | 3653 |
|----------------------|------|

(5.5 years duration) in:

|                                           |      |
|-------------------------------------------|------|
| Bioinformatics Engineering                | 3715 |
| Chemical Engineering                      | 3715 |
| Civil Engineering                         | 3715 |
| Computer Engineering                      | 3715 |
| Electrical Engineering                    | 3715 |
| Environmental Engineering                 | 3715 |
| Industrial Chemistry                      | 3715 |
| Manufacturing Engineering and Management  | 3715 |
| Mechanical Engineering                    | 3715 |
| Mechatronic Engineering                   | 3715 |
| Mining Engineering                        | 3715 |
| Petroleum Engineering                     | 3715 |
| Photonics Engineering                     | 3715 |
| Photovoltaics & Solar Energy              | 3715 |
| Renewable Energy Engineering              | 3715 |
| Surveying and Spatial Information Systems | 3715 |
| Telecommunications                        | 3715 |

**Bachelor of Engineering Bachelor of Laws BE LLB**

(6 years duration) in:

|                           |      |
|---------------------------|------|
| Civil Engineering         | 4775 |
| Environmental Engineering | 4777 |

**Bachelor of Engineering Bachelor of Engineering BE BE**

(5 years duration) in:

|                                                 |      |
|-------------------------------------------------|------|
| Civil Engineering and Mining Engineering        | 3146 |
| Civil Engineering and Environmental Engineering | 3631 |

**Bachelor of Science Bachelor of Science BSc BSc**

(4 years duration) in:

|                  |      |
|------------------|------|
| Computer Science | 3983 |
|------------------|------|

**Bachelor of Science Bachelor of Arts BSc BA**

(4 years duration) in:

|                  |      |
|------------------|------|
| Computer Science | 3968 |
|------------------|------|

**Bachelor of Science Bachelor of Digital Media BSc BDM**

(4 years duration) in:

|                                    |      |
|------------------------------------|------|
| Computer Science and Digital Media | 3982 |
|------------------------------------|------|

**Bachelor of Engineering Master of Engineering (BE ME) or Master of Science (BE MSc)**

**Admission Guidelines:** An applicant for the BE ME or BE MSc program should, at the time of application, be enrolled in the 4.5-year fast-track Faculty of Engineering BE MEngSc program and have just completed the requirements for the BE component at a minimum of Honours Class 2 or equivalent. Applications to transfer to the ME or MSc degree should be made to the Registrar.

**Period of Candidature for ME MSc Degree:** The normal period is three academic sessions (full-time). In special cases, this can be reduced by up to two academic sessions. The maximum period of registration is six academic sessions (full-time). It is expected that such candidates complete the entire BE ME or BE MSc program in 5 years (which includes a Summer Session in their 5th year), and that they would be enrolled on a full-time basis.

**Coursework:** Candidates who have completed the BE component of the BE MEngSc program (and who have hence successfully completed 12 units of credit of postgraduate coursework in their 4th year of study) are considered to have fully satisfied the Faculty of Engineering requirement for ME or MSc coursework.

**Award of ME MSc Degree:** As for the standard research ME or MSc program. That is, the award of the ME or MSc degree is on the basis of a thesis which embodies the result of an investigation, or design, or engineering development.

**Fast-Track Programs****Bachelor of Engineering Master of Engineering Science BE MEngSc**

Students may undertake a 4.5-year (10 semesters) full-time fast-track program leading to the awards of a Bachelor of Engineering and a Master of Engineering Science in an approved discipline (see below) of the Faculty of Engineering.

In the School of Computer Science and Engineering this program is the Bachelor of Engineering and Master of Information Technology.

The purpose of the program is to offer an accelerated completion of a postgraduate coursework program in engineering to high achieving students. The program will be fully accredited and will provide students with in-depth specialist training to facilitate employment in discipline specific consulting practices and other specialist areas of the profession. The fast-track program structure will thus encourage completion of a first postgraduate coursework program, and lay the groundwork for lifelong learning.

(4 1/2 years duration) in:

|                                           |      |
|-------------------------------------------|------|
| Bioinformatics                            | 3647 |
| Chemical Engineering                      | 3040 |
| Civil Engineering                         | 3620 |
| Computer Engineering                      | 3645 |
| Electrical Engineering                    | 3640 |
| Environmental Engineering                 | 3625 |
| Industrial Chemistry                      | 3100 |
| Manufacturing Engineering & Management    | 3710 |
| Mechanical Engineering                    | 3710 |
| Mechatronic Engineering                   | 3710 |
| Mining Engineering                        | 3140 |
| Software Engineering                      | 3648 |
| Surveying and Spatial Information Systems | 3741 |
| Telecommunications                        | 3643 |

**Fast-Track Programs Bachelor of Engineering Master of Commerce**

These programs are no longer offered to commencing students. Students who enrolled prior to 2004 only are eligible to do these programs. Please contact your School Office if you require further information.

**Concurrent Degree Programs**

Full-time programs are available for the award of the following degrees:

**Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE**

Students may undertake a five-year full-time program leading to the awards of a Bachelor of Engineering (in an approved discipline) and a Master of Biomedical Engineering.

The purpose of a program is to offer accelerated completion of a postgraduate coursework program to high-achieving students. Students are required to maintain a Credit average in the first three years in order to continue enrolment in the postgraduate component of the program.

(5 years duration) in:

|                         |      |
|-------------------------|------|
| Bioinformatics          | 3757 |
| Chemical Engineering    | 3048 |
| Computer Engineering    | 3728 |
| Electrical Engineering  | 3727 |
| Materials Science       | 3138 |
| Mechanical Engineering  | 3683 |
| Mechatronic Engineering | 3688 |
| Software Engineering    | 3749 |
| Telecommunications      | 3723 |

## UNSW Co-op Program

The UNSW Co-op Program is a scholarship program set up by industry and the University of New South Wales, which provides money and industry training for selected undergraduate students in disciplines in Commerce, Science and Engineering.

The UNSW Co-op Program offer scholarships for five-year programs in: Chemical Engineering, Industrial Chemistry, Computer Science, Electrical Engineering, Telecommunications, Material Science and Engineering, Mechanical and Manufacturing Engineering, Mining Engineering, Petroleum Engineering, Photovoltaics and Solar Energy, and Surveying and Spatial Information Systems.

Applicants should have achieved a particular academic standard (UAI 95.7 or equivalent), however, if you are expecting a UAI of at least 93.8, it would still be worth applying. Students are selected as Co-op Scholars largely on the basis of their personal skills, leadership potential and motivation, as well as their non-academic achievements.

Applications close the end of September each year with interviews held at UNSW at the beginning of December. For more details see your School Careers Adviser or contact the UNSW Co-op Program office on (02) 9385 5116 or visit [www.co-op.unsw.edu.au](http://www.co-op.unsw.edu.au)

## Transfer Programs

Students transferring to UNSW after successful completion of part of an engineering degree program at an Australian university would normally be admitted with advanced standing into the degree programs offered by the Faculty of Engineering.

Students who have completed part of an undergraduate program in one school may apply through UAC for a transfer to a program in another school of the Faculty with credit for relevant courses completed. However, as there are significant differences in the various programs, students are not necessarily granted exemption from the same number of courses as they have completed in the program to which the transfer is made.

Enrolment quotas apply to undergraduate programs and the number of places available for transfer is limited and offers will be made on a competitive basis.

Formal advanced standing procedures apply for entry into the following Bachelor of Engineering (BE) programs at the UNSW with full credit.

### BE in Aerospace Engineering

The Faculty has approved an arrangement whereby students who satisfy the requirements of the first two years of a Mechanical Engineering four-year degree program at any Australasian tertiary institution may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Aerospace Engineering. The proviso is that Head of the School is satisfied that the courses studied at the other institution are equivalent, and he gives his recommendation.

### BE in Naval Architecture

The Faculty has approved an arrangement whereby students who satisfy the requirements of the first two years of a Mechanical Engineering four-year degree program at any Australasian tertiary institution may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Naval Architecture. The proviso is that Head of the School is satisfied that the courses studied at the other institution are equivalent, and he gives his recommendation.

## Rules for Progression and the Award of Degrees

### Access to Exam Information

Students in the Faculty of Engineering may request access to their own final examination scripts and may request consultation with the examiner on their performance provided that a written application is made to the program authority no later than fifteen working days after the date of official release of results.

### Bachelor of Engineering Program Rules

1. The Bachelor of Engineering is awarded following the completion of a minimum of 192 units of credit.
2. The specific requirements for the Bachelor of Engineering in the various disciplines are set out in the relevant sections in this Handbook.
3. The degree may be awarded with Honours, based upon the overall performance in the program and in accordance with Faculty and School policies. Honours are awarded in the following classes – Class 1, Class 2 Division 1, Class 2 Division 2.

4. The standard duration of the program is four years, or eight sessions, of full-time study each comprising 24 units of credit. Students may undertake the program over a longer period on the basis of part-time study.

5. Each student is required to complete a minimum of 60 days of approved experience in industry prior to graduation.

6. General Education electives may only be attempted after the student has attempted at least 24 units of credit.

## Bachelor of Engineering Bachelor of Science Program Rules

To qualify for the Bachelor of Engineering and the Bachelor of Science a student must complete successfully courses that total at least 240 units of credit and include:

(a) in the Faculty of Engineering:

- courses making up a full 4-year engineering program described in the degree requirements for the BE specialisation for which the student is enrolled; and

(b) in the Faculty of Science:

- at least 102 units of credit comprising a major in an approved disciplinary stream described in Table A of the Science Handbook, or a major in Computer Science; and

(c) at least 60 days of approved Industrial Training (required for the award of the BE degree).

### Exclusions

The following combined degree combinations are specifically excluded:

BE in Computer Engineering BSc in Computer Science

BE in Software Engineering BSc in Computer Science

### Requirements for the BE and BSc degrees with Honours

#### (a) BE with Honours

On completion of the requirements for the combined degrees a student may qualify for the award of the BE degree with Honours in accordance with the rules for the BE program of specialisation and the Faculty of Engineering rules for calculation of the grade of Honours (1st Class Honours: a weighted average of 75% or greater; 2nd Class Honours Division i: a weighted average of 70% or greater; 2nd Class Honours Division ii: a weighted average of 65% or greater, a student being awarded the highest grade of Honours for which they qualify).

#### (b) BSc with Honours

On completion of the requirements for the combined degrees a student may be qualified to enrol in an Honours program in the Bachelor of Science and to qualify for the award of the BSc with Honours after successfully completing an additional year of study (48 UOC) as specified in the rules of the Faculty of Science.

### Programs of study

The programs of study which may be taken for the degrees of Bachelor of Engineering and Bachelor of Science are governed by the normal rules for award of the BE and BSc in the Faculty of Engineering and the Faculty of Science respectively, which specify:

- (i) units of credit;
- (ii) corequisites, prerequisites, assumed knowledge;
- (iii) the structure of the degree program; and
- (iv) any special conditions.

### Award of the degrees

(i) A candidate for the award of the degrees of Bachelor of Engineering or Bachelor of Science as part of a combined degree program shall not be eligible to be awarded either degree until he or she has completed both degree requirements.

(ii) A student who completes the requirements for both the BE and BSc degrees shall receive at graduation a separate testamur for each of the degrees.

(iii) A student may apply to discontinue the combined BE BSc programs and elect to complete either the BE or BSc degree in accordance with the rules governing award of that degree. Following discontinuation of one of the programs (BE or BSc), courses which count toward that program may not in general count toward the remaining single degree unless they meet the single degree requirements in their own right.

### Administration of the programs

(i) A student's general program will be administered by the Faculty of Engineering and delegated to administration by the school governing the Engineering specialisation.

(ii) Students' programs will be administered by the Faculty of Science for the BSc component of the program and by the Faculty of Engineering for the BE part of the program.

(iii) The Faculty of Science and the Faculty of Engineering shall jointly exercise authority in any matter concerning the combined programs not otherwise covered by these rules.

### Enrolment

(i) An application to enrol as a candidate for the combined program shall be made through the UAC, or on the prescribed form for international students which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(ii) The candidate shall be enrolled as either a full-time or part-time student.

### General Education

Students are enrolled in combined undergraduate programs, leading to the award of two degrees, each in a different faculty, and therefore meet their General Education requirements.

### Program structure

Contained in the University Handbook are typical program structures for each of the schools within the Faculty of Engineering, and for the Faculty of Science. The programs may be varied by students according to the rules governing electives, prerequisites and corequisites and progression within each program. Subject to pre and corequisites and progression rules, students may take courses at any time during the program; it is the responsibility of each student to ensure that the rules governing award of the degrees have been met and that the program of study in each session of enrolment is feasible with regards to progression and timetabling.

### Admission Requirements

(i) **Local HSC students:** Local students apply through the UAC. Students admitted to the combined program will have to meet the requirement for entry to the combined program, which ensures that the requirements for entry to both the BSc and the relevant BE program are met (i.e. the higher of the two requirements has to be met).

(ii) **International students:** International students will be assigned an equivalent rank to enable their performance to be compared to that of local HSC students, using criteria determined by the Admissions Office. Students have to apply to the Admissions Office using the application forms (paper or electronic) provided for the purpose. International students completing Year 12 in Australia apply directly to the UAC. An admission requirement similar to that for local students will have to be met.

(iii) **Admission to later stages of the program:** Students may be admitted to the combined degree program having satisfied part of the requirements for either the BSc or the BE component of the degree (or part of the requirements for both), either at UNSW or at another institution. Students will be admitted on the basis of an equivalent rank, determined by the Admissions Office, equivalent to that required for local HSC students in the year of entry. Students will be offered advanced standing in accordance with normal practice for the BE and BSc degrees. Students will apply using the procedures appropriate for either local HSC students or international students (above).

## Bachelor of Engineering Master of Engineering Science Program Rules

1. The minimum duration of the program is 4.5 years (including a summer semester at the end of the 4th year) leading to the award of the two degrees Bachelor of Engineering (BE) and Master of Engineering Science (MEngSc). In the School of Computer Science and Engineering, the award is Bachelor of Engineering (BE) and Master of Information Technology (MIT).

2. Students must study all courses in the sequence approved by the Faculty of Engineering and are not permitted to enrol in any graduate course until the first six semesters of the program are successfully completed.

3. A minimum average of 65% in the first 3 years of the BE program is required for consideration for entry to the fast track degree program.

4. Honours grading for the BE degree will be based on performance in the first 4 years of study, with course weightings in accordance with School guidelines. The 12 units of credit of graduate coursework undertaken in Year 4 are thus counted for both degrees.

5. Normal Student Contributions/fees apply to the first 8 semesters of the program (including the 12 units of credit of MEngSc courses completed in Year 4) consistent with other undergraduate programs within the Faculty. Fees for the remaining 36 units of credit of the MEngSc program will be 75% of the current fee for the standard 48 units of credit MEngSc.

### Faculty Rules for Progression

Progression in all undergraduate programs in the Faculty of Engineering is permitted by course. However:

1. Programs will continue to be stated and timetabled by year or stage and it cannot be guaranteed that non-standard programs can be completed in the minimum number of years. Students are not permitted to enrol in courses with clashing timetables.

2. Students must satisfy the relevant prerequisite and corequisite requirements. This will usually necessitate students completing or attempting all courses of a particular year or stage before proceeding to a course in the next part of a program. Further details are available from schools.

A **prerequisite** course is one which must be completed prior to enrolment in the course for which it is prescribed.

A **corequisite** course is one which must either be completed successfully before or be studied concurrently with the course for which it is prescribed.

3. Only in exceptional circumstances will students be allowed to enrol in a program containing courses from more than two consecutive years of the program or totalling more than 27 units of credit. Students repeating courses will be expected to choose a program that includes previously failed courses and limits their units of credit. Details of these limits are available from School offices and may only be exceeded with the express permission of the Head of School. A failed elective may be replaced by another elective.

4. Notwithstanding the above, before students can enrol in any non-standard programs, such program must meet with the approval of the Head of School. A non-standard program is one which involves enrolment in courses from more than one year or stage, or comprises courses which are not normally included in the program for a particular year.

For Academic Standing rules please refer to the General University Rules and Student Information section in this Handbook.

### Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

### Industrial Experience Requirements

All students must complete at least 60 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

### Program Revision

Following any program revision, students whose progression is normal are entitled to complete under the version of the program that applied when they first enrolled. Alternatively, they may transfer to the revised program with credit for all courses completed at the time the revised program is introduced.

## Program Rules and Information

### Faculty of Engineering – All Schools

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3715 Bachelor of Engineering Bachelor of Commerce

### BE BCom

#### Typical Duration

5.5 years

#### Minimum UOC for Award

264 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The Faculty of Engineering and the Faculty of Commerce and Economics offer a combined degree program which qualifies students for two degrees after five and a half years of successful study: the Bachelor of Engineering (potentially with Honours) and the Bachelor of Commerce (for which an Honours program requires an additional 48 UOC).

This combined degree is offered in the following Engineering disciplines:

Bioinformatics Engineering  
Chemical Engineering  
Civil Engineering  
Computer Engineering  
Electrical Engineering  
Environmental Engineering  
Industrial Chemistry  
Manufacturing Engineering and Management  
Mechanical Engineering  
Mechatronic Engineering  
Mining Engineering  
Petroleum Engineering  
Photonics Engineering  
Photovoltaics & Solar Energy  
Renewable Energy Engineering  
Software Engineering (program code 3653)  
Surveying and Spatial Information Systems  
Telecommunications

### Requirements for the Bachelor of Engineering and the Bachelor of Commerce degrees

To qualify for the Bachelor of Engineering and the Bachelor of Commerce a student must complete successfully courses that total at least 264 units of credit and include:

- (a) in the Faculty of Engineering:
  - courses making up at least 168 units of credit described in the degree requirements for the BE specialisation for which the student is enrolled; and
- (b) in the Faculty of Commerce:
  - at least 96 units of credit comprising a major of at least 48 units of credit in an approved disciplinary stream and a minor of 24 units of credit of approved session courses of which no more than 12 units may be level 1 courses; prescribed level 1 introductory courses; or suitable electives to make up the full 96 UOC; and
- (c) at least 60 days of approved Industrial Training (required for the award of the BE degree).

### Administration of the Programs

- (i) A student's general program will be administered by the Faculty of Engineering and delegated to administration by the school governing the engineering specialisation.
- (ii) Students' programs will be administered by the Faculty of Commerce and Economics for the BCom component of the program and by the Faculty of Engineering for the BE part of the program.
- (iii) The Faculty of Commerce and Economics and the Faculty of Engineering shall jointly exercise authority in any matter concerning the combined programs not otherwise covered by these rules.

### Enrolment

- (i) An application to enrol as a candidate for the combined program shall be made through UAC to the following programs:

BE in Software Engineering BCom 425028(HECS), 445028 (FEE)

BE in all other programs BCom 425029(HECS), 445029(FEE),

or on the prescribed form for international students which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

- (ii) The candidate shall be enrolled as either a full-time or part-time student.

### Program Objectives and Learning Outcomes

The program is intended for potential engineers who wish to become more aware of economic and social aspects of the engineering profession, and skilled in technical management. It is expected that those taking this program would progress to entrepreneurial and managerial roles. A full range of commerce and engineering careers will still be open to those who qualify with both components of the combined degree program.

Most engineers progress to technical management roles, and these programs will strengthen the commerce background in addition to providing the engineering skills. Increasingly, engineers also find employment in the commercial sector, and the combined programs will provide a good background for those entering banking, consultancy etc. Students wishing to enter the purely commercial sector will benefit from technical and numerate strengths obtained as part of the engineering program.

### Program Structure

#### Stage 1

##### Session One

Science & Engineering courses (24 UOC)

##### Session Two

Science & Engineering courses (24 UOC)

#### Stage 2

##### Session One

Science & Engineering courses (24 UOC)

##### Session Two

Commerce courses (24 UOC)

#### Stage 3

##### Session One

Commerce courses (24 UOC)

##### Session Two

Science & Engineering courses (24 UOC)

#### Stage 4

##### Session One

Science & Engineering courses (12 UOC)  
Commerce courses (12 UOC)

##### Session Two

Science & Engineering courses (12 UOC)  
Commerce courses (12 UOC)

#### Stage 5

##### Session One

Science & Engineering courses (24 UOC)

##### Session Two

Science & Engineering courses (24 UOC)

#### Stage 6

Commerce courses 24 units of credit

### Honours

#### (a) BE with Honours

On completion of the requirements for the combined degrees a student may qualify for the award of the BE degree with Honours in accordance with the rules for the BE program of specialisation and the Faculty of Engineering rules for calculation of the grade of Honours (1st Class Honours: a weighted average of 75% or greater; 2nd Class Honours Division i: a weighted average of 70% or greater; 2nd Class Honours Division ii: a weighted average of 65% or greater, a student being awarded the highest grade of Honours for which they qualify).

#### (b) BCom with Honours

On completion of the requirements for the combined degrees a student may be qualified to enrol in an Honours program in the Bachelor of Commerce and to qualify for the award of the BCom with Honours after successfully completing an additional year of study (48 UOC) as specified in the rules of the Faculty of Commerce.

### Academic Rules

The programs of study which may be taken for the degrees of Bachelor of Engineering and Bachelor of Commerce are governed by the normal

rules for award of the BE and BCom in the Faculty of Engineering and the Faculty of Commerce respectively, which specify:

- (i) units of credit;
- (ii) corequisites, prerequisites, assumed knowledge;
- (iii) the structure of the degree program; and
- (iv) any special conditions.

### Award of the Degrees

(i) A student who completes the requirements for both the BE and BCom degrees shall receive at graduation a separate testamur for each of the degrees.

(ii) A student may apply to discontinue the combined BE BCom programs and elect to complete either the BE or BCom degree in accordance with the rules governing award of that degree. Following discontinuation of one of the programs (BE or BCom), courses which count toward that program will not in general count toward the remaining single degree unless they meet the single degree requirements in their own right.

## School of Chemical Engineering and Industrial Chemistry

**Head of School:** Associate Professor Michael Brungs

**Administrative Officer:** Vivienne Brennan

**Director, Teaching and Learning:** Associate Professor Vicki Chen

The School offers a Bachelor of Engineering in both Chemical Engineering and Industrial Chemistry, together with a Bachelor of Science in Food Science and Technology. The duration of these degree programs is four years full-time. Six year part-time programs in Chemical Engineering and Industrial Chemistry are also available, leading to a Bachelor of Science (Technology). The School also offers a Bachelor of Science (Honours) in Food Science and Technology and a 3 year Bachelor of Science (Food Science and Nutrition major) program.

The Bachelor of Engineering degrees are accredited by the Institution of Engineers Australia and the Royal Chemical Institute. The Bachelor of Engineering in Chemical Engineering is also accredited by the Institution of Chemical Engineers (UK). Graduates of both Food Science and Technology programs qualify for membership of the Australian Institute of Food Science and Technology, the US Institute of Food Technologists and may qualify for membership of the Royal Australian Chemical Institute.

Combined degree programs are also available for suitably qualified students. These are the Bachelor of Engineering Bachelor of Science and the Bachelor of Engineering Bachelor of Arts. Also available are Bachelor of Engineering Bachelor of Commerce. A concurrent Bachelor of Engineering Master of Biomedical Engineering is also available in Chemical Engineering. The School offers a fast-track program over 4.5 years full-time, the Bachelor of Engineering and Master of Engineering Science (BE MEngSc), which allows flexibility of choice between formal coursework and project work and also a 5 year BE ME or MSc (Chem Eng).

Chemical Engineering is the application of the principles of the physical sciences, together with the principles of economics and human relations, to fields in which matter undergoes a change in state, energy content or composition. The chemical engineer is generally responsible for the design, construction and operation of plant and equipment used in the chemical processing industries. Chemical Engineers are employed in a very wide range of industries including the chemical, minerals, pharmaceutical, food and energy industries. Many chemical engineers work in environmental management, research and development business, management and computer applications.

Industrial chemists have a strong foundation in the basic sciences, particularly chemistry, in addition to their engineering skills. Their roles range from solving problems in forefront research areas, to the successful operation of Australia's manufacturing industry. Industrial chemists characterise and select raw materials, develop environmentally responsible routes for the production of commodity materials and chemicals, control chemical plan and processes and verify the quality of the product. Industrial chemists are capable of fulfilling a multiplicity of roles as research scientists, development chemists, technical representatives and as plant/company managers.

Food Science and Technology involves an understanding of the basic sciences and the application of this knowledge to food manufacture from the point of production, through handling, processing, preservation, distribution and marketing, up to consumption and utilisation by consumers. It is concerned with food processes, commodities, composition and quality (including sensory properties, safety and nutritional value).

The study of Food Science and Technology integrates many scientific disciplines. Its bases are in chemistry, physics, biochemistry, microbiology, and molecular biology. The challenges are to increase the availability, variety, quality and quantity of foods economically and in line with the needs of the world population. The Australian industry has a major role to play in supplying high quality foods to overseas markets and there is a national and international demand for professionally trained people prepared to accept responsibility for the production, quality and safety of this food. The programs provide basic preparation for food science and technology careers in the food industry, the public sector, education, research, the food service industry, public health, management and marketing. Graduates may also find careers in health and environmental sciences, management of food resources, and communication and in areas such as dietetics after further training.

For the award of Honours, students need to have distinguished themselves in the formal work, in other assignments as directed by the Head of the School, and in the final year project, for which a thesis is required. It is compulsory that, before completion of the program, students in both the Chemical Engineering and Industrial Chemistry full-time programs must obtain a minimum of twelve weeks professionally oriented or industrial experience. Students in the part-time programs in Chemical Engineering and Industrial Chemistry must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3040 Chemical Engineering (Full-time)

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

This program extends over four years and students study full-time during the day for twenty-eight weeks of each year (excluding examination and recess periods).

The Director of Teaching and Learning may approve various program patterns involving full-time or part-time study.

This program is also available as a combined degree program with BE (Chem Eng) BSc (program 3042), BE (Chem Eng) BA, (program 3043), BE(Chem Eng) BCom, program 3715, the concurrent degree BE (Chem Eng) MBiomedE, (program 3048), and the fast track program BE(Chem Eng) MEngSc, (program 3040, plan CEICL3040). For more information, please contact Director, Teaching and Learning.

### Program Structure

#### Year 1

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CEIC1010 | Introduction to the Chemical Industry   | (3 UOC) |
| CEIC1020 | Introduction to Chemical Engineering    | (6 UOC) |
| CEIC1030 | Communication & Business Skills         | (6 UOC) |
| CHEM1011 | Fundamentals of Chemistry 1A            | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B            | (6 UOC) |
| MATH1131 | Mathematics 1A                          | (6 UOC) |
| MATH1231 | Mathematics 1B                          | (6 UOC) |
| MECH0130 | Engineering Drawing and Solid Modelling | (3 UOC) |

And ONE of the following courses:

|          |                               |         |
|----------|-------------------------------|---------|
| PHYS1111 | Fundamentals of Physics*      | (6 UOC) |
| PHYS1169 | Physics 1 (Chem,Mech,Min Eng) | (6 UOC) |

\* If PHYS1111 is taken, then PHYS1229 MUST be taken in S2

#### Year 2

|          |                                   |         |
|----------|-----------------------------------|---------|
| CEIC2011 | Instrumental Analysis - Theory    | (3 UOC) |
| CEIC2012 | Instrumental Analysis - Practical | (3 UOC) |
| CEIC2020 | Introduction to Numerical Methods | (3 UOC) |
| CEIC2110 | Material & Energy Balances        | (3 UOC) |

|                   |                                           |         |
|-------------------|-------------------------------------------|---------|
| CEIC2120          | Fluid Flow                                | (3 UOC) |
| CEIC2130          | Heat Transfer                             | (3 UOC) |
| CHEN2050          | Chemical Engineering Laboratory 1         | (3 UOC) |
| CHEN2061          | Introduction to Process Chemistry 1       | (6 UOC) |
| CHEN2062          | Introduction to Process Chemistry 2       | (3 UOC) |
| CHEN2140          | Mass Transfer                             | (3 UOC) |
| ELEC0809          | Electrical Engineering 1C                 | (3 UOC) |
| MATH2020          | Mathematics 2A                            | (3 UOC) |
| MATH2030          | Mathematics 2B                            | (3 UOC) |
| MATH2899          | Applied Statistics for Chemical Engineers | (3 UOC) |
| General Education |                                           | (3 UOC) |

**Year 3**

|                   |                                                             |         |
|-------------------|-------------------------------------------------------------|---------|
| BIOT3100          | Fundamentals of Biotechnology                               | (3 UOC) |
| CEIC3010          | Reaction Engineering                                        | (4 UOC) |
| CEIC3070          | Process Control                                             | (4 UOC) |
| CEIC3110          | Thermodynamics                                              | (3 UOC) |
| CHEN3021          | Systems Modelling & Analysis                                | (3 UOC) |
| CHEN3022          | Process Modelling & Optimisation                            | (3 UOC) |
| CHEN3031          | Advanced Transport Phenomena                                | (3 UOC) |
| CHEN3062          | Particles, Separation, Heat Exchangers and Pressure Vessels | (6 UOC) |
| CHEN3065          | Plant and Equipment Design                                  | (4 UOC) |
| CHEN3067          | Process Design & Economics                                  | (3 UOC) |
| CHEN3068          | Process Design & Safety                                     | (3 UOC) |
| CHEN3080          | Chemical Engineering Practice 2                             | (3 UOC) |
| General Education |                                                             | (6 UOC) |

**Year 4**

|                   |                                 |          |
|-------------------|---------------------------------|----------|
| CEIC4070          | Laboratory Automation Science   | (4 UOC)  |
| CEIC4101          | Professional Electives Advanced | (3 UOC)  |
| CEIC4102          | Professional Electives Extended | (3 UOC)  |
| CEIC4106          | Professional Electives          | (3 UOC)  |
| CEIC4120          | Management & Plant Operation    | (6 UOC)  |
| CHEN4031          | Environmental Management 1      | (3 UOC)  |
| CHEN4081          | Design Project                  | (8 UOC)  |
| CHEN4091          | Research Project Theory         | (3 UOC)  |
| CHEN4092          | Research Project Practice       | (12 UOC) |
| General Education |                                 | (3 UOC)  |

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Honours**

For the award of Honours in the Chemical Engineering and Industrial Chemistry programs, students need to have distinguished themselves in the formal work, in other assignments as directed by the Head of the School, and in the final year project, for which a thesis is required.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience Requirements**

It is compulsory that, before completion of the program, students in both the Chemical Engineering and Industrial Chemistry full-time programs must obtain a minimum of twelve weeks professionally oriented or industrial experience. Students in the part-time programs in Chemical Engineering and Industrial Chemistry must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.

**Further Requirements**

Students are expected to possess a calculator having exponential capabilities, however, more advanced calculators and personal computers, will be found useful. In examinations, students may be required to use calculators supplied by the University, so that no student will have an unfair advantage over another. Further information may be obtained from the Head of School.

Students of both Chemical Engineering and Industrial Chemistry are advised to have a copy of Perry J H Ed. Chemical Engineers Handbook 6th Ed. McGraw-Hill. This book is used extensively for most courses and units. Certain courses and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

If you are required to complete a varied program of physics or maths in your first year (i.e. General Maths or Fundamentals of Physics), then

students are not permitted to undertake studies in higher options of other courses.

**Professional Recognition**

Successful completion of the BE degree program is accepted by the Institution of Chemical Engineers, the Institution of Engineers, Australia, and Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

**3050 Chemical Engineering (Part-time)****Bachelor of Science (Technology) BSc(Tech)****Typical Duration**

6 years

**Minimum UOC for Award**

144 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Six year part-time program leading to the award of the degree of Bachelor of Science (Technology) in Chemical Engineering is intended for students who are employed in relevant industries and who wish to prepare for a degree mainly by part-time attendance. They consist of the first 3 years of the respective full-time program, but undertaken over a six year period.

As part of the requirements for the award of the BSc(Tech) degree, students are required to complete an approved program of industrial training of not less than one year prior to the award of the degree. Industrial training should normally be completed concurrently with attendance in the program, but with the approval of the Head of School, may be completed after completion of the prescribed program of study.

Students who qualify for the award of the BSc(Tech) degree and who wish to proceed to the award of a BSc or BE degree will normally be required to complete further work which will involve at least one year of full-time attendance.

Holders of the degree of BSc(Tech) or BSc(Eng) will be eligible to proceed to the award of the degree of Master of Science or Master of Engineering, please refer to course regulations relating to these degrees.

Transfer is also possible from full-time programs to the part-time BSc (Tech) degree program, but a period of approved industrial experience must be gained before graduation. This requirement will apply to students transferring from BSc and BE degree programs within the Faculty.

Further details of part time programs can be obtained from the Director of Teaching and Learning.

**Program Structure**

The structure of this part-time program is similar to the full-time program (BE Chemical Engineering 3040) only over a longer period. Please refer to the 3040 Chemical Engineering program entry for more information.

**Academic Rules**

For academic rules relating to this program, please refer to the entry for the full-time program (BE Chemical Engineering 3040) and contact the Faculty of Engineering for more information.

Note that as part of the requirements for the award of the BSc(Tech) degree, students are required to complete an approved program of industrial training of not less than one year prior to the award of the degree or with the approval of the Head of School, may be completed after completion of the prescribed program of study.

**3060 Food Science and Technology (Full-time)****Bachelor of Science BSc****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

This program is designed to provide depth and breadth in the relevant physical and biological sciences on which food science and technology is based. It is strongly recommended that students obtain, before the completion of the program and during recess periods, as much

professionally oriented or industrial experience as possible. The BSc program in Food Science and Technology (3060) is Pass or Honours, determined by academic performance in Stages 2-4.

## Program Structure

### Year 1

|          |                                         |         |
|----------|-----------------------------------------|---------|
| BIOS1201 | Molecules, Cells and Genes              | (6 UOC) |
| FOOD1120 | Introduction to Food Science            | (6 UOC) |
| FOOD1130 | The Food industry                       | (6 UOC) |
| MATH1031 | Mathematics for Life Sciences           | (6 UOC) |
| MATH1041 | Statistics for Life and Social Sciences | (6 UOC) |
| PHYS1111 | Fundamentals of Physics                 | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1021 | Fundamentals of Chemistry 1B | (6 UOC) |
| CHEM1041 | Higher Chemistry 1D          | (6 UOC) |

### Year 2

|                           |                                             |          |
|---------------------------|---------------------------------------------|----------|
| CHEM2921                  | Food Chemistry 1                            | (6 UOC)  |
| FOOD1230                  | Food Choice                                 | (6 UOC)  |
| FOOD3220                  | Nutrition                                   | (6 UOC)  |
| MICR2201                  | Fundamentals of Microbiology and Immunology | (6 UOC)  |
| BIOC2181                  | Fundamentals of Biochemistry                | (6 UOC)  |
| BIOC2291                  | Fundamentals of Molecular Biology           | (6 UOC)  |
| General Education courses |                                             | (12 UOC) |

### Year 3

|          |                                                |         |
|----------|------------------------------------------------|---------|
| CHEM3811 | Food Chemistry 2                               | (6 UOC) |
| FOOD1360 | Food Processing Principles                     | (6 UOC) |
| FOOD1370 | Food Preservation: Principles and Applications | (6 UOC) |
| FOOD1380 | Unit Operations in Food Processing             | (6 UOC) |
| FOOD1390 | Product Design and Development                 | (6 UOC) |
| FOOD2320 | Food Microbiology                              | (6 UOC) |
| FOOD2330 | Quality Assurance and Control                  | (6 UOC) |
| FOOD2340 | Food Safety                                    | (6 UOC) |

### Year 4

#### Stream A

|          |                   |         |
|----------|-------------------|---------|
| FOOD5400 | Industry Liaison* | (6 UOC) |
|----------|-------------------|---------|

And ONE of the following courses:

|          |               |         |
|----------|---------------|---------|
| FOOD1400 | Project       | (6 UOC) |
| FOOD1480 | Minor Project | (6 UOC) |

Plus a combination of electives to total 30 or 36 units of credit from the following list.

|          |                                |         |
|----------|--------------------------------|---------|
| BIOT3011 | Biotechnology A                | (6 UOC) |
| BIOT3021 | Biotechnology B                | (6 UOC) |
| BIOT3071 | Commercial Biotechnology       | (6 UOC) |
| ECON1101 | Microeconomics 1               | (6 UOC) |
| ECON1102 | Macroeconomics 1               | (6 UOC) |
| FOOD1470 | Postharvest Technology of Food | (6 UOC) |
| FOOD1490 | Advanced Food Chemistry        | (6 UOC) |
| FOOD2350 | Forensic Food Science          | (6 UOC) |
| FOOD2480 | Advanced Food Microbiology     | (6 UOC) |
| FOOD2490 | Analytical Microbiology        | (6 UOC) |
| FOOD3440 | Advanced Nutrition             | (6 UOC) |
| FOOD4450 | Advanced Food Processing       | (6 UOC) |
| INFS1603 | Business Data Management       | (6 UOC) |
| MARK1012 | Marketing Fundamentals         | (6 UOC) |
| PHPH2101 | Physiology 1A                  | (6 UOC) |
| PHPH2201 | Physiology 1B                  | (6 UOC) |

Or such other electives as approved by the Head of School. FOOD courses taken within the School must total at least 36 units of credit.

Please note FOOD1470 and FOOD2490 will not be offered in 2006.

#### Stream B: Industry Module Program

|                |                    |          |
|----------------|--------------------|----------|
| FOOD5400       | Industry Liaison*  | (6 UOC)  |
| FOOD5410       | Industry Practicum | (24 UOC) |
| Plus Electives |                    | (18 UOC) |

\*During Stage 4 of the program, excursions are made to various food industries. Detailed reports of some of these visits may be required.

## General Education Requirements

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies.

For further information, please refer to the General Education section in this Handbook.

## Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Chemical Engineering and Industrial Chemistry for more information.

## Further Information

During the program, excursions are made to various food industries. Detailed reports of some of these visits may be required.

## Professional Recognition

Graduates of this program qualify for membership of the Australian Institute of Food Science and Technology, the US Institute of Food Technologists, and may qualify for membership of the Royal Australian Chemical Institute.

The program provides basic preparation for food science and technology careers in the food industry, the public sector, education, research, the food service industry, public health, management and marketing. Graduates may also find careers in health and environmental sciences, management of food resources and food wastes, and communication, and in areas such as dietetics after further training.

## 3065 Honours in Food Science

### Bachelor of Science (Honours) BSc(Hons)

#### Typical Duration

1 year

#### Minimum UOC for Award

48 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

This is a one-year full-time Honours program in Food Science. It is designed to provide extensive research training in some aspects of Food Science and Technology at undergraduate level. The research orientation of the program, compared to the Graduate Diploma, facilitates entry into a research higher degree (MSc/PhD) upon completion of Honours at a satisfactory level.

Entry to the program requires satisfactory completion of a Bachelor degree, or equivalent, in an area considered relevant to Food Science and Technology. Students who have completed a four year Bachelor program, in which Honours has already been awarded, are specifically excluded.

The major component of the program is an extensive research project, conducted throughout one year of full-time study. Candidates also take 6 units of credit of courses within the School, or such other courses as approved by the program coordinator. Honours is awarded on the basis of performance in the research project and satisfactory completion of coursework.

## Program Structure

### Compulsory Courses

|           |                          |
|-----------|--------------------------|
| FOOD9410  | Honours Research Project |
| (21 UOC)  |                          |
| FOODXXXX* |                          |

\*Courses offered in Food Science and Technology or as approved by the program coordinator and dependent upon the background of the candidate. Units of credit for coursework courses may be concentrated in one session.

## Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Chemical Engineering and Industrial Chemistry for more information.

## 3070 Food Science and Technology (Part-time)

### Bachelor of Science (Technology) BSc(Tech)

#### Typical Duration

6 years

#### Minimum UOC for Award

144 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

This program is designed for students who are employed in the food processing industries. It extends over six part-time years of study, and leads to the award of the degree of Bachelor of Science (Technology). Students are required to complete an approved program of industrial training of not less than twelve months prior to the award of the degree. Industrial training should normally be undertaken concurrently with attendance in the program, but with the approval of the Head of Department may be completed after completion of the prescribed program of study.

The program covers the same subject matter as the first three years of the full-time program: 3060. For the first two years students follow a common program in which general biology is taken, and thereafter specialise in the biological sciences, which are fundamental to the study of food science and technology. The courses of Stages 4, 5 and 6 may be available only in daytime classes, and substantial daytime release from industry may be required. Students who have completed the requirements of this program and have qualified for the award of the degree of Bachelor of Science (Technology) may proceed to the award of the degree of Bachelor of Science by attending for one full-time year and completing the courses listed in Year 4 of the full-time program. Students desiring to proceed to the award of a BSc degree must apply to the Head of the Department not later than 31 December of the year in which the sixth stage is completed.

**Program Structure****Years 1 and 2**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| BIOS1201 | Molecules, Cells and Genes              | (6 UOC) |
| FOOD1120 | Introduction to Food Science            | (6 UOC) |
| FOOD1130 | The Food Industry                       | (6 UOC) |
| MATH1031 | Mathematics for Life Sciences           | (6 UOC) |
| MATH1041 | Statistics for Life and Social Sciences | (6 UOC) |
| PHYS1111 | Fundamentals of Physics                 | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1021 | Fundamentals of Chemistry 1B | (6 UOC) |
| CHEM1041 | Higher Chemistry 1D          | (6 UOC) |

**Note:** Physics, Mathematics and Statistics are usually taken as Stage 1, the other courses as Stage 2

**Year 3**

|          |                                   |         |
|----------|-----------------------------------|---------|
| CHEM2921 | Food Chemistry 1                  | (6 UOC) |
| FOOD1230 | Food Choice                       | (6 UOC) |
| BIOC2181 | Fundamentals of Biochemistry      | (6 UOC) |
| BIOC2291 | Fundamentals of Molecular Biology | (6 UOC) |

**Year 4**

|                   |                                             |          |
|-------------------|---------------------------------------------|----------|
| MICR2201          | Fundamentals of Microbiology and Immunology | (6 UOC)  |
| FOOD3220          | Nutrition                                   | (6 UOC)  |
| General Education |                                             | (12 UOC) |

**Year 5**

|          |                               |         |
|----------|-------------------------------|---------|
| CHEM3811 | Food Chemistry 2              | (6 UOC) |
| FOOD2320 | Food Microbiology             | (6 UOC) |
| FOOD2330 | Quality Assurance and Control | (6 UOC) |
| FOOD2340 | Food Safety                   | (6 UOC) |

**Year 6**

|          |                                                |         |
|----------|------------------------------------------------|---------|
| FOOD1360 | Food Processing Principles                     | (6 UOC) |
| FOOD1370 | Food Preservation: Principles and Applications | (6 UOC) |
| FOOD1380 | Unit Operations in Food Processing             | (6 UOC) |
| FOOD1390 | Product Design and Development                 | (6 UOC) |

**General Education Requirements**

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies.

For further information, please refer to the General Education section in this Handbook.

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School of Chemical Engineering and Industrial Chemistry for more information.

**Professional Recognition**

Graduates of this program qualify for membership of the Australian Institute of Food Science and Technology, the US Institute of Food Technologists, and may qualify for membership of the Royal Australian Chemical Institute.

The program provides basic preparation for food science and technology careers in the food industry, the public sector, education, research, the food service industry, public health, management and marketing. Graduates may also find careers in health and environmental sciences, management of food resources and food wastes, and communication, and in areas such as dietetics after further training.

**3100 Industrial Chemistry (Full-time)****Bachelor of Engineering BE****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Industrial Chemistry is a four-year professional program that is concerned with the application of science and technology to the chemical industry.

Successful completion of the program is accepted by the Royal Australian Chemical Institute and the Institution of Engineers, Australia as sufficient academic qualification for full corporate membership.

The Director of Teaching and Learning may approve various program patterns involving full-time and part-time study.

This program can form part of combined degrees with BE (Ind Chem) BSc (program 3102), BE (Ind Chem)/BA (program 3103), BE (Ind Chem)/BCom (Program 3715) and also the fast-track program BE (Ind Chem)/MEngSc (plan CEICL13100). For more details contact the Director of Teaching and Learning, School of Chemical Engineering & Industrial Chemistry.

**Program Structure****Year 1**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CEIC1010 | Introduction to the Chemical Industry   | (3 UOC) |
| CEIC1020 | Introduction to Chemical Engineering    | (6 UOC) |
| CHEM1011 | Fundamentals of Chemistry 1A            | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B            | (6 UOC) |
| MATH1131 | Mathematics 1A                          | (6 UOC) |
| MATH1231 | Mathematics 1B                          | (6 UOC) |
| MECH0130 | Engineering Drawing and Solid Modelling | (3 UOC) |

And ONE of the following courses:

|          |                                 |         |
|----------|---------------------------------|---------|
| PHYS1111 | Fundamentals of Physics*        | (6 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng) | (6 UOC) |

And ONE of the following courses:

|          |                                  |         |
|----------|----------------------------------|---------|
| CEIC1030 | Communication & Business Skills  | (6 UOC) |
| PHYS1211 | Energy and Environmental Physics | (6 UOC) |

\* If PHYS1111 is taken then PHYS1229 must be taken in S2

**Year 2**

|                   |                                           |         |
|-------------------|-------------------------------------------|---------|
| CEIC2011          | Instrumental Analysis - Theory            | (3 UOC) |
| CEIC2012          | Instrumental Analysis - Practical         | (3 UOC) |
| CEIC2020          | Introduction to Numerical Methods         | (3 UOC) |
| CEIC2110          | Material & Energy Balances                | (3 UOC) |
| CEIC2120          | Fluid Flow                                | (3 UOC) |
| CEIC2130          | Heat Transfer                             | (3 UOC) |
| CHEM2021          | Organic Chemistry                         | (6 UOC) |
| CHEM2839          | Inorganic Chemistry                       | (6 UOC) |
| INDC2040          | Physical Process Chemistry                | (6 UOC) |
| MATH2020          | Mathematics 2A                            | (3 UOC) |
| MATH2030          | Mathematics 2B                            | (3 UOC) |
| MATH2899          | Applied Statistics for Chemical Engineers | (3 UOC) |
| General Education |                                           | (3 UOC) |

**Year 3**

|          |                               |         |
|----------|-------------------------------|---------|
| BIOT3100 | Fundamentals of Biotechnology | (3 UOC) |
| CEIC3010 | Reaction Engineering          | (4 UOC) |
| CEIC3070 | Process Control               | (4 UOC) |

|                   |                                      |         |
|-------------------|--------------------------------------|---------|
| CEIC3110          | Thermodynamics                       | (3 UOC) |
| CHEM3829          | Organic Chemistry                    | (6 UOC) |
| INDC3051          | Process Chemistry & Operation        | (4 UOC) |
| INDC3110          | Industrial & Environmental Chemistry | (6 UOC) |
| INDC3120          | Industrial Chemistry Practice        | (6 UOC) |
| POLY3011          | Polymer Science                      | (3 UOC) |
| POLY3012          | Polymer Science                      | (3 UOC) |
| General Education |                                      | (6 UOC) |

**Year 4**

|                   |                               |          |
|-------------------|-------------------------------|----------|
| CEIC4070          | Laboratory Automation Science | (4 UOC)  |
| CEIC4105          | Professional Electives        | (3 UOC)  |
| CEIC4120          | Management & Plant Operation  | (6 UOC)  |
| INDC4061          | Process Design A              | (4 UOC)  |
| INDC4062          | Process Design B              | (4 UOC)  |
| INDC4091          | Research Project Theory       | (12 UOC) |
| INDC4092          | Research Project              | (12 UOC) |
| General Education |                               | (3 UOC)  |

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**3110 Industrial Chemistry (Part-time)****Bachelor of Science (Technology) BSc(Tech)****Typical Duration**

6 years

**Minimum UOC for Award**

144 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

This six-year part-time program leading to the award of the degree of Bachelor of Science (Technology) in Industrial Chemistry is intended for students who are employed in relevant industry and who wish to prepare for a degree mainly by part-time attendance.

As part of the requirements for the award of the BSc(Tech) degree, students are required to complete an approved program of industrial training of not less than one year prior to the award of the degree. Industrial training should normally be completed concurrently with attendance in the program, but with the approval of the Head of School, may be completed after completion of the prescribed program of study.

Students who qualify for the award of the BSc(Tech) degree and who wish to proceed to the award of a BSc degree will normally be required to complete further work which will involve at least one year of full-time attendance.

Holders of the degree of BSc(Tech) or BSc(Eng) will be eligible to proceed to the award of the degree of Master of Science or Master of Engineering, refer to course regulations relating to these degrees.

Transfer is also possible from full-time programs to the part-time BSc(Tech) degree program, but a period of approved industrial experience must be gained before graduation. This requirement will apply to students transferring from BSc and BE degree programs within the Faculty.

Part time programs consist of first 3 years of the respective full-time program - undertaken over a six year period. Details of part time programs can be obtained from the Director of Teaching and Learning.

**Program Structure**

Please refer to the full-time BE Industrial Chemistry (Program 3100) and contact the School of Chemical Engineering & Industrial Chemistry for information regarding the Program Structure.

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School of Chemical Engineering and Industrial Chemistry for more information.

**Industrial Experience**

Students are required to complete an approved program of industrial training of not less than one year prior to the award of the degree. Industrial training should normally be completed concurrently with attendance in the program, but with the approval of the Head of School, may be completed after completion of the prescribed program of study.

**3042 Chemical Engineering/Bachelor of Science****Bachelor of Engineering Bachelor of Science BE BSc****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

The combined program of five years full-time study enables a student in the school to qualify for the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). Graduates from this course will have a broader range of complementary computing and engineering skills that will greatly enhance both their employment and career prospects. The School of Chemical Engineering and Industrial Chemistry administers the program.

**Program Structure****Year 1**

|          |                                      |         |
|----------|--------------------------------------|---------|
| CEIC1020 | Introduction to Chemical Engineering | (6 UOC) |
| CHEM1011 | Fundamentals of Chemistry 1A         | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B         | (6 UOC) |
| COMP1011 | Computing 1A                         | (6 UOC) |
| COMP1021 | Computing 1B                         | (6 UOC) |
| MATH1131 | Mathematics 1A                       | (6 UOC) |
| MATH1231 | Mathematics 1B                       | (6 UOC) |

And ONE of the following courses:

|          |                                 |         |
|----------|---------------------------------|---------|
| PHYS1111 | Fundamentals of Physics         | (6 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng) | (6 UOC) |

**Year 2**

|          |                                           |         |
|----------|-------------------------------------------|---------|
| CEIC2011 | Instrumental Analysis - Theory            | (3 UOC) |
| CEIC2110 | Material & Energy Balances                | (3 UOC) |
| CEIC2120 | Fluid Flow                                | (3 UOC) |
| CEIC2130 | Heat Transfer                             | (3 UOC) |
| CHEN2050 | Chemical Engineering Laboratory 1         | (3 UOC) |
| CHEN2061 | Introduction to Process Chemistry 1       | (6 UOC) |
| CHEN2062 | Introduction to Process Chemistry 2       | (3 UOC) |
| CHEN2140 | Mass Transfer                             | (3 UOC) |
| COMP2011 | Data Organisation                         | (6 UOC) |
| MATH1081 | Discrete Mathematics                      | (6 UOC) |
| MATH2020 | Mathematics 2A                            | (3 UOC) |
| MATH2030 | Mathematics 2B                            | (3 UOC) |
| MATH2899 | Applied Statistics for Chemical Engineers | (3 UOC) |

**Year 3**

|          |                                                             |         |
|----------|-------------------------------------------------------------|---------|
| CEIC3010 | Reaction Engineering                                        | (4 UOC) |
| CEIC3070 | Process Control                                             | (4 UOC) |
| CEIC3110 | Thermodynamics                                              | (3 UOC) |
| CEIC4103 | Professional Electives                                      | (3 UOC) |
| CHEN3021 | Systems Modelling & Analysis                                | (3 UOC) |
| CHEN3022 | Process Modelling & Optimisation                            | (3 UOC) |
| CHEN3031 | Advanced Transport Phenomena                                | (3 UOC) |
| CHEN3062 | Particles, Separation, Heat Exchangers and Pressure Vessels | (6 UOC) |
| CHEN3065 | Plant and Equipment Design                                  | (4 UOC) |
| CHEN3080 | Chemical Engineering Practice 2                             | (3 UOC) |
| COMP2021 | Digital System Structures                                   | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools                 | (6 UOC) |

**Year 4**

|          |                                   |         |
|----------|-----------------------------------|---------|
| CEIC2012 | Instrumental Analysis - Practical | (3 UOC) |
| CEIC4104 | Professional Electives            | (3 UOC) |
| CHEN3067 | Process Design & Economics        | (3 UOC) |
| CHEN3068 | Process Design & Safety           | (3 UOC) |

|                                               |         |
|-----------------------------------------------|---------|
| Plus Computing elective S1                    | (6 UOC) |
| Plus 2 Computing electives 6 UOC each S1 & S2 |         |
| Plus 2 Computing electives 6 UOC each S1 & S2 |         |
| Plus elective course* S2                      | (6 UOC) |

**Year 5**

|                       |                                 |          |
|-----------------------|---------------------------------|----------|
| CEIC4070              | Laboratory Automation Science   | (4 UOC)  |
| CEIC4101              | Professional Elect Advanced     | (3 UOC)  |
| CEIC4102              | Professional Electives Extended | (3 UOC)  |
| CEIC4106              | Professional Electives          | (3 UOC)  |
| CEIC4120              | Management & Plant Operation    | (6 UOC)  |
| CHEN4031              | Environmental Management 1      | (3 UOC)  |
| CHEN4081              | Design Project                  | (8 UOC)  |
| CHEN4091              | Research Project Theory         | (3 UOC)  |
| CHEN4092              | Research Project Practice       | (12 UOC) |
| Plus elective course* |                                 | (3 UOC)  |

\*either Computer Science or Chemical Engineering/Industrial Chemistry

**Honours**

For the award of Honours in the Chemical Engineering and Industrial Chemistry programs, students need to have distinguished themselves in the formal work, in other assignments as directed by the Head of the School, and in the final year project, for which a thesis is required.

**Academic Rules**

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience Requirements**

It is compulsory that, before completion of the program, students in both the Chemical Engineering and Industrial Chemistry full-time programs must obtain a minimum of twelve weeks professionally oriented or industrial experience. Students in the part-time programs in Chemical Engineering and Industrial Chemistry must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.

**Further Requirements**

Students are expected to possess a calculator having exponential capabilities, however, more advanced calculators and personal computers, will be found useful. In examinations, students may be required to use calculators supplied by the University, so that no student will have an unfair advantage over another. Further information may be obtained from the Head of School.

Students of both Chemical Engineering and Industrial Chemistry are advised to have a copy of Perry J H Ed. Chemical Engineers Handbook 6th Ed. McGraw-Hill. This book is used extensively for most courses and units. Certain courses and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

If you are required to complete a varied program of physics or maths in your first year (i.e. General Maths or Fundamentals of Physics), then students are not permitted to undertake studies in higher options of other courses.

**Professional Recognition**

Successful completion of the BE degree program is accepted by the Institution of Chemical Engineers, the Institution of Engineers, Australia, and Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

**3043 Chemical Engineering/Bachelor of Arts****Bachelor of Engineering Bachelor of Arts BE BA****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

The combined program of five years full-time study enables a student in the school to qualify for the award of the degrees of Bachelor of Engineering and Bachelor of Arts. Since Engineering and Arts programs can have

a common content, such as mathematics and physics, approximately two additional sessions of study are required to gain the additional qualifications of Bachelor of Arts. In general this additional study is taken concurrently with the BE program and both can be completed within 10 sessions.

The program is open to all students who satisfy both the Chemical Engineering and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program after completion of at least one year if they have a credit or higher average or permission from the Head of School.

The BE BA programs are administered by the School of Chemical Engineering. The School requires the student to obtain the approval of the Faculty of Arts and Social Sciences for the BA components of their program. The School of Chemical Engineering must approve the final program timetable.

**Program Structure**

For the Program Structure, please refer to the Academic Rules below and contact the Faculty of Engineering for more information.

**Honours**

For the award of Honours in the Chemical Engineering and Industrial Chemistry programs, students need to have distinguished themselves in the formal work, in other assignments as directed by the Head of the School, and in the final year project, for which a thesis is required.

**Academic Rules**

1. Students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. courses designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one sequence of study.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
European Studies  
Environmental Studies\*  
Film  
French  
German Studies  
Greek  
History  
History and Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music  
Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology & Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

\*Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 level 1 units of credit in an approved course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.

3. Except for courses completed as part of the Environmental Studies major sequence, no more than 12 units of credit may be obtained from courses in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE programs can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students must complete the full requirements of the program 3040 BE in Chemical Engineering or 3100 BE in Industrial Chemistry except that they are exempt from the General Education requirement of the BE BSc program. However, students will not be eligible for graduation for the BE

until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE BA program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of an Honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is  $5 \times 48 = 240$ .

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Experience Requirements

It is compulsory that, before completion of the program, students in both the Chemical Engineering and Industrial Chemistry full-time programs must obtain a minimum of twelve weeks professionally oriented or industrial experience. Students in the part-time programs in Chemical Engineering and Industrial Chemistry must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.

## Further Requirements

Students are expected to possess a calculator having exponential capabilities, however, more advanced calculators and personal computers, will be found useful. In examinations, students may be required to use calculators supplied by the University, so that no student will have an unfair advantage over another. Further information may be obtained from the Head of School.

Students of both Chemical Engineering and Industrial Chemistry are advised to have a copy of Perry J H Ed. Chemical Engineers Handbook 6th Ed. McGraw-Hill. This book is used extensively for most courses and units. Certain courses and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

If you are required to complete a varied program of physics or maths in your first year (i.e. General Maths or Fundamentals of Physics), then students are not permitted to undertake studies in higher options of other courses.

## Professional Recognition

Successful completion of the BE degree program is accepted by the Institution of Chemical Engineers, the Institution of Engineers Australia and Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

## 3715 Chemical Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook. Information about the program structure can be found in the Online Handbook program entry for 3715 BE BCom under the area of specialisation Chemical Engineering.

## 3048 Chemical Engineering/Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

At the end of the 5th year, you will graduate with BE in Chemical Engineering and MBiomedE. The program is based on modified 3040 with additional courses in preparation for Masters. A summary is provided

below with further details in the section 'Graduate School of Biomedical Engineering'. Students must maintain a 65 Credit average to retain their enrolment in MBiomedE.

## Program Structure

### Year 1

|                   |                                         |         |
|-------------------|-----------------------------------------|---------|
| BIOM1001          | Professional Biomedical Studies         | (3 UOC) |
| BIOM2010          | Biomedical Engineering Practice         | (3 UOC) |
| CEIC1020          | Introduction to Chemical Engineering    | (6 UOC) |
| CHEM1011          | Fundamentals of Chemistry 1A            | (6 UOC) |
| CHEM1021          | Fundamentals of Chemistry 1B            | (6 UOC) |
| MATH1131          | Mathematics 1A                          | (6 UOC) |
| MATH1231          | Mathematics 1B                          | (6 UOC) |
| MECH0130          | Engineering Drawing and Solid Modelling | (3 UOC) |
| PHYS1169          | Physics 1 (Chem, Mech, Min Eng)         | (6 UOC) |
| General Education |                                         | (3 UOC) |

### Year 2

|                                 |                                     |         |
|---------------------------------|-------------------------------------|---------|
| CEIC2011                        | Instrumental Analysis - Theory      | (3 UOC) |
| CEIC2012                        | Instrumental Analysis - Practical   | (3 UOC) |
| CEIC2020                        | Introduction to Numerical Methods   | (3 UOC) |
| CEIC2110                        | Material & Energy Balances          | (3 UOC) |
| CEIC2120                        | Fluid Flow                          | (3 UOC) |
| CEIC2130                        | Heat Transfer                       | (3 UOC) |
| CHEN2050                        | Chemical Engineering Laboratory 1   | (3 UOC) |
| CHEN2061                        | Introduction to Process Chemistry 1 | (6 UOC) |
| CHEN2062                        | Introduction to Process Chemistry 2 | (3 UOC) |
| CHEN2140                        | Mass Transfer                       | (3 UOC) |
| ELEC0809                        | Electrical Engineering 1C           | (3 UOC) |
| MATH2020                        | Mathematics 2A                      | (3 UOC) |
| MATH2030                        | Mathematics 2B                      | (3 UOC) |
| Biomedical Engineering Elective |                                     | (6 UOC) |

### Year 3

|                   |                                                             |         |
|-------------------|-------------------------------------------------------------|---------|
| BIOM9420          | Clinical Laboratory Science                                 | (6 UOC) |
| BIOT3100          | Fundamentals of Biotechnology                               | (3 UOC) |
| CEIC3010          | Reaction Engineering                                        | (4 UOC) |
| CEIC3070          | Process Control                                             | (4 UOC) |
| CEIC3110          | Thermodynamics                                              | (3 UOC) |
| CHEN3021          | Systems Modelling & Analysis                                | (3 UOC) |
| CHEN3022          | Process Modelling & Optimisation                            | (3 UOC) |
| CHEN3031          | Advanced Transport Phenomena                                | (3 UOC) |
| CHEN3062          | Particles, Separation, Heat Exchangers and Pressure Vessels | (6 UOC) |
| CHEN3065          | Plant and Equipment Design                                  | (4 UOC) |
| CHEN3080          | Chemical Engineering Practice 2                             | (3 UOC) |
| MATH2899          | Applied Statistics for Chemical Engineers                   | (3 UOC) |
| General Education |                                                             | (3 UOC) |

### Year 4

|                                      |                            |          |
|--------------------------------------|----------------------------|----------|
| BIOM5930                             | Research Project A         | (6 UOC)  |
| CEIC4104                             | Professional Electives     | (3 UOC)  |
| CEIC4130                             | Plant Operation            | (3 UOC)  |
| CHEN3067                             | Process Design & Economics | (3 UOC)  |
| CHEN3068                             | Process Design & Safety    | (3 UOC)  |
| PHPH2101                             | Physiology 1A              | (6 UOC)  |
| PHPH2201                             | Physiology 1B              | (6 UOC)  |
| Biomedical Engineering ENG Electives |                            | (18 UOC) |

### Year 5

|                                     |                               |         |
|-------------------------------------|-------------------------------|---------|
| BIOM5002                            | Thesis Part B                 | (9 UOC) |
| BIOM9410                            | Regulatory Req of Biomed Tech | (6 UOC) |
| CEIC4070                            | Laboratory Automation Science | (4 UOC) |
| CHEN4031                            | Environmental Management 1    | (3 UOC) |
| CHEN4081                            | Design Project                | (8 UOC) |
| ONE Biomedical Engineering Elective |                               | (6 UOC) |

And one of the following options:

|                                      |                |          |
|--------------------------------------|----------------|----------|
| BIOM9913                             | Project Report | (12 UOC) |
| or                                   |                |          |
| TWO Biomedical Engineering Electives |                | (12 UOC) |

### Biomedical Electives

#### Preferred electives

|          |                               |         |
|----------|-------------------------------|---------|
| BIOM9311 | Mass Transfer in Medicine     | (6 UOC) |
| BIOM9321 | Physiological Fluid Mechanics | (6 UOC) |
| BIOM9332 | Biocompatibility              | (6 UOC) |
| BIOM9440 | Biomedical Practical Measures | (6 UOC) |
| BIOM9613 | Medical Instrumentation       | (6 UOC) |

**Other electives**

|          |                                             |         |
|----------|---------------------------------------------|---------|
| ANAT2511 | Fundamentals of Anatomy                     | (6 UOC) |
| BIOM9027 | Medical Imaging                             | (6 UOC) |
| BIOM9060 | Biomedical Systems Analysis                 | (6 UOC) |
| BIOM9450 | Clinical Information Systems                | (6 UOC) |
| BIOM9541 | Mechanics of the Human Body                 | (6 UOC) |
| BIOM9551 | Biomechanics of Physical Rehabilitation     | (6 UOC) |
| BIOM9601 | Biomedical Applications of Microcomputers 1 | (6 UOC) |
| BIOM9621 | Biological Signal Analysis                  | (6 UOC) |
| BIOM9701 | Dynamics of the Cardiovascular System       | (6 UOC) |

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Honours**

For the award of Honours in the Chemical Engineering and Industrial Chemistry programs, students need to have distinguished themselves in the formal work, in other assignments as directed by the Head of the School, and in the final year project, for which a thesis is required.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience Requirements**

All students must complete at least 60 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

**Further Requirements**

Students are expected to possess a calculator having exponential capabilities, however, more advanced calculators and personal computers, will be found useful. In examinations, students may be required to use calculators supplied by the University, so that no student will have an unfair advantage over another. Further information may be obtained from the Head of School.

Students of both Chemical Engineering and Industrial Chemistry are advised to have a copy of Perry J H Ed. Chemical Engineers Handbook 6th Ed. McGraw-Hill. This book is used extensively for most courses and units. Certain courses and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

If you are required to complete a varied program of physics or maths in your first year (i.e. General Maths or Fundamentals of Physics), then students are not permitted to undertake studies in higher options of other courses.

**Professional Recognition**

Successful completion of the BE degree program is accepted by the Institution of Chemical Engineers, the Institution of Engineers, Australia, and Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

**3102 Industrial Chemistry/Bachelor of Science****Bachelor of Engineering Bachelor of Science BE BSc****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

This combined program of five years full-time study enables a student in the school to qualify for the award of both BE in Industrial Chemistry and Bachelor of Science. Graduates from this program will have a broader range of complementary computing, chemistry and engineering skills that will greatly enhance both their employment and career prospects.

The School of Chemical Engineering and Industrial Chemistry administers the program.

Successful completion of the BE in Industrial Chemistry program is accepted by the Institution of Engineers Australia and the Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

**Program Structure****Year 1**

|          |                                      |         |
|----------|--------------------------------------|---------|
| CEIC1020 | Introduction to Chemical Engineering | (6 UOC) |
| CHEM1011 | Fundamentals of Chemistry 1A         | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B         | (6 UOC) |
| COMP1011 | Computing 1A                         | (6 UOC) |
| COMP1021 | Computing 1B                         | (6 UOC) |
| MATH1131 | Mathematics 1A                       | (6 UOC) |
| MATH1231 | Mathematics 1B                       | (6 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng)      | (6 UOC) |

**Year 2**

|          |                                           |         |
|----------|-------------------------------------------|---------|
| CEIC2011 | Instrumental Analysis - Theory            | (3 UOC) |
| CEIC2012 | Instrumental Analysis - Practical         | (3 UOC) |
| CEIC2110 | Material & Energy Balances                | (3 UOC) |
| CEIC2120 | Fluid Flow                                | (3 UOC) |
| CEIC2130 | Heat Transfer                             | (3 UOC) |
| CHEM2021 | Organic Chemistry                         | (6 UOC) |
| COMP2011 | Data Organisation                         | (6 UOC) |
| INDC2040 | Physical Process Chemistry                | (6 UOC) |
| MATH1081 | Discrete Mathematics                      | (6 UOC) |
| MATH2020 | Mathematics 2A                            | (3 UOC) |
| MATH2030 | Mathematics 2B                            | (3 UOC) |
| MATH2899 | Applied Statistics for Chemical Engineers | (3 UOC) |

**Year 3**

|          |                                             |         |
|----------|---------------------------------------------|---------|
| CEIC3010 | Reaction Engineering                        | (4 UOC) |
| CEIC3070 | Process Control                             | (4 UOC) |
| CEIC3110 | Thermodynamics                              | (3 UOC) |
| CEIC4103 | Professional Electives                      | (3 UOC) |
| CHEM2031 | Inorganic Chemistry and Structure           | (6 UOC) |
| COMP2021 | Digital System Structures                   | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| INDC3051 | Process Chemistry & Operation               | (4 UOC) |
| INDC3110 | Industrial & Environmental Chemistry        | (6 UOC) |
| INDC3120 | Industrial Chemistry Practice               | (6 UOC) |

**Year 4**

|                                                                                                              |                                 |          |
|--------------------------------------------------------------------------------------------------------------|---------------------------------|----------|
| POLY3011                                                                                                     | Polymer Science                 | (3 UOC)  |
| POLY3012                                                                                                     | Polymer Science                 | (3 UOC)  |
| CEIC4101                                                                                                     | Professional Electives Advanced | (3 UOC)  |
| CEIC4102                                                                                                     | Professional Electives Extended | (3 UOC)  |
| 2 x Computing Electives                                                                                      |                                 | (12 UOC) |
| 2 x Computing Electives                                                                                      |                                 | (12 UOC) |
| Plus additional Elective Course 6 UOC (Either Computer Science or Chemical Engineering/Industrial Chemistry) |                                 |          |

**Year 5**

|                  |                               |          |
|------------------|-------------------------------|----------|
| CEIC4070         | Laboratory Automation Science | (4 UOC)  |
| CEIC4105         | Professional Electives        | (3 UOC)  |
| INDC4061         | Process Design A              | (4 UOC)  |
| INDC4062         | Process Design B              | (4 UOC)  |
| INDC4091         | Research Project Theory       | (12 UOC) |
| INDC4092         | Research Project              | (12 UOC) |
| Elective course* |                               | (3 UOC)  |

\*Either Computer Science or Chemical Engineering/Industrial Chemistry

**Academic Rules**

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience Requirements**

All students must complete at least 60 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## 3103 Industrial Chemistry/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BA

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The combined program of five years full-time study enables a student in the school to qualify for the award of the degrees of Bachelor of Engineering and Bachelor of Arts. Since Engineering and Arts programs can have common content, such as mathematics and physics, ordinarily only two additional sessions of study are required to gain the additional qualifications of Bachelor of Arts. In general this additional study is taken concurrently with the BE program and both can be completed within 10 sessions.

This program is open to all students who satisfy both the Industrial Chemistry and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program after completion of at least one year if they have a credit or higher average or from permission by the Head of School.

The BE BA programs are administered by the School of Industrial Chemistry. The School requires the student to obtain the approval of the Faculty of Arts and Social Sciences for the BA components of their program. The School of Industrial Chemistry must approve the final program timetable.

### Program Structure

Please refer to the Academic Rules below and contact the School of Industrial Chemistry and the Faculty of Arts and Social Sciences for information on the Program Structure.

### Academic Rules

1. Students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. courses designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one sequence of study.

2. Students must complete a major sequence (42 units of credit in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
European Studies  
Environmental Studies\*  
Film  
French  
German Studies  
Greek  
History  
History and Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music  
Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology & Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

\* Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 level 1 units of credit in an approved course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.

3. Except for courses completed as part of the Environmental Studies major sequences, no more than 12 units of credit may be obtained from subjects in the BA program which are offered by Schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE programs can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students must complete the full requirements of the program 3100 BE in Industrial Chemistry except that they are exempt from the General Studies requirement of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BSc program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of an Honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is  $5 \times 48 = 240$ .

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

### Industrial Experience Requirements

All students must complete at least 60 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## 3715 Industrial Chemistry/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook. Information about the program structure can be found in the Online Handbook program entry for 3715 BE BCom under the area of specialisation Industrial Chemistry.

## Fast Track Programs with Master of Engineering Science

### 3040 Chemical Engineering/Master of Engineering Science

#### Plan CEICL13040

#### Bachelor of Engineering Master of Engineering Science BE MEngSc

Students may undertake a 4.5 years (10 semesters) full-time fast-track program leading to the awards of a Bachelor of Engineering and a Master of Engineering in Chemical Engineering.

Students undertake the first three years (6 semesters) of the BE program in Chemical Engineering. Subject to satisfying a minimum performance over these three years (see 'Rules for Progression and the Award of Degrees'), they

(a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year;

(b) undertake 12 units of credit of project/thesis work over the Summer (9th) semester; and

(c) undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

Students need to apply, at the end of Year 3, to the Director of Teaching and Learning for entry into the program. The School of Chemical Engineering and Industrial Chemistry administers the program.

#### Stage 1 to Stage 3

Same as program 3040

**Total Units of Credit: 48 each Stage****Stage 4**

|          |                                   |         |
|----------|-----------------------------------|---------|
| CEIC4070 | Automation Science                | (4 UOC) |
|          | Selected Postgraduate Course      | (6 UOC) |
|          | Selected Postgraduate Course      | (6 UOC) |
| CEIC4120 | Management and Plant Operation    | (6 UOC) |
| CHEN4031 | Environmental Management 1        | (3 UOC) |
| CHEN4081 | Design Project                    | (8 UOC) |
| CHEN4091 | Research Project Theory           | (3 UOC) |
| CEIC4095 | Special Research Project Practice | (9 UOC) |
|          | General Education                 | (3 UOC) |

**Stage 5 (Summer Semester)**

|          |                 |          |
|----------|-----------------|----------|
| CEIC8320 | Graduate Thesis | (12 UOC) |
|----------|-----------------|----------|

**Stage 5 (Session 1)**

4 postgraduate elective courses, totalling 24 UOC.

## 3100 Industrial Chemistry/Master of Engineering Science

**Plan CEICL13100****Bachelor of Engineering Master of Engineering Science BE MEngSc**

Students may undertake a 4.5 years (10 semesters) full-time fast-track program leading to the awards of a Bachelor of Engineering and a Master of Engineering in Industrial Chemistry.

Students undertake the first three years (6 semesters) of the BE program in Industrial Chemistry. Subject to satisfying a minimum performance over these three years (see 'Rules for Progression and the Award of Degrees'), they

(a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year;

(b) undertake 12 units of credit of project/thesis work over the summer (9th) semester; and

(c) undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

Students need to apply, at the end of Year 3, to the Director of Teaching and Learning for entry into the program. The School of Chemical Engineering and Industrial Chemistry administers the program.

**Stage 1 to Stage 3**

Same as program 3100

**Total Units of Credit: 24 each Stage****Stage 4**

|          |                                   |         |
|----------|-----------------------------------|---------|
| CEIC4070 | Automation Science                | (4 UOC) |
| CEIC8XXX | Postgraduate Course               | (6 UOC) |
| CEIC8XXX | Postgraduate Course               | (6 UOC) |
| CEIC4120 | Management and Plant Operation    | (6 UOC) |
| INDC4061 | Process Design A                  | (4 UOC) |
| INDC4062 | Process Design B                  | (4 UOC) |
| CEIC4096 | Research Project Theory Extended  | (6 UOC) |
| CEIC4095 | Special Research Project Practice | (9 UOC) |
|          | General Education                 | (3 UOC) |

**Stage 5 (Summer Semester)**

|          |                 |          |
|----------|-----------------|----------|
| CEIC8320 | Graduate Thesis | (12 UOC) |
|----------|-----------------|----------|

**Stage 5 (Session 1)**

4 CEIC8XXX postgraduate courses totalling 24 UOC

## School of Civil and Environmental Engineering

**Head of School:** Professor NJ Ashbolt

**Senior Administrative Officer:** Ms KM Irvine

**Executive Assistant:** Vacant

The School undertakes teaching and research in the specialist disciplines of engineering construction and management, geotechnical engineering, structural engineering, transport engineering, water engineering and environmental engineering. The School comprises specialist staff with a broad spectrum of expertise across the disciplines of Civil and Environmental Engineering.

The Centre for Water and Waste Technology is located within the School. In addition to extensive laboratory facilities on the Kensington campus, the School operates the Heavy Structures Laboratory at Govett Street, Randwick, and the Water Research Laboratory at King Street, Manly Vale. The latter complex houses the School's Water Reference Library.

The School offers programs 3620 and 3625 leading to the award of degrees of Bachelor of Engineering in Civil Engineering (BE) and Bachelor of Engineering in Environmental Engineering (BE), at Pass or Honours level. In the Civil Engineering program, students may elect to major in structural engineering, geotechnical engineering, transport engineering, water engineering or engineering construction and management. These programs can be taken on a four year full-time basis, on a part-time basis or on a combined full-time/part-time basis subject to the approval of the Head of School. Intending part-time students are advised that all courses are offered only in the day-time. Part-time students will normally take two years for each equivalent full-time year. Alternatively, the programs may be taken in a sandwich form in which a student, after completing the first year of the program on a full-time basis, gains industrial experience during one or more periods of employment by taking leave of absence for an entire academic year.

The School also offers a range of combined degree programs which combine the Bachelor of Engineering degrees in Civil or Environmental Engineering with a range of other undergraduate degree programs and postgraduate degrees in engineering and other disciplines. These combined degree programs provide students with the opportunity to broaden their education and to complete two degrees with a significant saving in time. The combined degree programs include:

Five year full-time programs 3146 leading to the award of the degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Engineering in Mining Engineering (BE BE), and 3631 leading to the degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Engineering in Environmental Engineering (BE BE).

- Five year full-time programs 3730 and 3735 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Bachelor of Science (BE BSc).
- Five year full-time programs 3621 and 3626 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Bachelor of Arts (BE BA).
- Five and one half year full-time programs 3715 leading to the award of the degrees Bachelor of Engineering in Civil and Environmental Engineering and Bachelor of Commerce (BE BCom).
- Four and one half year full-time programs 3620 and 3625 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, with 8612 Master of Engineering Science.
- Six year full-time programs 4775 and 4777 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Bachelor of Laws (BE LLB).

The broad objective of the School's undergraduate programs is to develop well-educated graduates with the basic skills, attributes and knowledge required to practise as professional engineers. The desired skills are those that enable graduates to be problem solvers; critical thinkers; life long learners; good communicators; team players; independent investigators; effective managers; self-motivated; and economically, environmentally and socially aware.

It is intended that these attributes are developed in students at the same time that they gain knowledge in a broad range of disciplines. In addition, an objective of the programs is to provide the skills and knowledge in a social context. Integrating courses in each year of each program (the Engineering Practice courses) have been introduced to achieve this objective.

**Honours**

Honours is awarded to students who have achieved above average results and who undertake an Honours thesis in their final year. A weighted average is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each course by units of credit as follows:

Year 1 x 1  
General Education x 2  
Year 2 x 2  
Year 3 x 4  
Year 4 x 5

Although Industrial training is now part of course CVEN4126 it is assigned a further nominal value of 3 units of credit in Year 4 in the Honours calculation. For combined degree programs, only the marks obtained in the standard Civil or Environmental Engineering courses are used in the calculation. A weighted average mark in the range of 65–69 will result in a recommendation for Honours 2/2. A weighted average mark in the range of 70–74 will result in a recommendation for Honours 2/1.

A weighted average mark of 75 and above will result in a recommendation for Honours 1.

### Professional Recognition

Both the BE in Civil Engineering and the BE in Environmental Engineering are fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

### Industrial Experience

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least 60 days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study.

### Computing Requirements

Information regarding recommended computing equipment for the programs offered by the School is available on the website [www.civeng.unsw.edu.au/currentstudents/general/computing/](http://www.civeng.unsw.edu.au/currentstudents/general/computing/)

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3620 Civil Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Civil Engineering offers opportunities to become involved in projects that enhance the overall quality of life. Civil engineers design, construct, manage, operate and maintain the infrastructure that supports modern society including buildings, bridges, roads and highways, tunnels, airfields, dams, ports and harbours, railways, new mines, water supply and sewerage schemes, irrigation systems and flood mitigation works. The profession is very broad and affords opportunities for involvement in many specialist activities.

In the Civil Engineering program students may elect to major in structural engineering, geotechnical engineering, transport engineering, water engineering or engineering construction and management. This program can be taken on a four-year full-time basis, on a part-time basis or on a combined full-time part-time basis subject to the approval of the Head of School. Intending part-time students are advised that all courses are offered only in the daytime. Part-time students will normally take two years for each equivalent full-time year. Alternatively, the program may be taken in a sandwich form in which a student, after completing the first year of the program on a full-time basis, gains industrial experience during one or more periods of employment by taking leave of absence for an entire academic year.

The School also offers the combined degrees BE (Civil Eng)/BE (Mining Eng) (program 3146), BE (Civil Eng)/BE (Env Eng) (program 3631), BE (Civil Eng)/BA (program 3621), BE (Civil Eng)/BSc (program 3730), BE (Civil Eng)/BCom (program 3715), BE (Civil Eng)/LLB (Law) (program 4775), and also the fast track program BE/MEngSc (plan CVENG13620).

### Program Objectives and Learning Outcomes

The broad objective of the School's undergraduate programs is to develop well-educated graduates with the basic skills, attributes and knowledge required to practise as professional engineers. The desired skills are those that enable graduates to be problem solvers; critical thinkers; life long learners; good communicators; team players; independent investigators; effective managers; self-motivated; and economically, environmentally and socially aware.

It is intended that these attributes are developed in students at the same time that they gain knowledge in a broad range of disciplines. In addition, an objective of the programs is to provide the skills and knowledge in

a social context. Integrating courses in each year of each program (the Engineering Practice courses) have been introduced to achieve this objective.

### Program Structure

#### Plan CVENA13620

##### Year 1

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN1021 | Civil Engineering Practice 1A | (4 UOC) |
| CVEN1022 | Civil Engineering Practice 1B | (6 UOC) |
| CVEN1023 | Statics                       | (4 UOC) |
| CVEN1024 | Dynamics                      | (4 UOC) |
| CVEN1025 | Computing                     | (4 UOC) |
| CVEN1026 | Engineering Materials 1       | (4 UOC) |
| PHYS1279 | Physics 1 (Civil Engineering) | (4 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

##### Year 2

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN2022 | Civil Engineering Practice 2  | (3 UOC) |
| CVEN2023 | Mechanics of Solids           | (3 UOC) |
| CVEN2025 | Engineering Computations 1    | (3 UOC) |
| CVEN2026 | Engineering Materials 2       | (3 UOC) |
| CVEN2125 | Systems Engineering           | (3 UOC) |
| CVEN2126 | Engineering Construction 1    | (3 UOC) |
| CVEN2222 | Geotechnical Engineering 1    | (3 UOC) |
| CVEN2322 | Structural Engineering 1      | (6 UOC) |
| CVEN2525 | Intro to Water Engineering    | (3 UOC) |
| GMAT0442 | Surveying for Civil Engineers | (3 UOC) |
| GMAT0491 | Survey Camp                   | (3 UOC) |
| MATH2019 | Engineering Mathematics 2CE   | (6 UOC) |
|          | General Education             | (6 UOC) |

##### Year 3

|          |                                    |         |
|----------|------------------------------------|---------|
| CVEN3023 | Civil Engineering Practice 3A      | (3 UOC) |
| CVEN3024 | Civil Engineering Practice 3B      | (3 UOC) |
| CVEN3025 | Engineering Computations 2         | (3 UOC) |
| CVEN3125 | Engineering Construction 2         | (3 UOC) |
| CVEN3126 | Engineering Management 1           | (3 UOC) |
| CVEN3222 | Geotechnical Engineering 2         | (3 UOC) |
| CVEN3223 | Geotechnical Engineering 3         | (3 UOC) |
| CVEN3322 | Structural Engineering 2           | (6 UOC) |
| CVEN3324 | Structural Engineering 3           | (3 UOC) |
| CVEN3438 | Transport Planning and Environment | (3 UOC) |
| CVEN3448 | Transport Engineering              | (3 UOC) |
| CVEN3526 | Water Resources Engineering        | (3 UOC) |
| CVEN3527 | Water Engineering                  | (3 UOC) |
|          | General Education                  | (6 UOC) |

##### Year 4

#### Session One

Students achieving a School weighted average mark exceeding 62 (calculated from all courses in Years 1 to 3 of the BE program) are eligible to undertake an Honours thesis in Year 4 (CVEN4000 in S1 and CVEN4001 in S2).

|          |                                |         |
|----------|--------------------------------|---------|
| CVEN4126 | Engineering Management 2       | (3 UOC) |
| CVEN4225 | Geotechnical Engineering 4     | (3 UOC) |
| CVEN4323 | Structural Engineering 4       | (3 UOC) |
| CVEN4526 | Water and Wastewater Treatment | (3 UOC) |

Plus TWO of the following four electives:

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN4000 | Honours Thesis Part A         | (6 UOC) |
| CVEN4027 | Civil Engineering Practice 4A | (6 UOC) |
| CVEN4028 | Civil Engineering Practice 4B | (6 UOC) |
| CVEN4029 | Civil Engineering Practice 4C | (6 UOC) |

#### Session Two

All students not undertaking the Honours thesis are required to select two majors. Students undertaking the Honours thesis are required to undertake one major plus at least 8 units of credit of electives taken from one other discipline area. To complete a major, all three 4 units of credit elective subjects (listed for each discipline below) must be undertaken.

|          |                       |         |
|----------|-----------------------|---------|
| CVEN4001 | Honours Thesis Part B | (4 UOC) |
|----------|-----------------------|---------|

**Construction and Management Major**

|          |                                                        |         |
|----------|--------------------------------------------------------|---------|
| CVEN4139 | Advanced Construction and Project Management           | (4 UOC) |
| CVEN4149 | Professional Level Project Management Tools and Skills | (4 UOC) |
| CVEN4159 | Advanced Construction Technology and Engineering       | (4 UOC) |

**Geotechnical Engineering Major**

|          |                                             |         |
|----------|---------------------------------------------|---------|
| CVEN4279 | Rock and Slope Engineering                  | (4 UOC) |
| CVEN4289 | Site Investigations and Dam Engineering     | (4 UOC) |
| CVEN4299 | Advanced Topics in Geotechnical Engineering | (4 UOC) |

**Structural Engineering Major**

|          |                                                            |         |
|----------|------------------------------------------------------------|---------|
| CVEN4339 | Design of Bridges                                          | (4 UOC) |
| CVEN4349 | Special Topics in Concrete, Steel and Composite Structures | (4 UOC) |
| CVEN4359 | Structural Analysis and Finite Elements                    | (4 UOC) |

**Transport Engineering Major**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CVEN4439 | Transport Operations and Systems Design | (4 UOC) |
| CVEN4449 | Traffic Management and Control          | (4 UOC) |
| CVEN4459 | Transport and Environment               | (4 UOC) |

**Water Engineering Major**

|          |                                          |         |
|----------|------------------------------------------|---------|
| CVEN4539 | Advanced Water Quality and Treatment     | (4 UOC) |
| CVEN4549 | Advanced Catchment and Coastal Processes | (4 UOC) |
| CVEN4559 | Advanced Water Engineering               | (4 UOC) |

The School offers a range of specialist plans in the civil engineering program, which are available to high achieving students. Basically students complete most of the requirements of the standard plan CVENA13620 with specialist replacements for some courses in Years 2, 3 and especially Year 4 of the program. Students achieving a School weighted average mark of less than 65 (calculated from all courses in Years 1 to 3 of the BE program) are ineligible to continue in the plan and must transfer into and complete the standard Year 4 of the academic plan CVENA1 3620.

**CVENJS3620 Civil and Structural Engineering Plan****Year 2**

Replace CVEN2022 with CVEN2032 Civil/ Structural Engineering Practice 2

**Year 3**

Replace CVEN3023 with CVEN3032 Civil/Structural Engineering Practice 3A  
Replace CVEN3024 with CVEN3033 Civil/ Structural Engineering Practice 3B

**Year 4**

Replace CVEN4526 with CVEN4324 Structural Engineering Case Study CVEN4339, CVEN4349 and CVEN4359 are compulsory

**CVENKS3620 Civil and Geotechnical Engineering Plan****Year 2**

Replace CVEN2022 with CVEN2062 Civil/Geotechnical Engineering Practice 2

**Year 3**

Replace CVEN3023 with CVEN3062 Civil/Geotechnical Engineering Practice 3A  
Replace CVEN3024 with CVEN3063 Civil/Geotechnical Engineering Practice 3B

**Year 4**

Replace CVEN4526 with CVEN4226 Engineering Geology and Geotechnical Models  
CVEN4279, CVEN4289 and CVEN4289 are compulsory

**CVENLS3620 Civil Engineering and Project Management Plan****Year 2**

Same as CVENA1 3620

**Year 3**

Replace CVEN3023 with CVEN3012 Civil Engineering and Project Management Practice 3A  
Replace CVEN3024 with CVEN3013 Civil Engineering and Project Management Practice 3B  
Replace CVEN3438 with CVEN3127 Management of Projects

**Year 4**

Replace CVEN4526 with CVEN4127 Planning and Control of Projects  
CVEN4139, CVEN4149 and CVEN4159 are compulsory

**CVENMS3620 Civil and Transport Engineering Plan****Year 2**

Same as CVENA1 3620

**Year 3**

Replace CVEN3023 with CVEN3042 Civil/Transport Engineering Practice 3A  
Replace CVEN3024 with CVEN3043 Civil/Transport Engineering Practice 3B

**Year 4**

Replace CVEN4526 with CVEN4421 Transport Engineering 2  
CVEN4439, CVEN4449 and CVEN4459 are compulsory

**CVENNS3620 Civil, Water and Coastal Engineering Plan****Year 2**

Replace CVEN2022 with CVEN2052 Civil/Water Engineering Practice 2

**Year 3**

Replace CVEN3023 with CVEN3052 Civil/Water Engineering Practice 3A  
Replace CVEN3024 with CVEN3053 Civil/Water Engineering Practice 3B  
Replace CVEN3125 with CVEN3528 Sustainable Catchment and Coastal Systems

**Year 4**

Replace CVEN4126 with CVEN4533 Transport and Fate of Pollutants  
CVEN4539, CVEN4549 and CVEN4559 are compulsory

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Honours**

Honours is awarded to students who have achieved above average results and who undertake an Honours Thesis in their Final Year. A School weighted average mark is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each course by units of credit as follows:

Year 1 x 1  
General Education x 2  
Year 2 x 2  
Year 3 x 4  
Year 4 x 5

Industrial training is assigned a nominal value of 3 units of credit in Year 4 in the Honours calculation. For combined degree programs only the marks obtained in the standard Civil or Environmental Engineering courses are used in the calculation.

A School weighted average mark in the range of 65.0-69.9 will result in a recommendation for Honours 2/2. A School weighted average mark in the range of 70.0-74.9 will result in a recommendation for Honours 2/1. A School weighted average mark of 75.00 and above will result in a recommendation for Honours 1.

**Academic Rules**

For program rules relating to the Bachelor of Engineering and General Rules for Progression, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience**

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from completing further industrial training.

**Computing Requirements**

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

**Professional Recognition**

The BE in Civil Engineering is fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission

to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

## 3625 Environmental Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Environmental engineers are concerned with the environmental impact of engineering activities. They apply their broad knowledge of engineering and environmental processes in identifying environmental problems and in developing effective solutions to them. They also coordinate the activities of specialist groups such as biologists, ecologists and geologists within major projects. The discipline of environmental engineering embraces parts of civil engineering, with emphasis on management, systems design, water, geotechnical and transport engineering, together with aspects of chemical engineering, applied and biological sciences and environmental studies.

The School also offers the combined degrees BE (Civil Eng)/BE (Env Eng) (program 3631), BE (Env Eng)/BA (program 3626), BE (Env Eng)/BSc (program 3735), BE (Env Eng)/BCom (program 3715) BE (Env Eng)/LLB (Law) (program 4777) and also the fast track program BE/MEngSc (plan CVENH13625).

### Program Objectives and Learning Outcomes

The broad objective of the School's undergraduate programs is to develop well-educated graduates with the basic skills, attributes and knowledge required to practise as professional engineers. The desired skills are those that enable graduates to be problem solvers; critical thinkers; life long learners; good communicators; team players; independent investigators; effective managers; self-motivated; and economically, environmentally and socially aware.

It is intended that these attributes are developed in students at the same time that they gain knowledge in a broad range of disciplines. In addition, an objective of the programs is to provide the skills and knowledge in a social context. Integrating courses in each year of each program (the Engineering Practice courses) have been introduced to achieve this objective.

### Program Structure

#### Year 1

|          |                                                 |         |
|----------|-------------------------------------------------|---------|
| CVEN1023 | Statics                                         | (4 UOC) |
| CVEN1024 | Dynamics                                        | (4 UOC) |
| CVEN1025 | Computing                                       | (4 UOC) |
| CVEN1026 | Engineering Materials 1                         | (4 UOC) |
| CVEN1531 | Introduction to Water and Atmospheric Chemistry | (4 UOC) |
| CVEN1721 | Environmental Engineering Practice 1A           | (4 UOC) |
| CVEN1722 | Environmental Engineering Practice 1B           | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

#### Year 2

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOS1101 | Evolutionary and Functional Biology | (6 UOC) |
| CEIC0010 | Mass Transfer and Material Balances | (3 UOC) |
| CVEN2023 | Mechanics of Solids                 | (3 UOC) |
| CVEN2025 | Engineering Computations 1          | (3 UOC) |
| CVEN2125 | Systems Engineering                 | (3 UOC) |
| CVEN2222 | Geotechnical Engineering 1          | (3 UOC) |
| CVEN2525 | Introduction to Water Engineering   | (3 UOC) |

|          |                                             |         |
|----------|---------------------------------------------|---------|
| CVEN2722 | Environmental Engineering Practice 2        | (3 UOC) |
| GEOS1711 | Planet Earth                                | (3 UOC) |
| GMAT0753 | Introduction to Spatial Information Systems | (3 UOC) |
| INDC4120 | Chemistry of the Industrial Environment     | (3 UOC) |
| MATH2019 | Engineering Mathematics 2CE                 | (6 UOC) |
|          | General Education                           | (6 UOC) |

#### Year 3

|          |                                                              |         |
|----------|--------------------------------------------------------------|---------|
| BIOS3301 | Population and Community Ecology for Environmental Engineers | (3 UOC) |
| CEIC0050 | Atmospheric Process Chemistry                                | (3 UOC) |
| CVEN3025 | Engineering Computations 2                                   | (3 UOC) |
| CVEN3126 | Engineering Management 1                                     | (3 UOC) |
| CVEN3222 | Geotechnical Engineering 2                                   | (3 UOC) |
| CVEN3223 | Geotechnical Engineering 3                                   | (3 UOC) |
| CVEN3438 | Transport Planning and Environment                           | (3 UOC) |
| CVEN3526 | Water Resources Engineering                                  | (3 UOC) |
| CVEN3527 | Water Engineering                                            | (3 UOC) |
| CVEN3531 | Aquatic Chemistry                                            | (3 UOC) |
| CVEN3723 | Environmental Engineering Practice 3A                        | (3 UOC) |
| CVEN3724 | Environmental Engineering Practice 3B                        | (3 UOC) |
| CVEN3725 | Waste Management                                             | (3 UOC) |
| CVEN3726 | Environmental Policy                                         | (3 UOC) |
|          | General Education                                            | (6 UOC) |

#### Year 4

##### Session One

Students achieving a School weighted average mark exceeding 62 (calculated from all subjects in years 1 to 3 of the BE Program) are eligible to undertake an Honours thesis in Year 4 (CVEN4000 in S1 and CVEN4001 in S2).

|          |                                |         |
|----------|--------------------------------|---------|
| CVEN4126 | Engineering Management 2       | (3 UOC) |
| CVEN4225 | Geotechnical Engineering 4     | (3 UOC) |
| CVEN4526 | Water and Wastewater Treatment | (3 UOC) |
| CVEN4533 | Transport & Fate of Pollutants | (3 UOC) |

Plus TWO of the following four electives:

|          |                                       |         |
|----------|---------------------------------------|---------|
| CVEN4000 | Honours Thesis Part A                 | (6 UOC) |
| CVEN4727 | Environmental Engineering Practice 4A | (6 UOC) |
| CVEN4728 | Environmental Engineering Practice 4B | (6 UOC) |
| CVEN4729 | Environmental Engineering Practice 4C | (6 UOC) |

##### Session Two

All students not undertaking the Honours thesis are required to select two majors. Students undertaking the Honours thesis are required to undertake one major plus at least 8 units of credit of electives taken from one other discipline area. To complete a major, all three 4 units of credit elective courses (listed for each discipline below) must be undertaken.

|          |                       |         |
|----------|-----------------------|---------|
| CVEN4001 | Honours Thesis Part B | (4 UOC) |
|----------|-----------------------|---------|

#### Geotechnical Engineering Major

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CVEN4269 | Environmental Geotechnics               | (4 UOC) |
| CVEN4289 | Site Investigations and Dam Engineering | (4 UOC) |

Plus ONE of the following two electives:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| CVEN4279 | Rock and Slope Engineering                  | (4 UOC) |
| CVEN4299 | Advanced Topics in Geotechnical Engineering | (4 UOC) |

#### Transport Engineering Major

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CVEN4439 | Transport Operations and Systems Design | (4 UOC) |
| CVEN4449 | Traffic Management and Control          | (4 UOC) |
| CVEN4459 | Transport and Environment               | (4 UOC) |

#### Water Engineering Major

|          |                                          |         |
|----------|------------------------------------------|---------|
| CVEN4539 | Advanced Water Quality and Treatment     | (4 UOC) |
| CVEN4549 | Advanced Catchment and Coastal Processes | (4 UOC) |
| CVEN4569 | Advanced Environmental Systems           | (4 UOC) |

#### Chemical Engineering Major

|          |                                     |         |
|----------|-------------------------------------|---------|
| CEIC3010 | Reaction Engineering                | (4 UOC) |
| CHEN2062 | Introduction to Process Chemistry 2 | (3 UOC) |
| CEIC3070 | Process Control                     | (4 UOC) |

#### Geography Major

Any TWO of the following three courses:

|          |                             |         |
|----------|-----------------------------|---------|
| GEOH3921 | Coastal Resource Management | (6 UOC) |
| GEOS3731 | Geomorphology               | (6 UOC) |
| GEOS3761 | Environmental Change        | (6 UOC) |

The School offers a range of specialist plans in the Environmental Engineering program which are available to high achieving students. Basically students complete most of the requirements of the standard

plan CVENBS3625 with specialist replacements for some courses in Years 2, 3 and especially Year 4 of the program. Students achieving a School weighted average mark of less than 65 (calculated from all courses in Years 1 to 3 of the BE program) are ineligible to continue in the plan and must transfer into and complete the standard Year 4 of the academic plan CVENB13625.

#### **CVENPS3625 Environmental and Geotechnical Engineering Plan**

##### **Year 2**

Replace CVEN2722 with CVEN2732 Environmental/Geotechnical Engineering Practice 2

##### **Year 3**

Replace CVEN3438 with CVEN3225 Geotechnical Mapping and Logging

Replace CVEN3723 with CVEN3733 Environmental/Geotechnical Engineering Practice 3A

Replace CVEN3724 with CVEN3734 Environmental/Geotechnical Engineering Practice 3B

##### **Year 4**

Replace CVEN4126 with CVEN4226 Engineering Geology and Geotechnical Models

CVEN4269, CVEN4279 and CVEN4289 are compulsory.

#### **CVENQS3625 Environmental and Transport Engineering Plan**

##### **Year 2**

Same as CVENB13625

##### **Year 3**

Replace CVEN3531 with CVEN3448 Transport Engineering

Replace CVEN3723 with CVEN3743 Environmental/Transport Engineering Practice 3A

Replace CVEN3724 with CVEN3744 Environmental/Transport Engineering Practice 3B

##### **Year 4**

replace CVEN4126 with CVEN4421 Transport Engineering 2

CVEN4439, CVEN4449 and CVEN4459 are compulsory

#### **CVENRS3625 Environmental, Water and Waste Engineering Plan**

##### **Year 2**

Replace CVEN2722 with CVEN2752 Environmental/Water Engineering Practice 2

##### **Year 3**

Replace CEIC0050 with CVEN3528 Sustainable Catchment and Coastal Systems

Replace CVEN3723 with CVEN3753 Environmental/Water Engineering Practice 3A

Replace CVEN3724 with CVEN3754 Environmental/Water Engineering Practice 3B

##### **Year 4**

Replace CVEN4126 with CVEN4528 Surf, Water and Groundwater Environments

CVEN4539, CVEN4549 and CVEN4569 are compulsory

### **General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

### **Honours**

Honours is awarded to students who have achieved above average results and who undertake an Honours Thesis in their Final Year. A School weighted average mark is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each course by units of credit as follows:

Year 1 x 1

General Education x 2

Year 2 x 2

Year 3 x 4

Year 4 x 5

Industrial training is assigned a nominal value of 3 units of credit in Year 4 in the Honours calculation. For combined degree programs only the marks obtained in the standard Civil or Environmental Engineering courses are used in the calculation. A School weighted average mark in the range of 65.0-69.9 will result in a recommendation for Honours 2/2. A School weighted average mark in the range of 70.0-74.9 will result in a recommendation for Honours 2/1. A School weighted average mark of 75.00 and above will result in a recommendation for Honours 1.

### **Academic Rules**

For program rules relating to the Bachelor of Engineering and General Rules for Progression, please refer to the 'Rules for Progression and Award of Degrees under 'Faculty Information and Assistance' in this Handbook.

### **Industrial Experience**

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from completing further industrial training.

### **Professional Recognition**

The BE in Environmental Engineering is fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

### **Computing Requirements**

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

## **3730 Civil Engineering/Bachelor of Science**

### **Bachelor of Engineering Bachelor of Science BE BSc**

#### **Typical Duration**

5 years

#### **Minimum UOC for Award**

240 units of credit

#### **Typical UOC per Session**

24 units of credit

### **Program Description**

Students may seek to undertake a five-year full-time combined program leading to the award of the degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Science (BE BSc). The School of Civil and Environmental Engineering administer the program. Students should seek advice from the School Office.

With the combined degree program, students can add their choice of a Science, Mathematics or Computer Science program to the standard, professionally accredited Civil Engineering program offered by the School of Civil and Environmental Engineering.

The School of Civil and Environmental Engineering is the academic unit responsible for the program. The School will consult with the Faculty of Science in approving the BSc component of the program.

Students must satisfy admission requirements for both the BE in Civil Engineering and BSc programs or may transfer from the BE in Civil Engineering program after completion of at least one year, if they have a Credit or higher average.

Course credits can accrue simultaneously for both component degrees where there is an overlap of courses from the Civil Engineering program and Science program.

### **Program Structure**

#### **CVENA13730 + Science Plan**

##### **Year 1**

All the Year 1 courses in the Civil Engineering program.

##### **Year 2**

The Year 2 courses in the Civil Engineering program except that 12 units of credit of Science courses are substituted for CVEN2222, CVEN2022 and General Education.

##### **Year 3**

Science courses to total at least 36 units of credit and CVEN2222, CVEN2022, CVEN3025, CVEN3125

##### **Year 4**

Science courses to total at least 18 units of credit and CVEN3126, CVEN3222, CVEN3223, CVEN3322, CVEN3324, CVEN3438, CVEN3448, CVEN3526, CVEN3527.

**Year 5**

Science courses to total at least 6 units of credit in S1 in lieu of one civil engineering major (12 units of credit). Otherwise standard Year 4 program in Civil Engineering.

The degrees of Bachelor of Engineering and Bachelor of Science may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class 1 and Class 2 in two divisions. The award and grade of Honours in the BE are made in recognition of superior performance throughout the program with a greater weighting on courses in the later years. The BSc can be awarded Honours on the successful completion of an Honours year. It should be noted that entry into a particular Honours program might require completion of additional courses.

**Academic Rules**

1. The program is a five year full-time combined program leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc).
2. The five years of the program include at least 108 units of credit in the Science program and a minimum of 240 units of credit in total.
3. The 108 Science program units of credit must include a minimum of 36 and a maximum of 48 level 1 units of credit and all courses prescribed in a specific program as outlined in the Science section in this Handbook must be completed. A major sequence (42 units of credit of Level 2 and 3 courses with at least 18 units of credit of Level 3 courses) in a Science discipline is also a requirement of the Science program.
4. Students must satisfy the normal prerequisites for entry to Bachelor of Science Program and to individual courses therein. Also, students must satisfy the normal prerequisites for entry to Civil Engineering and to individual courses therein.
5. Students desiring to enrol in the BSc degree program at Honours level are not able to complete the program in five years and must obtain approval from the School of Civil and Environmental Engineering and the Faculty of Science for their programs. With the approval of the relevant school and of the Head of the School of Civil and Environmental Engineering, a student may follow a standard Honours program in the Science program which can be completed by an additional year of study.
6. The degrees of Bachelors of Engineering and Bachelor of Science are not awarded until the completion of the full five-year program.
7. Students contemplating enrolling in this program should consult fully with the Faculty of Science and with the School of Civil and Environmental Engineering before enrolment.
8. There will be a testamur for each degree in the combined program.
9. Students must complete the full requirements of the BE in Civil Engineering (code 3620) except that:
  - a) CVEN3023 and CVEN3024 are exempted;
  - b) the General Education requirement is exempted; and
  - c) a final year engineering major (12 units of credit) is exempted.
10. Group A and Group B courses listed in Rule 12 below will count towards satisfying requirements of both rules 2 and 9 above. The courses in Group B may not satisfy requirements for progression within science programs.
11. Students may apply for exemption from the requirements of Rule 9 for the courses listed in Rule 12 below in Group B on the basis of courses/requirements in parentheses.
12. Exemptions will be granted for the courses in Group C below with respect to Rule 9 on the basis of the requirements within parentheses.

**Group A**

MATH1131 or MATH1141, MATH1231 or MATH1241, CHEM1011 or CHEM1031, PHYS1279

**Group B**

PHYS1279 (PHYS1121), CHEM1011 (CHEM1021), MATH2019 (at least 12 units of credit of non-statistics level II mathematics), CVEN2025 (at least 3 units of credit of level II Statistics).

**Group C**

CVEN3025 (at least 3 units of credit of level III Applied Mathematics).

13. Students wishing to major in Physics must consult with the School of Physics and the School of Civil & Environmental Engineering in regards to choice of courses.
14. A typical structure of a combined Engineering/Science program is set out above in the Program Structure section. Subject to timetable restrictions, the full range of Science programs is available to Civil Engineering students.
15. The total units of credit in the program is 240.

**Industrial Experience**

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from completing further industrial training.

**Computing Requirements**

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

**Professional Recognition**

The BE in Civil Engineering is fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

---

**3621 Civil Engineering/Bachelor of Arts****Bachelor of Engineering Bachelor of Arts BE BA****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

With this combined degree program, students can add their choice of an Arts program to the standard, professionally accredited Civil Engineering (3620) program offered by the School of Civil and Environmental Engineering. It provides flexibility in the choice of courses within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as specialised studies in Civil Engineering.

Because Engineering and Arts programs can have a common content, such as mathematics and physics, two additional sessions of study is required to gain the additional qualification of Bachelor of Arts. In general, this additional study is taken concurrently with the BE program and both can be completed in ten sessions.

**Eligibility**

The program is open to all students who satisfy both the Civil Engineering (3620) and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program after completion of at least one year if they have a credit or higher average. Transfer after the second year may result in students taking more than minimum time to complete the combined program.

**Organisation**

The BE BA program is administered by the School of Civil and Environmental Engineering. The School will consult with the Faculty of Arts and Social Sciences in approving the BA component of the program. The School of Civil and Environmental Engineering must approve the final program and timetable.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as early as possible. Students should themselves determine the Arts program that they wish to undertake. The Arts and Social Sciences section in this Handbook describes the options. There are no special rules on what courses should be included in each year. Students should schedule the Arts and Engineering components to suit their preferences, while meeting the constraints of timetables and prerequisites.

**Program Objectives and Learning Outcomes**

The broad objective of the School's undergraduate programs is to develop well-educated graduates with the basic skills, attributes and knowledge required to practise as professional engineers. The desired skills are those that enable graduates to be problem solvers; critical thinkers; life long learners; good communicators; team players; independent investigators; effective managers; self-motivated; and economically, environmentally and socially aware.

It is intended that these attributes are developed in students at the same time that they gain knowledge in a broad range of disciplines. In addition, an objective of the programs is to provide the skills and knowledge in a social context. Integrating courses in each year of each program (the Engineering Practice courses) have been introduced to achieve this objective.

## Program Structure

### CVENA13621 and Arts Plan

Please refer to the Academic Rules below and contact the School of Civil and Environmental Engineering for information on the Program Structure of this degree.

## Computing Requirements

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

## Honours

Honours is awarded to students who have achieved above average results and who undertake an Honours Thesis in their Final Year. A School weighted average mark is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each course by units of credit as follows:

Year 1 x 1

Year 2 x 2

Year 3 x 4

Year 4 x 5

Industrial training is assigned a nominal value of 3 units of credit in Year 4 in the Honours calculation. For combined degree programs only the marks obtained in the standard Civil or Environmental Engineering courses are used in the calculation. A School weighted average mark in the range of 65.0-69.9 will result in a recommendation for Honours 2/2. A weighted average mark in the range of 70.0-74.9 will result in a recommendation for Honours 2/1. A weighted average mark of 75.0 and above will result in a recommendation for Honours 1.

## Academic Rules

1. Students must complete 60 units of credit in the BA program, with no more than 24 units of credit obtained at Level 1 (ie in courses designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one sequence of study.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
European Studies  
Film  
French  
German Studies  
Greek  
History  
History & Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music  
Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology and Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

3. Except for courses completed as part of the major sequence, no more than 12 units of credit may be obtained from courses in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program

5. Students must complete the full requirements of Program 3620 BE in Civil Engineering except that they are exempt from the General Education requirements of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA program have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of Honours year. It should be noted that entry into a particular BA Honours program might require completion of courses additional to those specified under Rules 1-4.

8. The total units of credit in the program is 240

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under Faculty Information and Assistance in this Handbook.

## Industrial Experience

Industrial experience is an integral part of the program. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from completing further industrial training.

## Professional Recognition

The BE in Civil Engineering is fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

## 3715 Civil Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 4775 Civil Engineering/Bachelor of Laws

### Bachelor of Engineering Bachelor of Laws BE LLB

#### CVENA14775 and Laws Plan

This program provides students with professional qualifications in areas of very great importance to the community. The program is attractive to students who have in mind a career involving construction or general engineering and the law. Most large developments raise a formidable range of legal issues and there is a need for highly qualified personnel who are able to understand both the engineering and the legal dimensions of development, both in Australia and overseas.

The Faculty of Law administers this program. For full details, see the entry under the Faculty of Law in this Handbook.

## 3146 Civil Engineering/Mining Engineering

### Bachelor of Engineering Bachelor of Engineering BE BE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

Students may enrol directly into Program 3146 or apply to transfer from Program 3620 (Civil Engineering) any time before the commencement of Year 4. The first three years of the combined degree program are identical to program 3620. The first three years is administered by the School of Civil & Environmental Engineering, with the final two years administered by the School of Mining Engineering. Students aim to complete the mining requirements in four additional sessions.

Students considering this option should discuss the above arrangements with the relevant program authorities.

## Program Structure

### Plans CVENAD3146 and MINEFD3146 (Full-time program)

#### Year 1

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN1021 | Civil Engineering Practice 1A | (4 UOC) |
| CVEN1022 | Civil Engineering Practice 1B | (6 UOC) |
| CVEN1023 | Statics                       | (4 UOC) |
| CVEN1024 | Dynamics                      | (4 UOC) |
| CVEN1025 | Computing                     | (4 UOC) |
| CVEN1026 | Engineering Materials 1       | (4 UOC) |
| PHYS1279 | Physics 1 (Civil Engineering) | (4 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

Total hours per week - Session 1: 20

Total hours per week - Session 2: 20

Total units of credit: 48

#### Year 2

|          |                                   |         |
|----------|-----------------------------------|---------|
| CVEN2022 | Civil Engineering Practice 2      | (3 UOC) |
| CVEN2023 | Mechanics of Solids               | (3 UOC) |
| CVEN2025 | Engineering Computations 1        | (3 UOC) |
| CVEN2026 | Engineering Materials 2           | (3 UOC) |
| CVEN2125 | Systems Engineering               | (3 UOC) |
| CVEN2126 | Engineering Construction 1        | (3 UOC) |
| CVEN2222 | Geotechnical Engineering 1        | (3 UOC) |
| CVEN2322 | Structural Engineering 1          | (6 UOC) |
| CVEN2525 | Introduction to Water Engineering | (3 UOC) |
| GMAT0442 | Surveying for Civil Engineers     | (3 UOC) |
| GMAT0491 | Survey Camp                       | (3 UOC) |
| MATH2019 | Engineering Mathematics 2CE       | (6 UOC) |
|          | General Education                 | (6 UOC) |

Total Hours per week - Session 1: 20

Total hours per week - Session 2: 20

Total units of credit: 48

#### Year 3

|          |                                    |         |
|----------|------------------------------------|---------|
| CVEN3023 | Civil Engineering Practice 3A      | (3 UOC) |
| CVEN3024 | Civil Engineering Practice 3B      | (3 UOC) |
| CVEN3025 | Engineering Computations 2         | (3 UOC) |
| CVEN3125 | Engineering Construction 2         | (3 UOC) |
| CVEN3126 | Engineering Management 1           | (3 UOC) |
| CVEN3222 | Geotechnical Engineering 2         | (3 UOC) |
| CVEN3223 | Geotechnical Engineering 3         | (3 UOC) |
| CVEN3322 | Structural Engineering 2           | (6 UOC) |
| CVEN3324 | Structural Engineering 3           | (3 UOC) |
| CVEN3438 | Transport Planning and Environment | (3 UOC) |
| CVEN3448 | Transport Engineering              | (3 UOC) |
| CVEN3526 | Water Resources Engineering        | (3 UOC) |
| CVEN3527 | Water Engineering                  | (3 UOC) |
|          | General Education                  | (6 UOC) |

Total hours per week - Session 1: 22

Total hours per week - Session 2: 22

Total units of credit: 48

#### Year 4

##### Session One

|          |                            |         |
|----------|----------------------------|---------|
| CVEN4225 | Geotechnical Engineering 4 | (3 UOC) |
| MINE3410 | Coal Mining Systems        | (6 UOC) |
| MINE3420 | Metal Mining Systems       | (6 UOC) |

Choose one of the following courses:

|          |                                |         |
|----------|--------------------------------|---------|
| CVEN4126 | Engineering Management 2       | (3 UOC) |
| CVEN4323 | Structural Engineering 4       | (3 UOC) |
| CVEN4526 | Water and Wastewater Treatment | (3 UOC) |

Choose one of the following courses:

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN4027 | Civil Engineering Practice 4A | (6 UOC) |
| CVEN4028 | Civil Engineering Practice 4B | (6 UOC) |
| CVEN4029 | Civil Engineering Practice 4C | (6 UOC) |

Total hours per week Session 1: 18

Total units of credit: 24

#### Session Two

Choose one major comprising 12 units of credit

##### Construction and Management Major

|          |                                                        |         |
|----------|--------------------------------------------------------|---------|
| CVEN4139 | Advanced Construction and Project Management           | (4 UOC) |
| CVEN4149 | Professional Level Project Management Tools and Skills | (4 UOC) |
| CVEN4159 | Advanced Construction Technology and Engineering       | (4 UOC) |

##### Structural Engineering Major

|          |                                                            |         |
|----------|------------------------------------------------------------|---------|
| CVEN4339 | Design of Bridges                                          | (4 UOC) |
| CVEN4349 | Special Topics in Concrete, Steel and Composite Structures | (4 UOC) |
| CVEN4359 | Structural Analysis and Finite Elements                    | (4 UOC) |

##### Transport Engineering

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CVEN4439 | Transport Operations and Systems Design | (4 UOC) |
| CVEN4449 | Traffic Management and Control          | (4 UOC) |
| CVEN4459 | Transport and Environment               | (4 UOC) |

##### Water Engineering Major

|          |                                          |         |
|----------|------------------------------------------|---------|
| CVEN4539 | Advanced Water Quality and Treatment     | (4 UOC) |
| CVEN4549 | Advanced Catchment and Coastal Processes | (4 UOC) |
| CVEN4559 | Advanced Water Engineering               | (4 UOC) |

|          |                                     |         |
|----------|-------------------------------------|---------|
| MINE3500 | Mine Workplace Environment          | (6 UOC) |
| MINE3710 | Mine Economics and Business Systems | (6 UOC) |

Total hours per week Session 2: 21

Total units of credit: 24

#### Year 5

|          |                              |         |
|----------|------------------------------|---------|
| MINE4210 | Mine Planning                | (6 UOC) |
| MINE4300 | Geotechnical Engineering     | (6 UOC) |
| MINE4410 | Industry Applications        | (6 UOC) |
| MINE4420 | Thesis A                     | (6 UOC) |
| MINE4500 | Sustainable Mining Practices | (3 UOC) |
| MINE4700 | Mining Law                   | (6 UOC) |

And one of the following courses:

|          |                                          |         |
|----------|------------------------------------------|---------|
| MINE4220 | Coal Mine Design and Evaluation Project  | (9 UOC) |
| MINE4230 | Metal Mine Design and Evaluation Project | (9 UOC) |
| MINE4240 | Mine Design and Evaluation               | (9 UOC) |

And choose two from the following three electives:

|          |                               |         |
|----------|-------------------------------|---------|
| MINE4800 | Mine Simulation and Modelling | (3 UOC) |
| MINE4805 | Mineral Process Technology    | (3 UOC) |
| MINE4810 | Comp Methods in Geomechanics  | (3 UOC) |

## Academic Rules

For program rules relating to the Bachelor of Engineering and General Rules for Progression, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## 3631 Civil Engineering/Environmental Engineering

### Bachelor of Engineering Bachelor of Engineering BE BE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

The program provides students with professional qualifications in areas of great importance to the community. The program is attractive to students who have in mind a career involving environmental issues and infrastructure development. The School of Civil and Environmental Engineering administers the program.

## Program Structure

### Plans CVENAD3631 and CVENBD3631

#### Year 1

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN1021 | Civil Engineering Practice 1A | (4 UOC) |
| CVEN1022 | Civil Engineering Practice 1B | (6 UOC) |
| CVEN1023 | Statics                       | (4 UOC) |

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN1024 | Dynamics                      | (4 UOC) |
| CVEN1025 | Computing                     | (4 UOC) |
| CVEN1026 | Engineering Materials 1       | (4 UOC) |
| PHYS1279 | Physics 1 (Civil Engineering) | (4 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

## Year 2

|                   |                                   |         |
|-------------------|-----------------------------------|---------|
| CHEM1021          | Fundamentals of Chemistry 1B      | (6 UOC) |
| CVEN2023          | Mechanics of Solids               | (3 UOC) |
| CVEN2025          | Engineering Computations 1        | (3 UOC) |
| CVEN2026          | Engineering Materials 2           | (3 UOC) |
| CVEN2126          | Engineering Construction 1        | (3 UOC) |
| CVEN2322          | Structural Engineering 1          | (6 UOC) |
| CVEN2525          | Introduction to Water Engineering | (3 UOC) |
| GEO1711           | Planet Earth                      | (3 UOC) |
| GMAT0442          | Surveying for Civil Engineers     | (3 UOC) |
| GMAT0491          | Survey Camp                       | (3 UOC) |
| MATH2019          | Engineering Mathematics 2CE       | (6 UOC) |
| General Education |                                   | (6 UOC) |

## Year 3

|          |                                             |         |
|----------|---------------------------------------------|---------|
| BIOS1101 | Evolutionary and Functional Biology         | (6 UOC) |
| CEIC0010 | Mass Transfer and Material Balances         | (3 UOC) |
| CVEN2125 | Systems Engineering                         | (3 UOC) |
| CVEN2222 | Geotechnical Engineering 1                  | (3 UOC) |
| CVEN3126 | Engineering Management 1                    | (3 UOC) |
| CVEN3322 | Structural Engineering 2                    | (6 UOC) |
| CVEN3324 | Structural Engineering 3                    | (3 UOC) |
| CVEN3438 | Transport Planning and Environment          | (3 UOC) |
| CVEN3448 | Transport Engineering                       | (3 UOC) |
| CVEN3526 | Water Resources Engineering                 | (3 UOC) |
| CVEN3527 | Water Engineering                           | (3 UOC) |
| GMAT0753 | Introduction to Spatial Information Systems | (3 UOC) |
| INDC4120 | Chemistry of the Industrial Environment     | (3 UOC) |

And ONE of the following courses:

|          |                                      |         |
|----------|--------------------------------------|---------|
| CVEN2022 | Civil Engineering Practice 2         | (3 UOC) |
| CVEN2722 | Environmental Engineering Practice 2 | (3 UOC) |

## Year 4

|          |                                                              |         |
|----------|--------------------------------------------------------------|---------|
| BIOS3301 | Population and Community Ecology for Environmental Engineers | (3 UOC) |
| CEIC0050 | Atmospheric Process Chemistry                                | (3 UOC) |
| CVEN3025 | Engineering Computations 2                                   | (3 UOC) |
| CVEN3125 | Engineering Construction 2                                   | (3 UOC) |
| CVEN3222 | Geotechnical Engineering 2                                   | (3 UOC) |
| CVEN3223 | Geotechnical Engineering 3                                   | (3 UOC) |
| CVEN3531 | Aquatic Chemistry                                            | (3 UOC) |
| CVEN3725 | Waste Management                                             | (3 UOC) |
| CVEN3726 | Environmental Policy                                         | (3 UOC) |
| CVEN4323 | Structural Engineering 4                                     | (3 UOC) |

And ONE of the following courses:

|          |                                       |         |
|----------|---------------------------------------|---------|
| CVEN3023 | Civil Engineering Practice 3A         | (3 UOC) |
| CVEN3723 | Environmental Engineering Practice 3A | (3 UOC) |

And ONE of the following courses:

|                    |                                       |         |
|--------------------|---------------------------------------|---------|
| CVEN3024           | Civil Engineering Practice 3B         | (3 UOC) |
| CVEN3724           | Environmental Engineering Practice 3B | (3 UOC) |
| Geography Elective |                                       | (6 UOC) |
| General Education  |                                       | (6 UOC) |

## Year 5

### Session One

Students achieving a School weighted average mark exceeding 62 (calculated from all courses in Years 1 to 4 of the BE program) are eligible to undertake an Honours thesis in Year 4 (CVEN4000 in S1 and CVEN4001 in S2).

|          |                                |         |
|----------|--------------------------------|---------|
| CVEN4126 | Engineering Management 2       | (3 UOC) |
| CVEN4225 | Geotechnical Engineering 4     | (3 UOC) |
| CVEN4526 | Water and Wastewater Treatment | (3 UOC) |
| CVEN4533 | Transport & Fate of Pollutants | (3 UOC) |

Plus TWO of the following electives:

|          |                                       |         |
|----------|---------------------------------------|---------|
| CVEN4000 | Honours Thesis Part A                 | (6 UOC) |
| CVEN4027 | Civil Engineering Practice 4A         | (6 UOC) |
| CVEN4028 | Civil Engineering Practice 4B         | (6 UOC) |
| CVEN4029 | Civil Engineering Practice 4C         | (6 UOC) |
| CVEN4727 | Environmental Engineering Practice 4A | (6 UOC) |
| CVEN4728 | Environmental Engineering Practice 4B | (6 UOC) |
| CVEN4729 | Environmental Engineering Practice 4C | (6 UOC) |

### Session Two

All students not undertaking the Honours thesis are required to select two majors. Students undertaking the Honours thesis are required to undertake one major plus at least 8 units of credit of electives taken from one other discipline area. To complete a major, all three 4 units of credit elective subjects (listed for each discipline below) must be undertaken.

|          |                       |         |
|----------|-----------------------|---------|
| CVEN4001 | Honours Thesis Part B | (4 UOC) |
|----------|-----------------------|---------|

### Construction and Management Major

|          |                                                        |         |
|----------|--------------------------------------------------------|---------|
| CVEN4139 | Advanced Construction and Project Management           | (4 UOC) |
| CVEN4149 | Professional Level Project Management Tools and Skills | (4 UOC) |
| CVEN4159 | Advanced Construction Technology and Engineering       | (4 UOC) |

### Geotechnical Major

Any 3 of the following 4 courses:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| CVEN4269 | Environmental Geotechnics                   | (4 UOC) |
| CVEN4279 | Rock and Slope Engineering                  | (4 UOC) |
| CVEN4289 | Site Investigations and Dam Engineering     | (4 UOC) |
| CVEN4299 | Advanced Topics in Geotechnical Engineering | (4 UOC) |

### Structures Major

|          |                                                            |         |
|----------|------------------------------------------------------------|---------|
| CVEN4349 | Special Topics in Concrete, Steel and Composite Structures | (4 UOC) |
| CVEN4359 | Structural Analysis and Finite Elements                    | (4 UOC) |
| CVEN4339 | Design of Bridges                                          | (4 UOC) |

### Transport Major

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CVEN4439 | Transport Operations and Systems Design | (4 UOC) |
| CVEN4449 | Traffic Management and Control          | (4 UOC) |
| CVEN4459 | Transport and Environment               | (4 UOC) |

### Water Major

Any 3 of the following 4 courses:

|          |                                          |         |
|----------|------------------------------------------|---------|
| CVEN4539 | Advanced Water Quality and Treatment     | (4 UOC) |
| CVEN4549 | Advanced Catchment and Coastal Processes | (4 UOC) |
| CVEN4559 | Advanced Water Engineering               | (4 UOC) |
| CVEN4569 | Advanced Environmental Systems           | (4 UOC) |

Note each major strand is divided into at least three courses each of 4 units of credit. A major consists of undertaking 12 units of credit in a given strand. Students may also take elective components of 4 units of credit each offered from different strands.

### General Education

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

### Honours

Honours is awarded to students who have achieved above average results and who undertake an Honours Thesis in their Final Year. A School weighted average mark is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each course by units of credit as follows:

|                       |
|-----------------------|
| Year 1 x 1            |
| General Education x 2 |
| Year 2 x 2            |
| Year 3 x 4            |
| Year 4 x 5            |

Industrial training is assigned a nominal value of 3 units of credit in Year 4 in the Honours calculation. For combined degree programs only the marks obtained in the standard Civil and Environmental Engineering courses are used in the calculation. A weighted average mark in the range of 65.0-69.9 will result in a recommendation for Honours 2/2. A weighted average mark in the range of 70.0-74.9 will result in a recommendation for Honours 2/1. A weighted average mark of 75.0 and above will result in a recommendation for Honours 1.

## Academic Rules

1. Students must satisfy the normal program and course prerequisites for Environmental Engineering and Civil Engineering.
2. The degrees of Bachelor of Engineering may be conferred as Pass or Honours degrees. There are two classes of Honours, Class 1, and Class 2, in two divisions. The award and grade of Honours are made in recognition of superior performance throughout the program with greater weighting on courses in the later years. The course can lead to the award of the University Medal in either Civil or Environmental Engineering.
3. There will be a testamur for each degree in the combined program.
4. Students must satisfy admission requirements for both the BE in Civil and Environmental Engineering for direct admission or may transfer from either the Civil or the Environmental BE program after completion of the first year with a weighted average mark of 65 or greater.
5. The total units of credit in the program is 240

## Industrial Experience

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from completing further industrial training.

## Computing Requirements

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

## Professional Recognition

Both the BE in Civil Engineering and the BE in Environmental Engineering are fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

## 3735 Environmental Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

Students may seek to undertake a five-year full-time combined program leading to the award of the degree of Bachelor of Engineering in Environmental Engineering and Bachelor of Science (BE BSc). The School of Civil and Environmental Engineering administers the program.

With the combined degree program, students can add their choice of a Science, Mathematics or Computer Science program to the standard, professionally accredited Environmental Engineering program offered by the School of Civil and Environmental Engineering.

The School of Civil and Environmental Engineering is the academic unit responsible for the program. The School will consult with the Faculty of Science in approving the BSc component of the program.

Students must satisfy admission requirements for both the BE in Environmental Engineering and BSc programs or may transfer from the BE in Environmental Engineering program after completion of at least one year if they have a credit or higher average.

Course credits can accrue simultaneously for both component degrees where there is an overlap of courses from the Environmental Engineering program and the Science Program.

## Program Objectives and Learning Outcomes

The broad objective of the School's undergraduate programs is to develop well-educated graduates with the basic skills, attributes and knowledge required to practise as professional engineers. The desired skills are those that enable graduates to be problem solvers; critical thinkers; life long

learners; good communicators; team players; independent investigators; effective managers; self-motivated; and economically, environmentally and socially aware.

Students will be able to combine this with the skills learnt from the Science portion of the combined degree.

## Program Structure

### CVENB13735 and Science Plan

#### Year 1

All the year 1 courses in the Environmental Engineering course

#### Year 2

The year 2 courses in the Environmental Engineering program, except that 12 units of credit of Science courses are substituted for CVEN2222, CVEN2722 and General Education.

#### Year 3

Science courses to total at least 36 units of credit and CVEN2222, CVEN2722, CVEN3025, CVEN3126

#### Year 4

Science courses to total at least 24 units of credit and BIOS3301, CEIC0050, CVEN3222, CVEN3223, CVEN3526, CVEN 3527, CVEN3531 and CVEN 3726

#### Year 5

Science courses to total at least 12 units of credit in S2 in lieu of one environmental engineering major (12 units of credit) and CVEN3438 and CVEN3725 in lieu of one of CVEN4727, CVEN4728 or CVEN4729 in S1. Otherwise the Standard Year 4 program in Environmental Engineering.

The degrees of Bachelor of Engineering and Bachelor of Science may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class 1 and Class 2 in two divisions. The award and grade of Honours in the BE are made in recognition of superior performance throughout the program with a greater weighting on courses in the later years. The BSc can be awarded Honours on the successful completion of an Honours year. It should be noted that entry into a particular Honours program might require completion of additional courses.

## Academic Rules

1. The program is a five year full-time combined program leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc).
2. The five years of the program include at least 108 units of credit in the Science program and a minimum of 240 units of credit in total.
3. The 108 Science program units of credit must include a minimum of 36 and a maximum of 48 level 1 units of credit and all courses prescribed in a specific program as outlined in the Science section in this Handbook must be completed.
4. Students must satisfy the normal prerequisites for entry to Bachelor of Science Program and to individual courses therein. Also, students must satisfy the normal prerequisites for entry to Environmental Engineering and to individual courses therein.
5. Students desiring to enrol in the BSc degree program at Honours level are not able to complete the program in five years and must obtain approval from the School of Civil and Environmental Engineering and the Faculty of Science for their programs. With the approval of the relevant school and of the Head of the School of Civil and Environmental Engineering, a student may follow a standard Honours program in the Science program which can be completed by an additional year of study.
6. The degrees of Bachelors of Engineering and Bachelor of Science are not awarded until the completion of the full five-year program.
7. Students contemplating enrolling in this program should consult fully with the Faculty of Science and with the School of Civil and Environmental Engineering before enrolment.
8. There will be a testamur for each degree in the combined program.
9. Students must complete the full requirements of the BE in Environmental Engineering (code 3625) except that:
  - a) CVEN3723 and CVEN3724 are exempted;
  - b) the General Education requirement is exempted;
  - c) a final year engineering major (12 units of credit) is exempted; and
  - d) final year engineering electives are to be selected from the Geotechnical, Transport, Water and Chemical Engineering majors.
10. Group A and Group B courses below will count towards satisfying requirements of both rules 2 and 9 above. The courses in Group B may not satisfy requirements for progression within science programs.

**11.** Students may apply for exemption from the requirements of Rule 9 for the courses listed in Rule 12 below Group B on the basis of courses/requirements in parentheses.

**12.** Exemptions will be granted for the courses in Group C below with respect to Rule 9 on the basis of the requirements within parentheses.

#### Group A

CHEM1011, CHEM1031, MATH1131 or MATH1141, MATH1231 or MATH1241, BIOS1101

#### Group B

CVEN1531 (CHEM1021), MATH2019 (at least 12 units of credit of non-statistics level II mathematics), CVEN2025 (at least 3 units of credit of level II Statistics), GEOS1711 (GEOS1721), BIOS3301 (BIOS3111).

#### Group C

CVEN3025 (at least 3 units of credit of level III applied mathematics).

**13.** Students wishing to major in Physics must consult with the School of Physics and the School of Civil & Environmental Engineering in regards to choice of courses.

**14.** A typical structure of a combined Engineering/Science program is set out above in the Program Structure section. Subject to timetable restrictions, the full range of Science programs is available to Environmental Engineering students.

**15.** The total units of credit in the program is 240.

### Industrial Experience

Industrial experience is an integral part of the program. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from completing further industrial training.

### Further Requirements

The School of Civil and Environmental Engineering is the academic unit responsible for the program. The School will consult with the Faculty of Science in approving the BSc component of the program.

Students must satisfy admission requirements for both the BE in Environmental Engineering and BSc programs or may transfer from the BE in Environmental Engineering program after completion of at least one year if they have a credit or higher average.

Course credits can accrue simultaneously for both component degrees where there is an overlap of courses from the Environmental Engineering program and Science and Mathematics programs.

### Computing Requirements

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

### Professional Recognition

The BE in Environmental Engineering is fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

## 3626 Environmental Engineering/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BArts

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

With this combined degree program, students can add their choice of an Arts program to the standard, professionally accredited Environmental Engineering (3625) program offered by the School of Civil and Environmental Engineering. It provides flexibility in the choice

of courses within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as specialised studies in Environmental Engineering.

Because Engineering and Arts programs can have a common content, such as mathematics and physics, two additional sessions of study is required to gain the additional qualification of Bachelor of Arts. In general, this additional study is taken concurrently with the BE program and both can be completed in ten sessions.

### Eligibility

The program is open to all students who satisfy both the Environmental Engineering (3625) and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program after completion of at least one year if they have a credit or higher average. Transfer after the second year may result in students taking more than minimum time to complete the combined program.

The BE BA program is administered by the School of Civil and Environmental Engineering. The School will consult with the Faculty of Arts and Social Sciences in approving the BA component of the program. The final program and timetable must be approved by the School of Civil and Environmental Engineering.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as early as possible. Students should themselves determine the Arts program that they wish to undertake. The Arts and Social Sciences section in this Handbook describes the options. There are no special rules on what courses should be included in each year. Students should schedule the Arts and Engineering components to suit their preferences, while meeting the constraints of timetables and prerequisites.

Students will need to refer to the Faculty of Arts and Social Sciences section in this Handbook.

### Program Structure

#### CVENB13626 and Arts Plan

Please contact the School of Civil and Environmental Engineering and the Faculty of Arts for the Program Structure of this combined degree.

### Honours

Honours is awarded to students who have achieved above average results and who undertake an Honours Thesis in their Final Year. A School weighted average is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each course by units of credit as follows:

Year 1 x 1

Year 2 x 2

Year 3 x 4

Year 4 x 5

### Academic Rules

**1.** Students must complete 60 units of credit in the BA program, with no more than 24 units of credit obtained at Level 1 (ie in courses designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one school or department.

**2.** Students must complete a major sequence (42 units of credit) in one of the following areas :

Australian Studies

Chinese Studies

Development Studies

Education

English

European Studies

Film

French

German Studies

Greek

History

History and Philosophy of Science

Indonesian Studies

Japanese Studies

Korean Studies

Linguistics

Media, Culture & Technology

Music

Philosophy

Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology and Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

3. Except for courses completed as part of the major sequence, no more than 12 units of credit may be obtained from courses in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program

5. Students must complete the full requirements of Program 3625 in Environmental Engineering except that they are exempt from the General Education requirements of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA program have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of Honours year. It should be noted that entry into a particular BA Honours program might require completion of courses additional to those specified under Rules 1-4.

8. The total units of credit in the program is 240.

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under Faculty Information and Assistance in this Handbook.

## Industrial Experience

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study.

## Professional Recognition

Both the BE in Civil Engineering and the BE in Environmental Engineering are fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

## Computing Requirements

For information about computing requirements, please refer to the School website: [www.civeng.unsw.edu.au/currentstudents/general/computing](http://www.civeng.unsw.edu.au/currentstudents/general/computing)

## 3715 Environmental Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 4777 Environmental Engineering/Bachelor of Laws

### Bachelor of Engineering Bachelor of Laws BE LLB CVENB14777 and Laws Plan

This program provides students with professional qualifications in areas of very great importance to the community. The program is attractive to students who have in mind a career involving environmental issues, engineering and the law. Most large developments raise a formidable range of legal issues, and there is a need for highly qualified personnel who are able to understand both the engineering and the legal dimensions of development, both in Australia and overseas.

The Faculty of Law administers this program. For full details, see entry under the Faculty of Law in this Handbook.

## Fast-Track Programs with Master of Engineering Science

### 3620 Civil Engineering/Master of Engineering Science – Plan CVENG13620

Bachelor of Engineering Master of Engineering Science BE MEngSc

### 3625 Environmental Engineering/Master of Engineering Science – Plan CVENH13625

Bachelor of Engineering Master of Engineering Science BE MEngSc

Students may undertake a 4.5 year full-time fast-track program leading to the awards of either Bachelor of Engineering in Civil Engineering or Environmental Engineering and Master of Engineering Science.

#### Program of Study

Students undertake the first three years of the standard BE program in either Civil or Environmental Engineering. Subject to satisfying a minimum performance over these three years they (a) complete standard S1 program of Year 4 without Honours thesis (b) substitute 12 units of credit of the standard Year 4 BE degree program with a School approved 12 units of credit of graduate coursework in their Year 4; (c) undertake a 12 units of credit of project/thesis work over the Summer (9th) Semester; and (d) undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year) in the following areas:

Environmental Engineering, Project Management, Technology Management, Geotechnical Engineering, Transport Engineering, Coastal Engineering and Management, Groundwater Studies, Hydrology and Water Resources, Waste Management, Water Quality Management, and Water and Wastewater Treatment.

It may not be possible to complete a specialisation in all sub disciplines in this fast-track mode.

## School of Computer Science and Engineering

**Head of School:** Professor PJ Compton

**Associate Head of School:** Associate Professor WH Wilson

**Student Office Manager:** Miss CJ Nock

**Undergraduate Program Directors:** Dr A Mahidadia (Computer Engineering)

Associate Professor S Parameswaran (Computer Engineering)

Associate Professor K Robinson (Software Engineering)

Associate Professor A Hoffmann (Computer Science)

Dr TD Lambert (Computer Science & Computer Science Honours)

Dr B Gaeta (Bioinformatics)

The School of Computer Science and Engineering and the School of Electrical Engineering and Telecommunications have joint responsibility for the curriculum of the Computer Engineering program.

The staff of the School of Computer Science and Engineering is grouped into research groups of Architecture, Artificial Intelligence, Computer Networks, Computer Systems, Database and Software Engineering. Courses in these areas are offered to students taking major studies in Computer Science or Computer Engineering, while introductory-level computing courses are available more generally to students studying Science, Arts or Engineering. Computer Science has links with discrete mathematics, which furnishes the theory behind the algorithms that computer software implements, and electrical engineering, which supplies the present technology underlying physical computing devices.

The School of Computer Science and Engineering, together with the School of Electrical Engineering and Telecommunications, jointly administers the BE Computer Engineering 3645. The BE Software Engineering 3648 is jointly managed with the School of Information Systems. The BE MBiomedE programs 3728, 3749, and 3757 are managed in conjunction with the Graduate School of Biomedical Engineering. The Bachelor of Engineering Bioinformatics 3647 is offered in collaboration with the Faculty of Science.

The School of Computer Science and Engineering also offers the program Bachelor of Science Computer Science 3978. Computer Science is offered as a major in the combined BE BSc programs, BSc BA, BSc BSc, BSc LLB and more recently, BSc BDigMed. It is offered as a minor in the program, BSc (Science and Mathematics) 3970. The School also offers a major sequence in computing within the BA 3400 and BSocSc 3420.

## Summary of Undergraduate Programs

### Normal full-time

#### Bachelor of Engineering

##### Duration

|      |                                     |           |
|------|-------------------------------------|-----------|
| 3645 | BE in Computer Engineering          | 4 years   |
| 3647 | BE in Bioinformatics                | 4 years   |
| 3648 | BE in Software Engineering          | 4 years   |
| 3651 | BE BSc in Software Engineering      | 5 years   |
| 3652 | BE BA in Software Engineering       | 5 years   |
| 3653 | BE BCom in Software Engineering     | 5 years   |
| 3722 | BE BA in Computer Engineering       | 5 years   |
| 3726 | BE BSc in Computer Engineering      | 5 years   |
| 3715 | BE BCom in Computer Engineering     | 5.5 years |
| 3728 | BE MBiomedE in Computer Engineering | 5 years   |
| 3749 | BE MBiomedE in Software Engineering | 5 years   |
| 3755 | BE BSc in Bioinformatics            | 5 years   |
| 3756 | BE BA in Bioinformatics             | 5 years   |
| 3715 | BE BCom in Bioinformatics           | 5.5 years |
| 3757 | BE MBiomedE in Bioinformatics       | 5 years   |

#### Bachelor of Science

##### Duration

|      |                         |                |
|------|-------------------------|----------------|
| 3978 | BSc in Computer Science | 3 years (Pass) |
| 3978 | BSc in Computer Science | 4 years (Hons) |

#### Combined BE BSc in Computer Science

##### Duration

|      |                                                     |         |
|------|-----------------------------------------------------|---------|
| 3042 | BE BSc in Chemical Engineering                      | 5 years |
| 3102 | BE BSc in Industrial Chemistry                      | 5 years |
| 3641 | BE BSc in Telecommunications                        | 5 years |
| 3711 | BE BSc in Aerospace Engineering                     | 5 years |
| 3711 | BE BSc in Manufacturing Management                  | 5 years |
| 3711 | BE BSc in Mechanical Engineering                    | 5 years |
| 3711 | BE BSc in Mechatronic Engineering                   | 5 years |
| 3711 | BE BSc in Naval Architecture                        | 5 years |
| 3725 | BE BSc in Electrical Engineering                    | 5 years |
| 3730 | BE BSc in Civil Engineering                         | 5 years |
| 3735 | BE BSc in Environmental Engineering                 | 5 years |
| 3746 | BE BSc in Surveying and Spatial Information Systems | 5 years |

#### Combined BSc BDigMed

##### Duration

|      |                                                |                |
|------|------------------------------------------------|----------------|
| 3982 | BSc Computer Science Bachelor of Digital Media | 4 years (Pass) |
|------|------------------------------------------------|----------------|

#### Combined BSc BSc

##### Duration

|      |                             |                |
|------|-----------------------------|----------------|
| 3983 | BSc BSc in Computer Science | 4 years (Pass) |
|------|-----------------------------|----------------|

#### Combined BSc with Other Degrees

##### Duration

|      |                                    |                |
|------|------------------------------------|----------------|
| 3529 | BCom BSc Commerce/Science          | 4 years (Pass) |
| 3935 | BSc BSoc Sc Science/Social Science | 4 years (Pass) |
| 3968 | BSc BA Science/Arts                | 4 years (Pass) |
| 4770 | BSc LLB Science/Law                | 5 years        |

For a description of the combined BE BSc programs, see the entries in this Handbook for the Schools conducting the Engineering major. Majors in the program 3978 are also offered in Computer Science and Psychology, Computer Science and Geography, and Computer Science and Philosophy. For the BA degree program, see the Arts and Social Sciences section in this Handbook and for the BSc LLB program, see the Law section in this Handbook. For the BSc BA and BSc BSoc, see the Science entry in this Handbook. For the BSc BCom, see the Commerce entry in this Handbook.

#### Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

#### General Education Courses

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3645 Computer Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The School of Computer Science and Engineering and the School of Electrical Engineering and Telecommunications have joint responsibility for the curriculum of the Computer Engineering program.

The staff of the School of Computer Science and Engineering is grouped into research groups of Architecture, Artificial Intelligence, Computer Systems, Database and Software Engineering. Courses in these areas are offered to students taking major studies in Computer Science or Computer Engineering, while introductory-level computing courses are available more generally to students studying Science, Arts or Engineering. Computer Science has links with discrete mathematics, which furnishes the theory behind the algorithms that computer software implements, and electrical engineering, which supplies the present technology underlying physical computing devices.

### Program Structure

#### Plan COMPB13645

##### Year 1

|          |                          |         |
|----------|--------------------------|---------|
| ELEC1011 | Electrical Engineering 1 | (6 UOC) |
| MATH1081 | Discrete Mathematics     | (6 UOC) |
| PHYS1131 | Higher Physics 1A        | (6 UOC) |
| PHYS1231 | Higher Physics 1B        | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

##### Year 2

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ACCT9003 | Introduction to Accounting Principles   | (3 UOC) |
| COMP2121 | Microprocessors and Interfacing         | (6 UOC) |
| COMP3111 | Software Engineering                    | (6 UOC) |
| COMP3222 | Digital Circuits and Systems            | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| ELEC2032 | Electronics and Systems                 | (3 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

And ONE of the following courses:

|          |                      |         |
|----------|----------------------|---------|
| MATH2510 | Real Analysis        | (3 UOC) |
| MATH2610 | Higher Real Analysis | (3 UOC) |

And ONE of the following courses:

|          |                         |         |
|----------|-------------------------|---------|
| MATH2520 | Complex Analysis        | (3 UOC) |
| MATH2620 | Higher Complex Analysis | (3 UOC) |

Plus General Education

(6 UOC)

**Year 3**

|          |                             |         |
|----------|-----------------------------|---------|
| COMP3211 | Computer Architecture       | (6 UOC) |
| COMP3711 | Software Project Management | (6 UOC) |
| ELEC3006 | Electronics A               | (6 UOC) |
| TELE3013 | Telecommunication Systems 1 | (6 UOC) |

And ONE of the following courses:

|          |                            |         |
|----------|----------------------------|---------|
| COMP3231 | Operating Systems          | (6 UOC) |
| COMP3891 | Extended Operating Systems | (6 UOC) |

And ONE of the following courses:

|                        |                              |          |
|------------------------|------------------------------|----------|
| COMP3120               | Introduction to Algorithms   | (3 UOC)  |
| MATH2509               | Linear Algebra for Engineers | (3 UOC)  |
| Plus 2 Electives       |                              | (12 UOC) |
| Plus General Education |                              | (3 UOC)  |

**Year 4**

|                        |                                |          |
|------------------------|--------------------------------|----------|
| COMP4910               | Thesis Part A                  | (3 UOC)  |
| COMP4911               | Thesis Part B                  | (15 UOC) |
| COMP4920               | Professional Issues and Ethics | (3 UOC)  |
| Plus 4 Electives       |                                | (24 UOC) |
| Plus General Education |                                | (3 UOC)  |

**Elective Courses**

1. The Program Director must approve the program selected by each student. Not all electives are offered in each session. Students are advised each year of the timetable of available electives. It may be possible to substitute other electives run by the participating schools, apart from those listed below, but this is not permitted if it unduly restricts the range of courses studied overall.

2. Electives for Stages 3 and 4 total 36 units of credit (6 courses of 6 units of credit, or equivalent) and are selected from Groups N, S, CE3, CE4, and D (see below), with these restrictions:

- i) At least 6 units of credit must be taken from Group N
- ii) At least 12 units of credit must be taken from Group CE4.
- iii) At most 12 units of credit may be counted from Group S.

**Group N Networks Electives**

And ONE of the following courses:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3931 | Extended Computer Networks and Applications | (6 UOC) |
| TELE3018 | Data Networks 1                             | (6 UOC) |
| TELE4352 | Data Networks 2                             | (6 UOC) |

**Group S Science Electives**

|          |                                |         |
|----------|--------------------------------|---------|
| MATH2301 | Mathematical Computing         | (6 UOC) |
| MATH2400 | Finite Mathematics             | (3 UOC) |
| MATH3411 | Information, Codes and Ciphers | (6 UOC) |
| PHYS2010 | Mechanics                      | (3 UOC) |
| PHYS2020 | Computational Physics          | (3 UOC) |
| PHYS2040 | Quantum Physics                | (3 UOC) |

**Group CE3 Level-3 Computer Engineering Electives**

|          |                                           |         |
|----------|-------------------------------------------|---------|
| COMP3141 | Software System Design and Implementation | (6 UOC) |
| ELEC3004 | Signal Processing and Transform Methods   | (6 UOC) |
| ELEC3014 | Systems and Control 1                     | (6 UOC) |
| ELEC3016 | Electronics B                             | (6 UOC) |
| TELE9301 | Switching System Design                   | (6 UOC) |
| TELE9303 | Network Management                        | (6 UOC) |
| COMP3131 | Programming Languages and Compilers       | (6 UOC) |
| COMP3151 | Foundations of Concurrency                | (6 UOC) |
| COMP3161 | Concepts of Programming Languages         | (6 UOC) |
| COMP3311 | Database Systems                          | (6 UOC) |
| COMP3411 | Artificial Intelligence                   | (6 UOC) |
| COMP3421 | Computer Graphics                         | (6 UOC) |
| COMP3431 | Robotic Software Architecture             | (6 UOC) |
| COMP3441 | Cryptography and Security                 | (6 UOC) |
| COMP3511 | Human Computer Interaction                | (6 UOC) |

**Group CE4 Level-4 Computer Engineering Electives**

|          |                                       |         |
|----------|---------------------------------------|---------|
| COMP4001 | Object-Oriented Software Development  | (6 UOC) |
| COMP4003 | Industrial Software Development       | (6 UOC) |
| COMP4132 | Advanced Functional Programming       | (6 UOC) |
| COMP4133 | Advanced Compiler Construction        | (6 UOC) |
| COMP4151 | Algorithm Verification                | (6 UOC) |
| COMP4211 | Advanced Architectures and Algorithms | (6 UOC) |
| COMP4411 | Experimental Robotics                 | (6 UOC) |
| COMP4412 | Introduction to Modal Logic           | (6 UOC) |

|          |                                                                     |         |
|----------|---------------------------------------------------------------------|---------|
| COMP4415 | First-order Logic                                                   | (6 UOC) |
| COMP4416 | Intelligent Agents                                                  | (6 UOC) |
| COMP4418 | Knowledge Representation                                            | (6 UOC) |
| COMP4511 | User Interface Design and Construction                              | (6 UOC) |
| COMP9116 | Software System Development Using the B-Method and B-Toolkit        | (6 UOC) |
| COMP9117 | Software Architecture                                               | (6 UOC) |
| COMP9242 | Advanced Operating Systems                                          | (6 UOC) |
| COMP9243 | Distributed Systems                                                 | (6 UOC) |
| COMP9314 | Next Generation Database Systems                                    | (6 UOC) |
| COMP9315 | Database Systems Implementation                                     | (6 UOC) |
| COMP9318 | Data Warehousing & Data Mining                                      | (6 UOC) |
| COMP9321 | E-Commerce Systems Implementation Infrastructure                    | (6 UOC) |
| COMP9332 | Network Routing and Switching                                       | (6 UOC) |
| COMP9333 | Advanced Computer Networks                                          | (6 UOC) |
| COMP9334 | Systems Capacity Planning                                           | (6 UOC) |
| COMP9417 | Machine Learning                                                    | (6 UOC) |
| COMP9444 | Neural Networks                                                     | (6 UOC) |
| COMP9515 | Pattern Recognition                                                 | (6 UOC) |
| COMP9517 | Computer Vision                                                     | (6 UOC) |
| COMP9519 | Multimedia Authoring                                                | (6 UOC) |
| COMP9790 | Principles of Global Navigation Satellite System (GNSS) Positioning | (6 UOC) |
| COMP9791 | Modern Navigation & Positioning Technologies                        | (6 UOC) |
| ELEC4042 | Signal Processing 2                                                 | (6 UOC) |
| ELEC4205 | Electrical Energy Systems                                           | (6 UOC) |
| ELEC4216 | Electrical Drive Systems                                            | (6 UOC) |
| ELEC4240 | Power Electronics                                                   | (6 UOC) |
| ELEC4412 | Control of Continuous-time Systems                                  | (6 UOC) |
| ELEC4413 | Control of Discrete-time Systems                                    | (6 UOC) |
| ELEC4483 | Biomedical Instrumentation, Measurement and Design                  | (6 UOC) |
| ELEC4503 | Electronics C                                                       | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology                              | (6 UOC) |
| ELEC9344 | Speech & Audio Processing                                           | (6 UOC) |
| ELEC9370 | Digital Image Processing Systems                                    | (6 UOC) |
| SOLA3540 | Applied Photovoltaics                                               | (6 UOC) |
| TELE4313 | Optical Communications                                              | (6 UOC) |
| TELE4323 | Digital Modulation and Coding                                       | (6 UOC) |
| TELE4333 | Wireless Data Communication Systems                                 | (6 UOC) |
| TELE4343 | Source Coding and Compression                                       | (6 UOC) |
| TELE4352 | Data Networks 2                                                     | (6 UOC) |
| TELE4353 | Mobile and Satellite Communication Systems                          | (6 UOC) |
| TELE4354 | Network Management                                                  | (6 UOC) |
| TELE4363 | Telecommunications Systems 2                                        | (6 UOC) |
| TELE9337 | Advanced Networking                                                 | (6 UOC) |

And ONE of the following courses:

|          |                            |         |
|----------|----------------------------|---------|
| COMP9231 | Integrated Digital Systems | (6 UOC) |
| ELEC4532 | Integrated Digital Systems | (6 UOC) |

**General Education Requirements**

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies. For further information, please refer to General Education section in this Handbook.

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

**Honours**

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at sufficient standard. Weighted average marks required for Honours grades are given below: The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Training

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

## Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

## Further Requirements

1. A HSC Maths mark of 145-150 is required in Maths Extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI >97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

## Professional Recognition

### The Institution of Engineers, Australia

The professional body for engineering in Australia is the Institution of Engineers, Australia (IEAust), which has as its first objective the promotion of the science and practice of engineering in all its branches.

The IEAust has its national headquarters in Canberra and functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession, e.g. civil, mechanical, electrical, engineering management and environmental engineering.

Students of an approved school of engineering may join the Institution as a student member (StudIEAust). Student members receive the monthly publication Engineers Australia and for a small fee they also receive The Transactions which contains articles on a particular branch of engineering.

Student members are invited to participate in the Excellence Award for Work Experience, the National Young Engineer of the Year Award and to avail themselves of other IEAust services including the Mentor Scheme and industrial experience guidance.

For more information and membership application forms, contact The Institution of Engineers, Australia, Sydney Division, 1st Floor, 118 Alfred Street, Milsons Point 2061, telephone 8923 7100, website [www.ieaust.org.au](http://www.ieaust.org.au)

## 3647 Bioinformatics

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

The School of Computer Science and Engineering and the Faculty of Science jointly administer the Bioinformatics program. Day-to-day administration is conducted through the Computer Science and Engineering Student Office, to which enquiries should be directed.

The stages of the program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements. Approval should be obtained for changes.

The School also offers the combined degrees BE (Bioinformatics)/BA (program 3756), BE (Bioinformatics)/BSc (program 3755), the concurrent degree BE (Bioinformatics)/MBiomedE (program 3757), and also the fast-track program BE/MEngSc (plan BINFL13647).

## Program Structure

### Plan COMPB13647

#### Year 1

|          |                            |         |
|----------|----------------------------|---------|
| BINF1001 | Bioinformatics 1           | (6 UOC) |
| BIOS1201 | Molecules, Cells and Genes | (6 UOC) |

And ONE of the following courses:

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOS1101 | Evolutionary and Functional Biology | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B        | (6 UOC) |
| CHEM1041 | Higher Chemistry 1D                 | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

#### Year 2

|          |                                             |         |
|----------|---------------------------------------------|---------|
| BINF2001 | Bioinformatics 2                            | (6 UOC) |
| BIOC2201 | Principles of Molecular Biology (Advanced)  | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| LIFE2101 | Introductory Biochemistry & Microbiology    | (6 UOC) |
| MATH1081 | Discrete Mathematics                        | (6 UOC) |

And ONE of the following courses:

|          |                           |         |
|----------|---------------------------|---------|
| BIOS2021 | Genetics                  | (6 UOC) |
| BIOS2621 | Genetics (Advanced Level) | (6 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

And ONE of the following courses:

|          |                             |         |
|----------|-----------------------------|---------|
| MATH2801 | Theory of Statistics        | (6 UOC) |
| MATH2901 | Higher Theory of Statistics | (6 UOC) |

#### Year 3

|          |                                    |         |
|----------|------------------------------------|---------|
| BINF3001 | Bioinformatics 3                   | (6 UOC) |
| BIOC3121 | Molecular Biology of Nucleic Acids | (6 UOC) |
| COMP3311 | Database Systems                   | (6 UOC) |
| COMP3711 | Software Project Management        | (6 UOC) |

And one of the following courses:

|          |                                                |         |
|----------|------------------------------------------------|---------|
| COMP3121 | Algorithms and Programming Techniques          | (6 UOC) |
| COMP3821 | Extended Algorithms and Programming Techniques | (6 UOC) |

3 Electives (2 Year 3 electives in S1 and 1 Year 3 elective in S2. At least one from Life Science and one from COMP/MATH) (18 UOC)

General Education (3 UOC)

#### Year 4

|          |                                                   |          |
|----------|---------------------------------------------------|----------|
| BINF4910 | Thesis Part A                                     | (3 UOC)  |
| BINF4911 | Thesis Part B                                     | (12 UOC) |
| BINF4920 | Professional Issues and Ethics for Bioinformatics | (3 UOC)  |

3 electives (at least one from Life Science and one from COMP/MATH) (18 UOC)

General Education (9 UOC)

Electives for Stages 3 and 4 total 42 units of credit and are selected from the lists below:

#### Year 3 Electives

|          |                                 |         |
|----------|---------------------------------|---------|
| BIOC3111 | Molecular Biology of Proteins   | (6 UOC) |
| BIOC3151 | Human Genetics and Variation    | (6 UOC) |
| BIOC3281 | Recombinant DNA Techniques      | (6 UOC) |
| BIOC3291 | Genes, Genomes & Evolution      | (6 UOC) |
| BIOT3011 | Biotechnology A                 | (6 UOC) |
| BIOT3061 | Biopharmaceuticals              | (6 UOC) |
| COMP2121 | Microprocessors and Interfacing | (6 UOC) |
| COMP3111 | Software Engineering            | (6 UOC) |
| COMP3411 | Artificial Intelligence         | (6 UOC) |
| COMP3431 | Robotic Software Architecture   | (6 UOC) |

And ONE of the following courses:

|          |                            |         |
|----------|----------------------------|---------|
| COMP3231 | Operating Systems          | (6 UOC) |
| COMP3891 | Extended Operating Systems | (6 UOC) |

And ONE of the following courses:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3931 | Extended Computer Networks and Applications | (6 UOC) |

And ONE of the following courses:

|          |                      |         |
|----------|----------------------|---------|
| MATH2831 | Linear Models        | (6 UOC) |
| MATH2931 | Higher Linear Models | (6 UOC) |

#### Year 4 Electives

|          |                                        |         |
|----------|----------------------------------------|---------|
| BIOT3071 | Commercial Biotechnology               | (6 UOC) |
| COMP3151 | Foundations of Concurrency             | (6 UOC) |
| COMP3222 | Digital Circuits and Systems           | (6 UOC) |
| COMP3511 | Human Computer Interaction             | (6 UOC) |
| COMP4511 | User Interface Design and Construction | (6 UOC) |
| COMP9243 | Distributed Systems                    | (6 UOC) |
| COMP9314 | Next Generation Database Systems       | (6 UOC) |
| COMP9318 | Data Warehousing & Data Mining         | (6 UOC) |
| COMP9333 | Advanced Computer Networks             | (6 UOC) |
| COMP9417 | Machine Learning                       | (6 UOC) |
| COMP9444 | Neural Networks                        | (6 UOC) |
| MATH3821 | Statistical Modelling and Computing    | (6 UOC) |
| MICR3011 | Microbial Physiology                   | (6 UOC) |
| MICR3021 | Microbial Genetics                     | (6 UOC) |

And ONE of the following courses:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| MATH3801 | Probability and Stochastic Processes        | (6 UOC) |
| MATH3901 | Higher Probability and Stochastic Processes | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| MATH3811 | Statistical Inference        | (6 UOC) |
| MATH3911 | Higher Statistical Inference | (6 UOC) |

Other level 3 MATH electives may also be considered.

Other level 3/4/9 COMP courses not listed are permitted.

### General Education Requirements

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies. For further information, please refer to the General Education section in this Handbook.

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

### Honours

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at sufficient standard. Weighted average marks required for Honours grades are given below: The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

### Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

### Industrial Training

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

### Further Information and Requirements

1. A HSC Maths mark of 145-150 is required in Maths extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI >97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711

### Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

### Professional Recognition

#### The Institution of Engineers, Australia

The professional body for engineering in Australia is the Institution of Engineers, Australia (IEAust), which has as its first objective the promotion of the science and practice of engineering in all its branches.

The IEAust has its national headquarters in Canberra and functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession, e.g. civil, mechanical, electrical, engineering management and environmental engineering.

Students of an approved school of engineering may join the Institution as a student member (StudIEAust). Student members receive the monthly publication Engineers Australia and for a small fee they also receive the transactions that contains articles on a particular branch of engineering.

Student members are invited to participate in the Excellence Award for Work Experience, the National Young Engineer of the Year Award and to avail themselves of other IEAust services including the Mentor Scheme and industrial experience guidance.

For more information and membership application forms, contact The Institution of Engineers, Australia, Sydney Division, 1st Floor, 118 Alfred Street, Milsons Point 2061, telephone 8923 7100, website [www.ieaust.org.au](http://www.ieaust.org.au)

## 3648 Software Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The School of Computer Science and Engineering and the School of Information Systems, Technology and Management jointly administer the Software Engineering Program. Day-to-day administration is conducted through the Computer Science and Engineering Student Office, to which enquiries should be directed.

The stages of the program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements. Approval should be obtained for changes.

The School also offers the combined degrees BE (Software Eng)/BSc (program 3651), BE (Software Eng)/BA (program 3652), BE (Software Eng)/BCom (program 3715), the concurrent degree BE (Software Eng)/MBiomedE (program 3749) and also the fast track program BE (Software Eng)/MEngSc (plan SENGL13648).

### Program Structure

#### Plan SENGAI3648

##### Year 1

|          |                                 |         |
|----------|---------------------------------|---------|
| INFS1603 | Business Data Management        | (6 UOC) |
| INFS1611 | Requirements Engineering        | (3 UOC) |
| MATH1081 | Discrete Mathematics            | (6 UOC) |
| MATH2400 | Finite Mathematics              | (3 UOC) |
| SENG1031 | Software Engineering Workshop 1 | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

Year 1 - Free Electives (6 UOC)

**Year 2**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| COMP2121 | Microprocessors and Interfacing         | (6 UOC) |
| COMP2111 | System Modelling and Design             | (6 UOC) |
| COMP3711 | Software Project Management             | (6 UOC) |
| INFS2603 | Systems Analysis and Design             | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |
| SENG2010 | Software Engineering Workshop 2A        | (3 UOC) |
| SENG2020 | Software Engineering Workshop 2B        | (3 UOC) |

And ONE of the following courses:

|                         |                          |         |
|-------------------------|--------------------------|---------|
| COMP2011                | Data Organisation        | (6 UOC) |
| COMP2711                | Higher Data Organisation | (6 UOC) |
| General Education       |                          | (6 UOC) |
| Year 2 - Free Electives |                          | (6 UOC) |

**Year 3**

|                   |                                           |          |
|-------------------|-------------------------------------------|----------|
| COMP3141          | Software System Design and Implementation | (6 UOC)  |
| INFS2607          | Business Data Networks                    | (6 UOC)  |
| SENG3010          | Software Engineering Workshop 3A          | (3 UOC)  |
| SENG3020          | Software Engineering Workshop 3B          | (3 UOC)  |
| SE Electives      |                                           | (24 UOC) |
| General Education |                                           | (6 UOC)  |

**Year 4**

|              |                                |          |
|--------------|--------------------------------|----------|
| SENG4910     | Thesis Part A                  | (6 UOC)  |
| SENG4911     | Thesis Part B                  | (12 UOC) |
| SENG4921     | Professional Issues and Ethics | (6 UOC)  |
| SE Electives |                                | (24 UOC) |

**Electives**

The 8 options (48 units) for stages 3 and 4 are chosen from a list that includes all third and fourth stage COMP, INFS courses and some MATH courses. See SE electives. Electives and more information can be found on the School's website at [www.seng/se-electives/](http://www.seng/se-electives/)

**General Education Requirements**

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies. For further information, please refer to the General Education section in this Handbook.

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

**Honours**

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at a sufficient standard. Weighted average marks required for Honours grades are given below: The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Training Requirements**

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

**Computing Requirements**

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

**Professional Recognition****The Institution of Engineers, Australia**

The professional body for engineering in Australia is the Institution of Engineers, Australia (IEAust), which has as its first objective the promotion of the science and practice of engineering in all its branches.

The IEAust has its national headquarters in Canberra and functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession, e.g. civil, mechanical, electrical, engineering management and environmental engineering.

Students of an approved school of engineering may join the Institution as a student member (StudIEAust). Student members receive the monthly publication *Engineers Australia* and for a small fee they also receive the transactions that contains articles on a particular branch of engineering.

Student members are invited to participate in the Excellence Award for Work Experience, the National Young Engineer of the Year Award and to avail themselves of other IEAust services including the Mentor Scheme and industrial experience guidance.

For more information and membership application forms, contact The Institution of Engineers, Australia, Sydney Division, 1st Floor, 118 Alfred Street, Milsons Point 2061, telephone 8923 7100, website [www.ieaust.org.au](http://www.ieaust.org.au)

**Further Requirements**

1. A HSC Maths mark of 145-150 is required in Maths Extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI >97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

**Computing Requirements**

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

**3978 Computer Science****Bachelor of Science BSc****Typical Duration**

3 years

**Minimum UOC for Award**

144 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Entry to this program is restricted to students who have been offered a place directly via UAC (UAC code 425019).

Computer Science involves the study of the design, construction and uses of computer systems. It is concerned with the representation of data and data structures in computer systems and the design of algorithms for automatic manipulation of this information by programming languages and machine systems. It is very much concerned with the design and development of hardware and software tools by which computer applications may be developed, but not so much with the applications themselves. It is, however, noted that non-computing elements (such as human interface or psychological aspects) can often dictate the level of success of computing systems. At UNSW, particular emphasis is given to comprehension of the basic principles behind computing tools, operating systems, compilers and translators, and computer hardware.

Students in other programs may take some Level 1 and Level 2 Computer Science courses. Level 3 studies in Computer Science are only available in other specified combined programs. Appropriate disciplines are Physics and Computing, Mathematics and Computer Science.

Minors - that is, recognised sequences of related courses in disciplines other than Computer Science - are available in the Computer Science program. For details, see the Science program 3970 entry in this Handbook.

**Program Structure****Plan COMPA13978****Year 1**

|          |                      |         |
|----------|----------------------|---------|
| MATH1081 | Discrete Mathematics | (6 UOC) |
|----------|----------------------|---------|

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

|                |          |
|----------------|----------|
| Plus Electives | (18 UOC) |
|----------------|----------|

Computer Science has mathematics and computing courses in year 1, representing five out of eight courses for a full-time student. Electives are chosen from areas such as Physics, Information Systems, Chemistry, Philosophy, Psychology, Geography, and Economics.

## Year 2

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP2121 | Microprocessors and Interfacing             | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| COMP2920 | Professional Issues and Ethics              | (3 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

|                   |          |
|-------------------|----------|
| Electives         | (21 UOC) |
| General Education | (6 UOC)  |

Four of the ten courses in Year 2 comprise core computing. The remainders are electives. Common electives include mathematics (many choices), psychology, geography, biology, chemistry, physics, economics, arts, more first year courses (maximum 12 UOC), material that follows on from first-year electives and information systems.

## Year 3

|                                      |                      |          |
|--------------------------------------|----------------------|----------|
| COMP3111                             | Software Engineering | (6 UOC)  |
| Level 3/4 Computer Science Electives |                      | (24 UOC) |
| General Education                    |                      |          |
| Electives                            |                      | (12 UOC) |

Between five and seven computing courses (selected from available Level 3 and 4 courses) are taken in Year 3. Students proceeding to the Honours year must take at least six Level 3 courses in computing or other disciplines.

## Level 3 Computing Electives

|          |                                           |         |
|----------|-------------------------------------------|---------|
| COMP3131 | Programming Languages and Compilers       | (6 UOC) |
| COMP3141 | Software System Design and Implementation | (6 UOC) |
| COMP3151 | Foundations of Concurrency                | (6 UOC) |
| COMP3161 | Concepts of Programming Languages         | (6 UOC) |
| COMP3211 | Computer Architecture                     | (6 UOC) |
| COMP3222 | Digital Circuits and Systems              | (6 UOC) |
| COMP3311 | Database Systems                          | (6 UOC) |
| COMP3411 | Artificial Intelligence                   | (6 UOC) |
| COMP3421 | Computer Graphics                         | (6 UOC) |
| COMP3431 | Robotic Software Architecture             | (6 UOC) |
| COMP3441 | Cryptography and Security                 | (6 UOC) |
| COMP3511 | Human Computer Interaction                | (6 UOC) |

One of the following:

|          |                                                |         |
|----------|------------------------------------------------|---------|
| COMP3121 | Algorithms and Programming Techniques          | (6 UOC) |
| COMP3821 | Extended Algorithms and Programming Techniques | (6 UOC) |

One of the following:

|          |                            |         |
|----------|----------------------------|---------|
| COMP3231 | Operating Systems          | (6 UOC) |
| COMP3891 | Extended Operating Systems | (6 UOC) |

One of the following:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3931 | Extended Computer Networks and Applications | (6 UOC) |

## Level 4 Computing Electives

|          |                                        |         |
|----------|----------------------------------------|---------|
| COMP4001 | Object-Oriented Software Development   | (6 UOC) |
| COMP4003 | Industrial Software Development        | (6 UOC) |
| COMP4133 | Advanced Compiler Construction         | (6 UOC) |
| COMP4151 | Algorithm Verification                 | (6 UOC) |
| COMP4418 | Knowledge Representation               | (6 UOC) |
| COMP4511 | User Interface Design and Construction | (6 UOC) |
| COMP9314 | Next Generation Database Systems       | (6 UOC) |
| COMP9231 | Integrated Digital Systems             | (6 UOC) |
| COMP9243 | Distributed Systems                    | (6 UOC) |
| COMP9318 | Data Warehousing & Data Mining         | (6 UOC) |

|          |                                                                     |         |
|----------|---------------------------------------------------------------------|---------|
| COMP9321 | E-Commerce Systems Implementation Infrastructure                    | (6 UOC) |
| COMP9332 | Network Routing and Switching                                       | (6 UOC) |
| COMP9333 | Advanced Computer Networks                                          | (6 UOC) |
| COMP9334 | Systems Capacity Planning                                           | (6 UOC) |
| COMP9417 | Machine Learning                                                    | (6 UOC) |
| COMP9444 | Neural Networks                                                     | (6 UOC) |
| COMP9515 | Pattern Recognition                                                 | (6 UOC) |
| COMP9517 | Computer Vision                                                     | (6 UOC) |
| COMP9519 | Multimedia Authoring                                                | (6 UOC) |
| COMP9790 | Principles of Global Navigation Satellite System (GNSS) Positioning | (6 UOC) |
| COMP9791 | Modern Navigation & Positioning Technologies                        | (6 UOC) |

With the approval of the Program Director or nominee, students in this program wishing to fulfil the requirements for a major in a second discipline, as well as the Computer Science requirements, may substitute a course from the other discipline for one of the Level 3/4 Computer Science courses. Students who have met the required prerequisites may also select electives from comp COMP4XXXX and COMP9XXX courses.

## General Education Requirements

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies. For further information, please refer to the General Education section in this Handbook.

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

## Honours

### Year 4 Honours (Optional) COMPAH3978

Computer Science Honours takes one year full-time or two years of part-time study.

Normally, students are expected to have attained an average mark of 65 (according to NewSouth Student calculations) to qualify for entry to the Honours year. Students who do not meet this expectation may be admitted in special circumstances. Students who have graduated with a three-year computer science degree from UNSW or another university can apply for admission to Honours. Application forms are available from the Student Office of Computer Science and Engineering in K17 G01. Detailed information about the program is available at the Honours website at: [www.cse.unsw.edu.au/~cs4914](http://www.cse.unsw.edu.au/~cs4914)

|          |               |          |
|----------|---------------|----------|
| COMP4910 | Thesis Part A | (3 UOC)  |
| COMP4911 | Thesis Part B | (15 UOC) |

## Computing Electives

|                                    |          |
|------------------------------------|----------|
| Level 3/4 Computer Science Courses | (12 UOC) |
| (subject to approval)              |          |

|                                               |          |
|-----------------------------------------------|----------|
| Level 4 Computer Science Courses              | (18 UOC) |
| (subject to approval of the Program Director) |          |

Computer Science Honours students must at least complete 18UOC level 4 elective courses. Students may substitute level 4 courses from other schools with the permission of the Program Director.

## Academic Rules

Please refer to Program Structure for the Academic Requirements relating to this program.

1. A HSC Maths mark of 145-150 is required in Maths Extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI > 97 in order to do COMP1711.
2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.
3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.
4. Students may take COMP3111 Software Engineering in either semester.
5. Electives, COMP electives and General Education courses may be allocated between first and second semesters according to the student's preference, but the total units of credit per semester should be 24. COMP3111 is offered in both semesters.

## Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science Engineering Student Office.

## 3726 Computer Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

With this combined degree program students can add a science program to the standard, professionally accredited engineering program BE in Computer Engineering offered by the School of Computer Science & Engineering. All science majors within program 3970 are available.

Students who achieve a creditable performance, 65CR average after one or two years of their Computer Engineering program, may apply to transfer to the combined BE in Computer Engineering/BSc program.

There are no special rules on what to include in each year. Students should schedule the science and engineering components to suit their preferences while meeting the constraints of timetables and prerequisites. The Faculty of Science section in this Handbook describes the options and the School of Computer Science and Engineering Student Office can supply sample programs showing what previous students have arranged.

In addition to the BE program, students must complete a minimum of 60 units of credit in Science courses, including a major sequence in an approved area. The Science office must approve the Science component while the School of Computer Science & Engineering will approve the final program and schedule.

In the Faculty of Engineering, Honours are awarded for superior performance in the standard program. In the Faculty of Science, the award of Honours requires a separate program involving at least one further year of study.

## Program Objectives and Learning Outcomes

### Combined Degree Programs - Computer Engineering

Students in Computer Engineering who maintain a high average performance may qualify for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged. The degrees referred to here are the Bachelor of Engineering (Computer Engineering)/Bachelor of Arts BE BA and the Bachelor of Engineering (Computer Engineering)/Bachelor of Science BE BSc. Students wishing to gain a degree at Honours level in Arts or Science as part of their combined degree program shall meet all the relevant requirements of the Faculty concerned and of the appropriate schools.

Students wishing to enrol in, transfer into, or continue in a combined program shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a credit average, i.e. 65%) of both the program authorities concerned.

Students who commence a combined program, but subsequently do not wish to proceed with both areas of study, or who fail to maintain a credit average performance, should revert to a single degree program with appropriate credit for courses completed.

Students in a combined degree program are exempt from all General Education requirements. However, if the student reverts to the single degree program, the usual General Education requirements for that program apply.

There will be a testamur for each part of the combined degree program.

Students who complete the BE program first may proceed to graduation with the degree of Bachelor of Engineering in the usual way.

## Program Structure

### Plan COMPB13726

Please refer to the program entry for 3645 BE in Computer Engineering and contact the School of Computer Science and Engineering and the Faculty of Science for more information.

## Honours

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at sufficient standard. Weighted average marks required for Honours grades are given below: The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

## Academic Rules

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Training

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

## Further Requirements

1. A HSC Maths mark of 145-150 is required in Maths Extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI >97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

## Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

## Professional Recognition

The Institution of Engineers, Australia and the Australian Computer Society.

For more information, please refer to 'Professional Recognition' in the program entry for 3645 Computer Engineering.

## 3722 Computer Engineering/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BA

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

Anyone who meets the entry requirements for both Computer Engineering and Arts is eligible for the combined program. Students may enter directly in first year or may apply to transfer from the normal Engineering program later, although with late transfer it might not be possible to complete the program in minimum time.

The BE in Computer Engineering BA combined program requires the completion of 240 UOC, including at least 60 UOC of Arts courses, and must contain a major sequence of 42 UOC at stages 2 and 3 in a single Arts discipline. Students in this combined program are exempt from the General Education requirement.

The major Arts discipline may not be Computer Science.

The Faculty of Arts and Social Sciences must approve the Arts component while the School of Computer Science & Engineering will approve the final program and schedule.

In the Faculty of Engineering, Honours are awarded for superior performance in the standard program. In the Faculty of Arts, the award of Honours requires a separate program involving at least one further year of study.

## Program Objectives and Learning Outcomes

### Combined Degree Programs - Computer Engineering

Students in Computer Engineering who maintain a high average performance may qualify for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged. The degrees referred to here are the Bachelor of Engineering (Computer Engineering)/Bachelor of Arts BE BA and the Bachelor of Engineering (Computer Engineering)/Bachelor of Science BE BSc. Students wishing to gain a degree at Honours level in Arts or Science as part of their combined degree program shall meet all the relevant requirements of the Faculty concerned and of the appropriate schools.

Students wishing to enrol in, transfer into, or continue in a combined program shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a credit average, i.e. 65%) of both the program authorities concerned.

Students who commence a combined program, but subsequently do not wish to proceed with both areas of study, or who fail to maintain a credit average performance, should revert to a single degree program with appropriate credit for courses completed.

Students in a combined degree program are exempt from all General Education requirements. However, if the student reverts to the single degree program, the usual General Education requirements for that program apply.

There will be a testamur for each part of the combined degree program.

Students who complete the BE program first may proceed to graduation with the degree of Bachelor of Engineering in the usual way.

### Program Structure

#### Plan COMPB13722

Please refer to the program entry for 3645 BE in Computer Engineering and contact the School of Computer Science and Engineering and the Faculty of Arts and Social Sciences for more information.

### Honours

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at sufficient standard. Weighted average marks required for Honours grades are given below: The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

### Academic Rules

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

### Industrial Training

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

### Further Requirements

1. A HSC Maths mark of 145-150 is required in Maths Extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI > 97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

### Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

### Professional Recognition

The Institution of Engineers, Australia, and the Australian Computer Society.

For more information, please refer to 'Professional Recognition in the program entry for 3645 Computer Engineering.

## 3715 Computer Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 3728 Computer Engineering/Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The BE (Computer Engineering) /Master of Biomedical Engineering concurrent degree program is offered jointly through the School of Computer Science and Engineering and the Graduate School of Biomedical Engineering.

### Program Structure

#### Plan COMPB13728

#### Year 1

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| BIOM1001 | Professional Biomedical Studies               | (3 UOC) |
| BIOM2010 | Biomedical Engineering Practice               | (3 UOC) |
| CHEM1817 | Chemistry 1ME                                 | (3 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |
| PHYS1131 | Higher Physics 1A                             | (6 UOC) |
| PHYS1231 | Higher Physics 1B                             | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

#### Year 2

|          |                                       |         |
|----------|---------------------------------------|---------|
| ACCT9003 | Introduction to Accounting Principles | (3 UOC) |
| ANAT2511 | Fundamentals of Anatomy               | (6 UOC) |
| BIOM9420 | Clinical Laboratory Science           | (6 UOC) |
| COMP2121 | Microprocessors and Interfacing       | (6 UOC) |
| COMP3111 | Software Engineering                  | (6 UOC) |
| ELEC1011 | Electrical Engineering 1              | (6 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

And ONE of the following courses:

|          |                      |         |
|----------|----------------------|---------|
| MATH2510 | Real Analysis        | (3 UOC) |
| MATH2610 | Higher Real Analysis | (3 UOC) |

And ONE of the following courses:

|          |                         |         |
|----------|-------------------------|---------|
| MATH2520 | Complex Analysis        | (3 UOC) |
| MATH2620 | Higher Complex Analysis | (3 UOC) |

General Education (3 UOC)

#### Year 3

|          |                              |         |
|----------|------------------------------|---------|
| COMP3211 | Computer Architecture        | (6 UOC) |
| COMP3222 | Digital Circuits and Systems | (6 UOC) |

|          |                                         |         |
|----------|-----------------------------------------|---------|
| COMP3711 | Software Project Management             | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| ELEC2032 | Electronics and Systems                 | (3 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

And ONE of the following courses:

|          |                            |         |
|----------|----------------------------|---------|
| COMP3231 | Operating Systems          | (6 UOC) |
| COMP3891 | Extended Operating Systems | (6 UOC) |

And ONE of the following courses:

|                                 |                              |         |
|---------------------------------|------------------------------|---------|
| COMP3120                        | Introduction to Algorithms   | (3 UOC) |
| MATH2509                        | Linear Algebra for Engineers | (3 UOC) |
| Biomedical Engineering elective |                              | (6 UOC) |
| COMP Elective                   |                              | (6 UOC) |
| General Education               |                              | (3 UOC) |

#### Year 4

|                |                                |          |
|----------------|--------------------------------|----------|
| BIOM5920       | Thesis A                       | (3 UOC)  |
| BIOM9027       | Medical Imaging                | (6 UOC)  |
| COMP4920       | Professional Issues and Ethics | (3 UOC)  |
| ELEC3006       | Electronics A                  | (6 UOC)  |
| PH2121         | Principles of Physiology A     | (6 UOC)  |
| PHPH2221       | Principles of Physiology B     | (6 UOC)  |
| TELE3013       | Telecommunication Systems 1    | (6 UOC)  |
| COMP electives |                                | (12 UOC) |

#### Year 5

|          |                               |          |
|----------|-------------------------------|----------|
| BIOM5921 | Thesis B                      | (15 UOC) |
| BIOM9410 | Regulatory Req of Biomed Tech | (6 UOC)  |

And ONE of the following options:

|          |                |          |
|----------|----------------|----------|
| BIOM9913 | Project Report | (12 UOC) |
|----------|----------------|----------|

or

2 BIOM9xxx electives totalling 12 UOC

Plus BIOM9xxx electives totalling 12 UOC

#### Preferred Biomedical Engineering Electives

|          |                               |         |
|----------|-------------------------------|---------|
| BIOM9440 | Biomedical Practical Measures | (6 UOC) |
| BIOM9450 | Clinical Information Systems  | (6 UOC) |
| BIOM9613 | Medical Instrumentation       | (6 UOC) |

#### Other Biomedical Engineering Electives

|          |                                                                                             |         |
|----------|---------------------------------------------------------------------------------------------|---------|
| BIOM9012 | Biomedical Statistics                                                                       | (6 UOC) |
| BIOM9050 | Microprocessors and Circuit Design for Biomedical Engineers                                 | (6 UOC) |
| BIOM9060 | Biomedical Systems Analysis                                                                 | (6 UOC) |
| BIOM9311 | Mass Transfer in Medicine                                                                   | (6 UOC) |
| BIOM9321 | Physiological Fluid Mechanics                                                               | (6 UOC) |
| BIOM9332 | Biocompatibility                                                                            | (6 UOC) |
| BIOM9430 | Electromedical Standards                                                                    | (6 UOC) |
| BIOM9432 | Chemistry and Physics of Synthetic and Biological Polymers (Introductory Polymer Chemistry) | (6 UOC) |
| BIOM9510 | Introductory Biomechanics                                                                   | (6 UOC) |
| BIOM9541 | Mechanics of the Human Body                                                                 | (6 UOC) |
| BIOM9551 | Biomechanics of Physical Rehabilitation                                                     | (6 UOC) |
| BIOM9561 | Mechanical Properties of Biomaterials                                                       | (6 UOC) |
| BIOM9601 | Biomedical Applications of Microcomputers 1                                                 | (6 UOC) |
| BIOM9621 | Biological Signal Analysis                                                                  | (6 UOC) |
| BIOM9701 | Dynamics of the Cardiovascular System                                                       | (6 UOC) |
| SESC9451 | Experimental Biomechanics                                                                   | (6 UOC) |

#### General Education Requirements

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies.

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

#### Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

#### Industrial Training

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

#### Further Requirements

1. A HSC Maths mark of 145-150 is required in Maths Extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI > 97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

#### Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

#### Professional recognition

The Institution of Engineers, Australia.

For more information, please refer to 'Professional Recognition in the program entry for 3645 Computer Engineering.

## 3755 Bioinformatics/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

#### Program Description

The combined Bachelor of Engineering in Bioinformatics/Bachelor of Science program allows students to study additional Science courses in their Bioinformatics program to gain a broader understanding of the various scientific disciplines that contribute to Bioinformatics (such as mathematics, statistics and chemistry) or constitute major application areas of bioinformatics (for example, medical sciences or biotechnology).

Students must meet the entry requirements for the BE (Bioinformatics) program and the Bachelor of Science program, and must complete the courses and electives required by the Bioinformatics program (3647) as well as 60 additional units of credit in Science courses, including an approved major sequence of 42 UOC at Stages 2 and 3. Combined programs are exempt from the General Education requirement. Approved majors are listed in Table A of the BSc program (3970).

The stages of a generic combined program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements and overall program requirements. The School of Computer Science and Engineering Student Office can supply examples of specific combined programs.

#### Program Structure

##### Plan BINFB13755

#### Year 1

|          |                            |         |
|----------|----------------------------|---------|
| BINF1001 | Bioinformatics 1           | (6 UOC) |
| BIOS1201 | Molecules, Cells and Genes | (6 UOC) |

And ONE of the following courses:

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOS1101 | Evolutionary and Functional Biology | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B        | (6 UOC) |
| CHEM1041 | Higher Chemistry 1D                 | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

**Year 2**

|          |                                             |         |
|----------|---------------------------------------------|---------|
| BIOC2201 | Principles of Molecular Biology (Advanced)  | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| LIFE2101 | Introductory Biochemistry & Microbiology    | (6 UOC) |
| MATH1081 | Discrete Mathematics                        | (6 UOC) |

And ONE of the following courses:

|          |                           |         |
|----------|---------------------------|---------|
| BIOS2021 | Genetics                  | (6 UOC) |
| BIOS2621 | Genetics (Advanced Level) | (6 UOC) |

And ONE of the following courses:

|          |                             |         |
|----------|-----------------------------|---------|
| MATH2801 | Theory of Statistics        | (6 UOC) |
| MATH2901 | Higher Theory of Statistics | (6 UOC) |

Plus 2 Science majors level 1 or 2 (6 UOC S1 and 6 UOC S2)

**Year 3**

|          |                                    |         |
|----------|------------------------------------|---------|
| BINF2001 | Bioinformatics 2                   | (6 UOC) |
| BIOC3121 | Molecular Biology of Nucleic Acids | (6 UOC) |
| COMP3311 | Database Systems                   | (6 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

Plus 2 Science majors level 2 (6 UOC S1 and 6 UOC S2)

Plus 1 Year 3 elective (6 UOC)

Plus 2 General Education Courses (6 UOC)

**Year 4**

|          |                                                   |         |
|----------|---------------------------------------------------|---------|
| BINF3001 | Bioinformatics 3                                  | (6 UOC) |
| BINF4920 | Professional Issues and Ethics for Bioinformatics | (3 UOC) |
| COMP3711 | Software Project Management                       | (6 UOC) |

And one of the following courses:

|          |                                                |         |
|----------|------------------------------------------------|---------|
| COMP3121 | Algorithms and Programming Techniques          | (6 UOC) |
| COMP3821 | Extended Algorithms and Programming Techniques | (6 UOC) |

Plus 4 level 3 Science majors (24 UOC)

Plus 1 Year 3 elective (6 UOC)

*Overall electives in Stages 3 and 4 must include at least one computer science and one life science elective.*

**Year 5**

|                               |               |          |
|-------------------------------|---------------|----------|
| BINF4910                      | Thesis Part A | (3 UOC)  |
| BINF4911                      | Thesis Part B | (12 UOC) |
| Plus 2 Level 3 Science majors |               | (12 UOC) |
| Plus 3 Year's 3/4/5 electives |               | (18 UOC) |

**Year 3 and 4 Electives**

|          |                                 |         |
|----------|---------------------------------|---------|
| BIOC3111 | Molecular Biology of Proteins   | (6 UOC) |
| BIOC3151 | Human Genetics and Variation    | (6 UOC) |
| BIOC3281 | Recombinant DNA Techniques      | (6 UOC) |
| BIOC3291 | Genes, Genomes & Evolution      | (6 UOC) |
| BIOT3011 | Biotechnology A                 | (6 UOC) |
| BIOT3061 | Biopharmaceuticals              | (6 UOC) |
| COMP2121 | Microprocessors and Interfacing | (6 UOC) |
| COMP3111 | Software Engineering            | (6 UOC) |
| COMP3411 | Artificial Intelligence         | (6 UOC) |
| MICR3021 | Microbial Genetics              | (6 UOC) |

One of the following:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3931 | Extended Computer Networks and Applications | (6 UOC) |

**Year 5 Electives**

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOT3071 | Commercial Biotechnology            | (6 UOC) |
| COMP3151 | Foundations of Concurrency          | (6 UOC) |
| COMP3222 | Digital Circuits and Systems        | (6 UOC) |
| COMP3511 | Human Computer Interaction          | (6 UOC) |
| COMP9314 | Next Generation Database Systems    | (6 UOC) |
| COMP9318 | Data Warehousing & Data Mining      | (6 UOC) |
| COMP9333 | Advanced Computer Networks          | (6 UOC) |
| COMP9417 | Machine Learning                    | (6 UOC) |
| COMP9444 | Neural Networks                     | (6 UOC) |
| MATH3821 | Statistical Modelling and Computing | (6 UOC) |
| MICR3011 | Microbial Physiology                | (6 UOC) |

Level 3 MATH electives and other COMP3/4/9 electives may also be considered. Electives must include at least one life science and at least one COMP course.

**General Education Requirements**

Students in this program must also satisfy the General Education requirements. This is usually taken in second and third year studies. For further information, please refer to the General Education section in this Handbook.

It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

**Honours**

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at sufficient standard. Weighted average marks required for Honours grades are given below. The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

**Academic Rules**

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Training**

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

**Further Requirements**

1. A HSC Maths mark of 145-150 is required in Maths extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI > 97 in order to do COMP1711.

2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.

3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

**Computing Requirements**

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

**Career Information**

The Institution of Engineers, Australia

For more information, please refer to 'Professional Recognition' in the program entry for 3647 Bioinformatics.

**3756 Bioinformatics/Bachelor of Arts****Bachelor of Engineering Bachelor of Arts BE BA****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Students qualify for the award of the two degrees of Bachelor of Engineering (Bioinformatics) and Bachelor of Arts. This cross-disciplinary program allows students to add their choice of Arts major to the standard Bioinformatics program and obtain the broader education offered by Arts and Social Sciences.

Students must meet the entry requirements for the BE (Bioinformatics) program and the Bachelor of Arts program, and must complete the courses and electives required by the Bioinformatics program (3647) as well as 60 additional units of credit in arts courses, including an approved major sequence of 42UOC at stages 2 and 3. Approved majors are given in List A of the Bachelor of Arts (3400) program. Combined programs are exempt from the General Education requirement.

The stages of a generic combined program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements and overall program requirements. The School of Computer Science and Engineering Student Office can supply examples of specific programs.

## Program Structure

### Plan BINF13756

#### Year 1

|          |                            |         |
|----------|----------------------------|---------|
| BINF1001 | Bioinformatics 1           | (6 UOC) |
| BIOS1201 | Molecules, Cells and Genes | (6 UOC) |

And ONE of the following courses:

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOS1101 | Evolutionary and Functional Biology | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B        | (6 UOC) |
| CHEM1041 | Higher Chemistry 1D                 | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

#### Year 2

|          |                                             |         |
|----------|---------------------------------------------|---------|
| BIOC2201 | Principles of Molecular Biology (Advanced)  | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| LIFE2101 | Introductory Biochemistry & Microbiology    | (6 UOC) |
| MATH1081 | Discrete Mathematics                        | (6 UOC) |

And ONE of the following courses:

|          |                           |         |
|----------|---------------------------|---------|
| BIOS2021 | Genetics                  | (6 UOC) |
| BIOS2621 | Genetics (Advanced Level) | (6 UOC) |

And ONE of the following courses:

|          |                             |         |
|----------|-----------------------------|---------|
| MATH2801 | Theory of Statistics        | (6 UOC) |
| MATH2901 | Higher Theory of Statistics | (6 UOC) |

Plus 2 Arts major level 1 (6 UOC S1 and 6 UOC S2)

#### Year 3

|          |                                    |         |
|----------|------------------------------------|---------|
| BINF2001 | Bioinformatics 2                   | (6 UOC) |
| BIOC3121 | Molecular Biology of Nucleic Acids | (6 UOC) |
| COMP3311 | Database Systems                   | (6 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

Plus Arts major level 2

Plus Arts major level 2 or Arts elective

Plus 2 Year 3 electives (12 UOC)

#### Year 4

|          |                                                   |         |
|----------|---------------------------------------------------|---------|
| BINF3001 | Bioinformatics 3                                  | (6 UOC) |
| BINF4920 | Professional Issues and Ethics for Bioinformatics | (3 UOC) |
| COMP3711 | Software Project Management                       | (6 UOC) |

And one of the following courses:

|          |                                                |         |
|----------|------------------------------------------------|---------|
| COMP3121 | Algorithms and Programming Techniques          | (6 UOC) |
| COMP3821 | Extended Algorithms and Programming Techniques | (6 UOC) |

2 Arts major level 2

2 Arts major level 2 or Arts elective

Level 3 elective (6 UOC)

**Note:** Overall electives in stages 3 and 4 must include at least one computer science elective and one life science elective.

#### Year 5

|          |               |          |
|----------|---------------|----------|
| BINF4910 | Thesis Part A | (3 UOC)  |
| BINF4911 | Thesis Part B | (12 UOC) |

|                                    |          |
|------------------------------------|----------|
| Plus 2 level 3 Arts major          | (12 UOC) |
| Plus 3 Years 3 or 4 or 5 electives | (18 UOC) |

### Years 3 and 4 Electives

|          |                                             |         |
|----------|---------------------------------------------|---------|
| BIOC3111 | Molecular Biology of Proteins               | (6 UOC) |
| BIOC3151 | Human Genetics and Variation                | (6 UOC) |
| BIOC3281 | Recombinant DNA Techniques                  | (6 UOC) |
| BIOC3291 | Genes, Genomes & Evolution                  | (6 UOC) |
| BIOT3011 | Biotechnology A                             | (6 UOC) |
| BIOT3061 | Biopharmaceuticals                          | (6 UOC) |
| COMP2121 | Microprocessors and Interfacing             | (6 UOC) |
| COMP3111 | Software Engineering                        | (6 UOC) |
| COMP3411 | Artificial Intelligence                     | (6 UOC) |
| COMP3431 | Robotic Software Architecture               | (6 UOC) |
| MATH3801 | Probability and Stochastic Processes        | (6 UOC) |
| MATH3901 | Higher Probability and Stochastic Processes | (6 UOC) |
| MICR3021 | Microbial Genetics                          | (6 UOC) |

And ONE of the following:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3931 | Extended Computer Networks and Applications | (6 UOC) |

### Year 5 Electives

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOT3071 | Commercial Biotechnology            | (6 UOC) |
| COMP3151 | Foundations of Concurrency          | (6 UOC) |
| COMP3222 | Digital Circuits and Systems        | (6 UOC) |
| COMP3511 | Human Computer Interaction          | (6 UOC) |
| COMP3914 | Next Generation Database Systems    | (6 UOC) |
| COMP9333 | Advanced Computer Networks          | (6 UOC) |
| COMP9417 | Machine Learning                    | (6 UOC) |
| COMP9444 | Neural Networks                     | (6 UOC) |
| MATH3811 | Statistical Inference               | (6 UOC) |
| MATH3821 | Statistical Modelling and Computing | (6 UOC) |
| MATH3911 | Higher Statistical Inference        | (6 UOC) |
| MICR3011 | Microbial Physiology                | (6 UOC) |

Level 3 MATH electives and other COMP3/4/9 electives may also be considered. Electives must include at least one life science and at least one COMP course.

## Academic Rules

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Training

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

## Further Requirements

1. A HSC Maths mark of 145-150 is required in Maths extension 1 or a mark of 186-200 in Maths Extension 2 or a UAI > 97 in order to do COMP1711.
2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.
3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.

## Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Student Office.

## Professional Recognition

### The Institution of Engineers, Australia

For more information, please refer to 'Professional Recognition in the program entry for 3647 Bioinformatics.

## 3715 Bioinformatics/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 3757 Bioinformatics/Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The BE (Bioinformatics)/Master of Biomedical Engineering concurrent degree program is offered jointly through the School of Computer Science and Engineering, the Faculty of Science and the Graduate School of Biomedical Engineering. The combined Bachelor of Engineering in Bioinformatics/Master of Biomedical Engineering program allows students to combine the software engineering/molecular biology focus of bioinformatics with the broader engineering and medical emphases of the biomedical engineering program.

Students who are enrolled in a joint program are expected to maintain a Credit (65%) average across courses taken from each of the composite programs. Students who fail to meet this condition will be counselled about their suitability to remain in the combined program.

The stages of a generic combined program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements and overall program requirements.

### Program Structure

#### Plan BINFA13757

##### Year 1

|          |                            |         |
|----------|----------------------------|---------|
| BINF1001 | Bioinformatics 1           | (6 UOC) |
| BIOS1201 | Molecules, Cells and Genes | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| CHEM1011 | Fundamentals of Chemistry 1A | (6 UOC) |
| CHEM1031 | Higher Chemistry 1C          | (6 UOC) |

And ONE of the following courses:

|          |                                     |         |
|----------|-------------------------------------|---------|
| BIOS1101 | Evolutionary and Functional Biology | (6 UOC) |
| CHEM1021 | Fundamentals of Chemistry 1B        | (6 UOC) |
| CHEM1041 | Higher Chemistry 1D                 | (6 UOC) |

*Students who have completed HSC Biology with a mark of 75 or above may replace BIOS1101 by any of BIOS2021 or BIOS2621 in Year 1. Students who complete BIOS2201 or BIOS2621 in Year 1 will choose an elective in Year 3*

##### Year 2

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| BINF2001 | Bioinformatics 2                              | (6 UOC) |
| BIOC2201 | Principles of Molecular Biology (Advanced)    | (6 UOC) |
| BIOM2010 | Biomedical Engineering Practice               | (3 UOC) |
| COMP2041 | Software Construction: Techniques and Tools   | (6 UOC) |
| COMP3711 | Software Project Management                   | (6 UOC) |
| LIFE2101 | Introductory Biochemistry & Microbiology      | (6 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

And ONE of the following courses:

|          |                             |         |
|----------|-----------------------------|---------|
| MATH2801 | Theory of Statistics        | (6 UOC) |
| MATH2901 | Higher Theory of Statistics | (6 UOC) |

General Education (3 UOC)

##### Year 3

|          |                                    |         |
|----------|------------------------------------|---------|
| BINF3001 | Bioinformatics 3                   | (6 UOC) |
| BIOC3121 | Molecular Biology of Nucleic Acids | (6 UOC) |
| COMP3311 | Database Systems                   | (6 UOC) |

And ONE of the following courses:

|          |                                                |         |
|----------|------------------------------------------------|---------|
| COMP3121 | Algorithms and Programming Techniques          | (6 UOC) |
| COMP3821 | Extended Algorithms and Programming Techniques | (6 UOC) |

And ONE of the following courses:

|          |                           |         |
|----------|---------------------------|---------|
| BIOS2021 | Genetics                  | (6 UOC) |
| BIOS2621 | Genetics (Advanced Level) | (6 UOC) |

2 BIOM 9XXX Biomedical Engineering electives (6 UOC each)

1 Bioinformatics elective from the list below:

|          |                                 |         |
|----------|---------------------------------|---------|
| BIOC3281 | Recombinant DNA Techniques      | (6 UOC) |
| BIOT3061 | Biopharmaceuticals              | (6 UOC) |
| COMP2121 | Microprocessors and Interfacing | (6 UOC) |

And ONE of the following courses:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3931 | Extended Computer Networks and Applications | (6 UOC) |

And ONE of the following courses:

|          |                      |         |
|----------|----------------------|---------|
| MATH2831 | Linear Models        | (6 UOC) |
| MATH2931 | Higher Linear Models | (6 UOC) |

##### Year 4

2 BIOM9XXX Biomedical Engineering electives (12 UOC)  
General Education (3 UOC)

2 Bioinformatics electives from Year 3 or Year 4 list below:

|          |                                                   |         |
|----------|---------------------------------------------------|---------|
| BINF4920 | Professional Issues and Ethics for Bioinformatics | (3 UOC) |
| BIOC3111 | Molecular Biology of Proteins                     | (6 UOC) |
| BIOC3151 | Human Genetics and Variation                      | (6 UOC) |
| BIOC3291 | Genes, Genomes & Evolution                        | (6 UOC) |
| BIOM5001 | Thesis Part A                                     | (6 UOC) |
| BIOT3011 | Biotechnology A                                   | (6 UOC) |
| BIOT3071 | Commercial Biotechnology                          | (6 UOC) |
| COMP3111 | Software Engineering                              | (6 UOC) |
| COMP3151 | Foundations of Concurrency                        | (6 UOC) |
| COMP3222 | Digital Circuits and Systems                      | (6 UOC) |
| COMP3411 | Artificial Intelligence                           | (6 UOC) |
| COMP3511 | Human Computer Interaction                        | (6 UOC) |
| COMP4511 | User Interface Design and Construction            | (6 UOC) |
| COMP9243 | Distributed Systems                               | (6 UOC) |
| COMP9314 | Next Generation Database Systems                  | (6 UOC) |
| COMP9333 | Advanced Computer Networks                        | (6 UOC) |
| COMP9417 | Machine Learning                                  | (6 UOC) |
| COMP9444 | Neural Networks                                   | (6 UOC) |
| MATH3821 | Statistical Modelling and Computing               | (6 UOC) |
| MICR3011 | Microbial Physiology                              | (6 UOC) |
| MICR3021 | Microbial Genetics                                | (6 UOC) |
| PHPH2101 | Physiology 1A                                     | (6 UOC) |
| PHPH2201 | Physiology 1B                                     | (6 UOC) |

And ONE of the following courses:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| MATH3801 | Probability and Stochastic Processes        | (6 UOC) |
| MATH3901 | Higher Probability and Stochastic Processes | (6 UOC) |

And ONE of the following courses:

|          |                              |         |
|----------|------------------------------|---------|
| MATH3811 | Statistical Inference        | (6 UOC) |
| MATH3911 | Higher Statistical Inference | (6 UOC) |

##### Year 5

BIOM5904 Thesis Part B (12 UOC)  
BIOM9410 Regulatory Req of Biomed Tech (6 UOC)

BIOM9XXX or COMP9XXX 1 Biomedical engineering elective+

And ONE of the following courses:

|          |                |          |
|----------|----------------|----------|
| BIOM9913 | Project Report | (12 UOC) |
|----------|----------------|----------|

or

2 Bioinformatics electives from Stage 3/4 list (6 UOC)

Industrial Training

*Level 3 MATH electives and other level 3/4/9 COMP electives may be also considered. Electives must include at least two life science electives and at least two COMP or MATH electives.*

+Can be substituted for a level 9 COMP elective, preferably from the Stage 4 Bioinformatics elective list.

#### Recommended Biomedical Engineering Electives:

|          |                               |         |
|----------|-------------------------------|---------|
| BIOM9027 | Medical Imaging               | (6 UOC) |
| BIOM9332 | Biocompatibility              | (6 UOC) |
| BIOM9420 | Clinical Laboratory Science   | (6 UOC) |
| BIOM9440 | Biomedical Practical Measures | (6 UOC) |
| BIOM9450 | Clinical Information Systems  | (6 UOC) |
| BIOM9613 | Medical Instrumentation       | (6 UOC) |

Note that the BE (Bioinformatics) program allows a variation in standard prerequisites for some courses. Bioinformatics students who want to enrol in these courses will need to request manual enrolment after consultation with the program authority.

#### General Education Requirements

UNSW wants all students to develop skills in a broad range of areas, not just in their specific study discipline, and so students in all degrees are required to undertake a number of general studies courses outside their discipline. It may not be possible for Bioinformatics Engineering students to enrol in general education courses that are similar in content to the courses offered in the Bioinformatics Engineering degree.

For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/undergrad/current/gened.html](http://www.cse.unsw.edu.au/undergrad/current/gened.html)

#### Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Computer Science and Engineering for more information.

#### Industrial Training Requirement

At least 60 days of approved industrial training must be completed before graduation. Industrial Training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4. Opportunities exist for 6 months industrial placement in Year 3.

#### Further Requirements

##### Assumed Knowledge

Assumed knowledge for Mathematics (MATH1131); students will be expected to have achieved the equivalent of a combined mark of at least 100 in HSC Mathematics and HSC Mathematics Extension 1. Failure to meet this required knowledge means that General Mathematics (MATH1011) will have to be taken first. Assumed knowledge for English: at least band 3 in 2 Unit Standard English.

#### Professional Recognition

Accreditation will be sought from Engineers Australia and the Australian Computing Society.

#### Career Opportunities

Data analysis and software development in drug companies, biotechnology companies and medical and biological research institutes. Graduates from this course will also be well trained to take up careers in other areas of computational data analysis, such as in banks and insurance companies. They could also pursue careers in other more general areas of computing.

## 3651 Software Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

#### Program Description

The stages of a generic combined program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements and the overall requirements given under Academic Rules below.

Day to day administration of this program is conducted through the Computer Science and Engineering Student Office, to which enquiries should be directed.

## Program Structure

### Plan SENG13651

#### Stage 1

|                           |                                 |         |
|---------------------------|---------------------------------|---------|
| INFS1603                  | Business Data Management        | (6 UOC) |
| INFS1611                  | Requirements Engineering        | (3 UOC) |
| MATH1081                  | Discrete Mathematics            | (6 UOC) |
| MATH2400                  | Finite Mathematics              | (3 UOC) |
| SENG1031                  | Software Engineering Workshop 1 | (6 UOC) |
| Stage 1 Science electives |                                 | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

#### Stage 2

|                           |                                         |          |
|---------------------------|-----------------------------------------|----------|
| COMP2121                  | Microprocessors and Interfacing         | (6 UOC)  |
| COMP2111                  | System Modeling and Design              | (6 UOC)  |
| COMP2411                  | Logic and Logic Programming             | (6 UOC)  |
| COMP3711                  | Software Project Management             | (6 UOC)  |
| INFS2603                  | Systems Analysis and Design             | (6 UOC)  |
| MATH2859                  | Probability, Statistics and Information | (3 UOC)  |
| SENG2010                  | Software Engineering Workshop 2A        | (3 UOC)  |
| SENG2020                  | Software Engineering Workshop 2B        | (3 UOC)  |
| Stage 2 Science electives |                                         | (12 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

#### Stage 3

|                           |                                           |          |
|---------------------------|-------------------------------------------|----------|
| COMP3141                  | Software System Design and Implementation | (6 UOC)  |
| INFS2607                  | Business Data Networks                    | (6 UOC)  |
| SENG3010                  | Software Engineering Workshop 3A          | (3 UOC)  |
| SENG3020                  | Software Engineering Workshop 3B          | (3 UOC)  |
| SE Electives              |                                           | (24 UOC) |
| Stage 2 Science Electives |                                           | (6 UOC)  |

#### Stage 4

|                                |  |          |
|--------------------------------|--|----------|
| Stage 2 or 3 Science electives |  | (30 UOC) |
| Stage 3 Science electives      |  | (18 UOC) |

#### Stage 5

|              |                                |          |
|--------------|--------------------------------|----------|
| SENG4910     | Thesis Part A                  | (6 UOC)  |
| SENG4911     | Thesis Part B                  | (12 UOC) |
| SENG4921     | Professional Issues and Ethics | (6 UOC)  |
| SE Electives |                                | (24 UOC) |

## Honours

Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at sufficient standard. Weighted average marks required for Honours grades are given below: The School of Computer Science and Engineering uses an internal method for calculating this average, the information provided by New South Student is not used for this purpose.

Honours Class 1: WA greater than or equal to 75

Honours Class 2: Division 1: WA equal to 70 up to and including 74

Division 2: WA equal to 65 up to and including 69

## Academic Rules

The BE (Software Engineering)/BSc combined program requires the completion of 240 UOC, including at least 84 UOC of science courses, and must contain a major sequence of 42 UOC at Stages 2 and 3, with at least 18 UOC at Stage 3 in a single science discipline. To satisfy the requirement of the combined program, the free electives and the General Education electives of the standard Software Engineering program are assigned to science electives. The science content of the generic combined program consists of:

- 18 UOC of Mathematics in Stages 1 and 2;
- 6 UOC of Science electives in Stage 1;
- 12 UOC of Science electives in Stage 2;
- 6 UOC of Science electives in Stage 3;
- an extra stage of 48 UOC of Science courses

This yields a possible total of 90 UOC of Science. Combined Programs are exempt from the General Education requirement.

The major Science discipline may not be Computer Science.

Students who are enrolled in a combined program are expected to maintain a credit (65% or higher) average across courses taken from each of the composite programs. Students who fail to meet this condition will be counselled about their suitability to remain in the combined program.

Refer to the School of Computer Science and Engineering website for examples of specific SE/Science programs: [www.cse.unsw.edu.au/seng](http://www.cse.unsw.edu.au/seng)

### Industrial Training Requirements

All students in the BE in Computer Engineering, Bioinformatics Engineering and Software Engineering programs must complete at least 60 days of approved Industrial Training before the end of Year 4.

### Further Requirements

1. A HSC Maths mark of 145-150 is required in 2 & 3 units Maths or 186-200 in 3 & 4 units Maths or a UAI > 97 in order to do COMP1711.
2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.
3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.
4. The chosen courses must form a major sequence of 42 units of credit at stages 2 and 3.
5. To satisfy prerequisites it may be necessary to use a different arrangement of courses than shown above.
6. All students in the BE/BSc Software Engineering/Science program must complete at least 60 days of approved Industrial Training before the end of Year 5 to fulfill the requirements of SENG4903 in stage 5.

### Professional Recognition

The Institution of Engineers, Australia

For more information, please refer to 'Professional Recognition' in the program entry for 3648 Software Engineering.

## 3652 Software Engineering/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BA

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Day-to-day administration of this program is conducted through the Computer Science and Engineering Student Office, to which enquiries should be directed.

The stages of the program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements. Approval should be obtained for changes.

### Program Structure

#### Plan SENG13652

##### Year 1

|                        |                                 |         |
|------------------------|---------------------------------|---------|
| INFS1603               | Business Data Management        | (6 UOC) |
| INFS1611               | Requirements Engineering        | (3 UOC) |
| MATH1081               | Discrete Mathematics            | (6 UOC) |
| MATH2400               | Finite Mathematics              | (3 UOC) |
| SENG1031               | Software Engineering Workshop 1 | (6 UOC) |
| Stage 1 Arts electives |                                 | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

##### Stage 2

|          |                                 |         |
|----------|---------------------------------|---------|
| COMP2121 | Microprocessors and Interfacing | (6 UOC) |
| COMP2111 | System Modeling Design          | (6 UOC) |

|                |                                         |          |
|----------------|-----------------------------------------|----------|
| COMP2411       | Logic and Logic Programming             | (6 UOC)  |
| COMP3711       | Software Project Management             | (6 UOC)  |
| INFS2603       | Systems Analysis and Design             | (6 UOC)  |
| MATH2859       | Probability, Statistics and Information | (3 UOC)  |
| SENG2010       | Software Engineering Workshop 2A        | (3 UOC)  |
| SENG2020       | Software Engineering Workshop 2B        | (3 UOC)  |
| Arts electives |                                         | (12 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

##### Stage 3

|                |                                           |          |
|----------------|-------------------------------------------|----------|
| COMP3141       | Software System Design and Implementation | (6 UOC)  |
| INFS2607       | Business Data Networks                    | (6 UOC)  |
| SENG3010       | Software Engineering Workshop 3A          | (3 UOC)  |
| SENG3020       | Software Engineering Workshop 3B          | (3 UOC)  |
| SE Electives   |                                           | (18 UOC) |
| Arts electives |                                           | (12 UOC) |

##### Stage 4

|                |          |
|----------------|----------|
| SE electives   | (6 UOC)  |
| Arts electives | (42 UOC) |

##### Stage 5

|              |                                |          |
|--------------|--------------------------------|----------|
| SENG4910     | Thesis Part A                  | (6 UOC)  |
| SENG4911     | Thesis Part B                  | (12 UOC) |
| SENG4921     | Professional Issues and Ethics | (6 UOC)  |
| SE electives |                                | (24 UOC) |

1. The chosen Arts courses must include a major sequence of 42 UOC.
2. To satisfy prerequisites it may be necessary to use a different arrangement of courses than shown above.
3. To accommodate particular sequences of Arts electives it may be necessary to change the distribution of SE electives between stages 3, 4 and 5.

### Academic Rules

The BE (Software Engineering)/BA combined program requires the completion of 240 units of credit, including at least 60UOC (Units of Credit) of Arts courses, and must contain a major sequence of 42UOC at stages 2 and 3 in a single Arts discipline. To satisfy the requirement of the combined program, the free electives and the General Education electives of the standard Software Engineering program are assigned to Arts electives. Combined Programs are exempt from the General Education requirement.

The major Arts discipline may not be Computer Science.

Students who are enrolled in a combined program are expected to maintain a credit (65% or higher) average across courses taken from each of the composite programs. Students who fail to meet this condition will be counselled about their suitability to remain in the combined program.

The stages of a generic combined program are shown above. In general, it will be necessary to adapt the program by moving courses to meet the requirements of particular Arts majors. This generic program can accommodate 72 units of credit of Arts electives.

Refer to the School of Computer Science and Engineering website for examples of specific SE/Arts programs: [www.cse.unsw.edu.au/seng](http://www.cse.unsw.edu.au/seng)

The Faculty of Arts and Social Science should approve all Arts programs.

### Further Requirements

1. An HSC Maths mark of 145-150 is required in 2 & 3 Unit Maths or 186-200 in 3 & 4 Unit Maths or a UAI >97 in order to do COMP1711.
2. A mark of at least 75DN is required in COMP1011 or COMP1711 in order to do COMP1721.
3. A mark of at least 75DN is required in COMP1021 or COMP1721 in order to do COMP2711.
4. The chosen courses must form a major sequence of 42 UOC.
5. To satisfy prerequisites it may be necessary to use a different arrangement of courses than shown above.
6. To accommodate particular sequences of Arts electives it may be necessary to change the distribution of SE electives between stages 3, 4 and 5.
7. All students in the BE/BA Software Engineering/Arts program must complete at least 60 days of approved Industrial Training before the end of Year 5 to fulfill the requirements of SENG4903 in Stage 5.

## 3653 Software Engineering/Bachelor of Commerce

### Bachelor of Engineering Bachelor of Commerce BE BCom

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Day to day administration of this program is conducted through the Computer Science and Engineering Student Office, to which enquiries should be directed.

The stages of the program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements. Approval should be obtained for changes.

### Program Structure

#### Plan SENG13653

##### Year 1

|          |                                        |         |
|----------|----------------------------------------|---------|
| ACCT1501 | Accounting and Financial Management 1A | (6 UOC) |
| INFS1603 | Business Data Management               | (6 UOC) |
| INFS1611 | Requirements Engineering               | (3 UOC) |
| MATH1081 | Discrete Mathematics                   | (6 UOC) |
| MATH2400 | Finite Mathematics                     | (3 UOC) |
| SENG1031 | Software Engineering Workshop 1        | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

##### Year 2

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ACCT1511 | Accounting and Financial Management 1B  | (6 UOC) |
| COMP2121 | Microprocessors and Interfacing         | (6 UOC) |
| COMP2111 | System Modeling and Design              | (6 UOC) |
| COMP2411 | Logic and Logic Programming             | (6 UOC) |
| COMP3711 | Software Project Management             | (6 UOC) |
| ECON1101 | Microeconomics 1                        | (6 UOC) |
| INFS2603 | Systems Analysis and Design             | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |
| SENG2010 | Software Engineering Workshop 2A        | (3 UOC) |
| SENG2020 | Software Engineering Workshop 2B        | (3 UOC) |

And ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

##### Year 3

|              |                                           |          |
|--------------|-------------------------------------------|----------|
| COMP3141     | Software System Design and Implementation | (6 UOC)  |
| ECON1102     | Macroeconomics 1                          | (6 UOC)  |
| INFS2607     | Business Data Networks                    | (6 UOC)  |
| SENG3010     | Software Engineering Workshop 3A          | (3 UOC)  |
| SENG3020     | Software Engineering Workshop 3B          | (3 UOC)  |
| SE Electives |                                           | (24 UOC) |

##### Stage 4

|                                           |          |
|-------------------------------------------|----------|
| Faculty of Commerce & Economics Electives | (48 UOC) |
|-------------------------------------------|----------|

##### Stage 5

|                                |                                |          |
|--------------------------------|--------------------------------|----------|
| SENG4910                       | Thesis Part A                  | (6 UOC)  |
| SENG4911                       | Thesis Part B                  | (12 UOC) |
| SENG4921                       | Professional Issues and Ethics | (6 UOC)  |
| Software Engineering Electives |                                | (24 UOC) |

At least 3 UOC of the Software Engineering electives must be chosen from INFS courses.

### Please Note

1. The above staging of the program represents one possible sequence of courses. The staging of the courses may be modified, subject to prerequisites and timetabling. In particular, the FCE and SE electives may be redistributed.

2. Further information regarding SE electives can be found at [www.cse.unsw.edu.au/seng](http://www.cse.unsw.edu.au/seng)

### Academic Rules

The Bachelor of Engineering in Software Engineering Bachelor of Commerce combined program requires the following:

- At least 96 units of credit from the courses offered by the Faculty of Commerce and Economics (FCE) including: ACCT 1501, ACCT1511, ECON1101, ECON1102, and
- Completion of a major of at least 48 units of credit in an FCE approved disciplinary stream and a minor of 24 units of credit in INFS courses of which no more than 12 units of credit may be Level 1 courses.
- No more than 60 units of credit of Level 1 FCE courses;
- 6 units of credit of first year mathematics courses as required for the Software Engineering program, and at least 6 units of credit in statistics and mathematics chosen from ECON1203, MATH1041, MATH1141, MATH1081, MATH2400, MATH2859, MATH2801, MATH2901, MATH2841, or alternative statistics and mathematics courses approved by the program advisor.

Students who are enrolled in a combined program are expected to maintain a Credit (65% or higher) average across courses taken from each of the composite programs. Students who fail to meet this condition will be counselled about their suitability to remain in the combined program.

The stages of a generic combined program are shown above. In general, it will be necessary to adapt the program by undertaking courses to meet the requirements of particular Commerce majors. This generic program accommodates 96 UOC of courses from FCE.

The Faculty of Commerce and Economics should approve the BCom program.

## 3749 Software Engineering/Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBIomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The BE (Software Engineering)/Master of Biomedical Engineering concurrent degree program is offered jointly through the School of Computer Science and Engineering and the Graduate School of Biomedical Engineering. Students who are enrolled in a joint program are expected to maintain a Credit (65%) average across courses taken from each of the composite programs.

### Program Structure

#### Plan SENG13749

##### Year 1

|          |                                 |         |
|----------|---------------------------------|---------|
| BIOM2010 | Biomedical Engineering Practice | (3 UOC) |
| INFS1603 | Business Data Management        | (6 UOC) |
| INFS1611 | Requirements Engineering        | (3 UOC) |
| MATH1081 | Discrete Mathematics            | (6 UOC) |
| MATH2400 | Finite Mathematics              | (3 UOC) |
| SENG1031 | Software Engineering Workshop 1 | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|                   |                     |         |
|-------------------|---------------------|---------|
| COMP1021          | Computing 1B        | (6 UOC) |
| COMP1721          | Higher Computing 1B | (6 UOC) |
| General Education |                     | (3 UOC) |

**Year 2**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| BIOM1001 | Professional Biomedical Studies         | (3 UOC) |
| COMP2121 | Microprocessors and Interfacing         | (6 UOC) |
| COMP2111 | System Modeling and Design              | (6 UOC) |
| COMP3711 | Software Project Management             | (6 UOC) |
| INFS2603 | Systems Analysis and Design             | (6 UOC) |
| INFS2607 | Business Data Networks                  | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |
| SENG2010 | Software Engineering Workshop 2A        | (3 UOC) |
| SENG2020 | Software Engineering Workshop 2B        | (3 UOC) |

And ONE of the following courses:

|                                    |                          |         |
|------------------------------------|--------------------------|---------|
| COMP2011                           | Data Organisation        | (6 UOC) |
| COMP2711                           | Higher Data Organisation | (6 UOC) |
| Biomedical Engineering Elective S1 |                          | (6 UOC) |
| General Education S1               |                          | (3 UOC) |

**Year 3**

|                                |                                           |          |
|--------------------------------|-------------------------------------------|----------|
| COMP2411                       | Logic and Logic Programming               | (6 UOC)  |
| COMP3141                       | Software System Design and Implementation | (6 UOC)  |
| PHPH2101                       | Physiology 1A                             | (6 UOC)  |
| PHPH2201                       | Physiology 1B                             | (6 UOC)  |
| SENG3010                       | Software Engineering Workshop 3A          | (3 UOC)  |
| SENG3020                       | Software Engineering Workshop 3B          | (3 UOC)  |
| Software Engineering Electives |                                           | (18 UOC) |

**Year 4**

|                                  |                                |          |
|----------------------------------|--------------------------------|----------|
| BIOM5909                         | Thesis Part A                  | (3 UOC)  |
| SENG4921                         | Professional Issues and Ethics | (6 UOC)  |
| Biomedical Engineering Electives |                                | (18 UOC) |
| Software Engineering Electives   |                                | (18 UOC) |

**Year 5**

|                                   |                |          |
|-----------------------------------|----------------|----------|
| BIOM5904                          | Thesis Part B  | (12 UOC) |
| And ONE of the following options: |                |          |
| BIOM9913                          | Project Report | (12 UOC) |
| or                                |                |          |
| 2 Biomedical Electives            |                | (12 UOC) |
| Biomedical Engineering Electives  |                | (18 UOC) |
| Software Engineering Electives    |                | (6 UOC)  |

**Preferred Biomedical Engineering Electives**

|          |                               |         |
|----------|-------------------------------|---------|
| BIOM9321 | Physiological Fluid Mechanics | (6 UOC) |
| BIOM9332 | Biocompatibility              | (6 UOC) |
| BIOM9420 | Clinical Laboratory Science   | (6 UOC) |
| BIOM9440 | Biomedical Practical Measures | (6 UOC) |
| BIOM9613 | Medical Instrumentation       | (6 UOC) |

**Other Biomedical Engineering Electives**

|          |                                                             |         |
|----------|-------------------------------------------------------------|---------|
| BIOM9027 | Medical Imaging                                             | (6 UOC) |
| BIOM9050 | Microprocessors and Circuit Design for Biomedical Engineers | (6 UOC) |
| BIOM9060 | Biomedical Systems Analysis                                 | (6 UOC) |
| BIOM9430 | Electromedical Standards                                    | (6 UOC) |
| BIOM9450 | Clinical Information Systems                                | (6 UOC) |
| BIOM9510 | Introductory Biomechanics                                   | (6 UOC) |
| BIOM9541 | Mechanics of the Human Body                                 | (6 UOC) |
| BIOM9601 | Biomedical Applications of Microcomputers 1                 | (6 UOC) |
| BIOM9621 | Biological Signal Analysis                                  | (6 UOC) |
| BIOM9701 | Dynamics of the Cardiovascular System                       | (6 UOC) |

**General Education Requirements**

UNSW wants all students to develop skills in a broad range of areas, not just in their specific study discipline, and so students in all degrees are required to undertake a number of general studies courses outside their discipline. It may not be possible for Computer Engineering students to enrol in general education courses that are similar in content to the courses offered in the Computer Engineering degree. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/undergrad/current/gened.html](http://www.cse.unsw.edu.au/undergrad/current/gened.html)

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School Office for more information.

**3983 Computer Science/Bachelor of Science****Bachelor of Science Bachelor of Science (Computer Science) BSc BSc****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

With this combined degree program, students can add a Science program to the standard, professionally accredited BSc in Computer Science program offered by the School of Computer Science and Engineering. All Science majors within program 3970 are available.

Students who meet the entry requirements for the BSc in Computer Science program 3978 and for the Bachelor of Science program 3970 may apply to enter the combined Bachelor of Science Bachelor of Science (Computer Science) program.

Students should schedule the Science and Computer Science components to suit their preferences while meeting constraints of timetables and prerequisites. The Science Faculty section in this Handbook describes the Science options and the School of Computer Science and Engineering Student Office can supply sample programs indicating what previous students have arranged.

In addition to the BSc in Computer Science program 3978, students must complete a minimum of 84 units of credit in Science courses, including a major sequence in an approved area. The Science office must approve the Science component while the School of Computer Science and Engineering will approve the final program and schedule.

The award of Honours in either the Science or the Computer Science program requires at least one further year of study.

Students wishing to gain a degree at Honours level as part of their combined degree program shall meet all the relevant requirements of the faculty concerned and of the appropriate schools. Such students may enrol for the Honours year only on the recommendation of both the program authorities concerned.

**Program Structure****Plan COMPA13983****Year 1****Sample Program:**

Choose ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|                                 |                       |          |
|---------------------------------|-----------------------|----------|
| MATH1231                        | Mathematics 1B        | (6 UOC)  |
| MATH1241                        | Higher Mathematics 1B | (6 UOC)  |
| Plus Science Electives, Level 1 |                       | (24 UOC) |

**Year 2**

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP2121 | Microprocessors and Interfacing             | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| MATH1081 | Discrete Mathematics                        | (6 UOC) |

And ONE of the following courses:

|                                 |                          |          |
|---------------------------------|--------------------------|----------|
| COMP2011                        | Data Organisation        | (6 UOC)  |
| COMP2711                        | Higher Data Organisation | (6 UOC)  |
| Plus Science Electives, Level 2 |                          | (24 UOC) |

**Year 3**

|                                           |                      |          |
|-------------------------------------------|----------------------|----------|
| COMP3111                                  | Software Engineering | (6 UOC)  |
| Plus Level 3/4 Computer Science Electives |                      | (18 UOC) |
| Plus Science Electives, Levels 2 & 3      |                      | (24 UOC) |

**Year 4**

|                                           |          |
|-------------------------------------------|----------|
| COMP2920 Professional Issues and Ethics   | (3 UOC)  |
| Plus Level 3/4 Computer Science Electives | (6 UOC)  |
| Plus Other Computer Science Electives     | (6 UOC)  |
| Plus Science Electives, Levels 2 & 3      | (12 UOC) |
| Plus Electives                            | (15 UOC) |
| General Education Courses                 | (6 UOC)  |

External courses which may be included here and count towards the 84 UOC Computer Science electives, include: MATH2301, MATH3411/3301, TELE3013, PHYS1601 & 2601 and any of ELEC1011, 2031, 2032, 2042, 3004, 3006, 3014, 3016, 3017, 3041, 4042, 4412, 4413, 4503, 4522 and 4532.

**General Education Requirements**

Students in this program may also need to satisfy the General Education requirements. It may not be possible for computing students to enrol in General Education courses which are similar in content to the courses offered in their respective degree program. For a comprehensive list, please refer to the CSE website: [www.cse.unsw.edu.au/school/teaching/courses/gened.html](http://www.cse.unsw.edu.au/school/teaching/courses/gened.html)

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School of Computer Science and Engineering for more information.

**3968 Computer Science/Bachelor of Arts****Bachelor of Science Bachelor of Arts BSc BA****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

The double degree of BSc (Computer Science) BA normally requires an additional stage of study, and enables students to complete the requirements of the BSc (Computer Science) and in a school, department, or program of the Faculty of Arts and Social Sciences.

For admission to the program, students must satisfy the entry requirements for both the BSc (Computer Science) and the Faculty of Arts and Social Sciences. Students in this program must complete 192 units of credit of study. Students are required to undertake courses totalling 84 units of credit from the Science component and also 84 units of credit from the Arts component of which 42 units of credit would be from an approved major sequence (refer to Lists A and B in the rules for program 3400 Bachelor of Arts, in the Faculty of Arts and Social Science section of this Handbook). The remaining 24 units of credit may be taken from either area.

Students should enrol in at least 24 Level 1 units of credit and no more than 36 Level 1 within the Arts component of the program. Of these, no more than 12 units of credit can be taken in any one school or department.

The award of Honours in either the Arts and Social Sciences or the Computer Science component requires at least a further year of study, and the Honours year is subject to the admission requirements of the corresponding Arts and Social Sciences program or the Honours program in Computer Science.

The School of Computer Science and Engineering administers this degree.

The specific requirements for the BSc Computer Science are described in the Engineering section of the Handbook, under program code 3978 BSc Computer Science.

**Program Structure****Plan COMPA13968****Year 1**

|                               |         |
|-------------------------------|---------|
| MATH1081 Discrete Mathematics | (6 UOC) |
|-------------------------------|---------|

And ONE of the following courses:

|                              |         |
|------------------------------|---------|
| COMP1011 Computing 1A        | (6 UOC) |
| COMP1711 Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|                              |         |
|------------------------------|---------|
| COMP1021 Computing 1B        | (6 UOC) |
| COMP1721 Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|                                |         |
|--------------------------------|---------|
| MATH1131 Mathematics 1A        | (6 UOC) |
| MATH1141 Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|                                |         |
|--------------------------------|---------|
| MATH1231 Mathematics 1B        | (6 UOC) |
| MATH1241 Higher Mathematics 1B | (6 UOC) |

**Year 2**

|                                                      |         |
|------------------------------------------------------|---------|
| COMP2121 Microprocessors and Interfacing             | (6 UOC) |
| COMP2041 Software Construction: Techniques and Tools | (6 UOC) |
| COMP2920 Professional Issues and Ethics              | (3 UOC) |

And ONE of the following courses:

|                                   |         |
|-----------------------------------|---------|
| COMP2011 Data Organisation        | (6 UOC) |
| COMP2711 Higher Data Organisation | (6 UOC) |

**Year 3**

|                                           |          |
|-------------------------------------------|----------|
| COMP3111 Software Engineering             | (6 UOC)  |
| Plus Level 3/4 Computer Science Electives | (24 UOC) |

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School of Computer Science and Engineering for more information.

**3982 Computer Science/Bachelor of Digital Media****Bachelor of Science Bachelor of Digital Media BSc BDM****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

The BSc (Computer Science) BDM combined program provides both a technical and creative foundation to the development and use of computer graphics. It also allows specialisation in the final semester in either the technical or creative strand of computer graphics and associated fields.

**Program Structure****Plan COMPA13982****Plan DIGMA13982****Year 1****Sample Program:**

|                                        |         |
|----------------------------------------|---------|
| SOMA1600 Language of Digital Media     | (6 UOC) |
| SOMA1604 Introduction to Digital Media | (6 UOC) |
| SOMA1608 Digital Composite 1           | (6 UOC) |
| SOMA2602 Sound Media 1                 | (6 UOC) |
| MATH1081 Discrete Mathematics          | (6 UOC) |

And ONE of the following courses:

|                              |         |
|------------------------------|---------|
| COMP1011 Computing 1A        | (6 UOC) |
| COMP1711 Higher Computing 1A | (6 UOC) |

And ONE of the following courses:

|                              |         |
|------------------------------|---------|
| COMP1021 Computing 1B        | (6 UOC) |
| COMP1721 Higher Computing 1B | (6 UOC) |

And ONE of the following courses:

|                                |         |
|--------------------------------|---------|
| MATH1131 Mathematics 1A        | (6 UOC) |
| MATH1141 Higher Mathematics 1A | (6 UOC) |

**Year 2**

|                                                      |         |
|------------------------------------------------------|---------|
| COMP2041 Software Construction: Techniques and Tools | (6 UOC) |
| MATH2400 Finite Mathematics                          | (3 UOC) |
| MATH2859 Probability, Statistics & Information       | (3 UOC) |
| SOMA1603 Digital Video 1                             | (6 UOC) |
| SOMA2607 Multimedia 1                                | (6 UOC) |
| SOMA2609 3D Graphics & Modelling 1                   | (6 UOC) |

And ONE of the following courses:

|                                   |         |
|-----------------------------------|---------|
| COMP2011 Data Organisation        | (6 UOC) |
| COMP2711 Higher Data Organisation | (6 UOC) |

Plus COFA elective (6 UOC)  
Plus SMA or CSE elective (6 UOC)

**Year 3**

COMP3111 Software Engineering (6 UOC)  
COMP3421 Computer Graphics (6 UOC)  
SAHT3614 Screen Culture (6 UOC)  
Plus COFA electives (6 UOC)  
Plus Level 3/4 Computer Science Electives (12 UOC)  
Plus SMA or CSE elective (12 UOC)

**Year 4**

SOMA3610 Digital Studio (6 UOC)  
SOMA3616 Professional Practice (6 UOC)  
SOMA3612 Professional Portfolio (6 UOC)  
SAHT3613 Digital Theory and Aesthetics (6 UOC)  
Plus SMA or CSE electives (6 UOC)  
Plus Level 3/4 Computer Science Electives (18 UOC)

**General Education Requirements**

Students in this program are exempt from General Education requirements.

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School of Computer Science and Engineering for more information.

**Fast-Track Programs with Master of Engineering Science****3645 Computer Engineering/Master of Engineering Science – Plan COMPL13645****Bachelor of Engineering Master of Engineering Science BE MEngSc**

Students may undertake 4.5 years (10 semesters) full-time combined program leading to the award of a Bachelor of Engineering and a Master of Engineering Science in Computer Engineering.

Students undertake the first three years (6 semesters) of the BE program in Computer Engineering. Subject to satisfying 75% over Years 2 and 3 (see Rules for Progression and the Award of Degrees), they (a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year; (b) they undertake a 12 units of credit of project/thesis work over the summer (9th) semester; and (c) they undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

**3647 Bioinformatics/Master of Engineering Science – Plan BINFL13647****Bachelor of Engineering Master of Engineering Science BE MEngSc**

Students may undertake 4.5 years (10 semesters) full-time fast-track program leading to the award of a Bachelor of Engineering and a Master of Engineering Science in Bioinformatics.

Students undertake the first three years (6 semesters) of the BE program in Bioinformatics. Subject to satisfying a minimum performance over these three years (see Rules for Progression and the Award of Degrees), they (a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year; (b) they undertake a 12 units of credit of project/thesis work over the summer (9th) semester; and (c) they undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

**3648 Software Engineering/Master of Engineering Science – Plan SENGL13648****Bachelor of Engineering Master of Engineering Science BE MEngSc**

Students may undertake a 4.5 years (10 semesters) full-time fast-track program leading to the award of a Bachelor of Engineering and a Master of Engineering Science in Software Engineering.

Students undertake the first three years (6 semesters) of the BE program in Software Engineering. Subject to satisfying 75% over years 2 and 3 (see 'Rules for Progression and the Award of Degrees'), they (a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year; (b) they undertake a 12 units of credit of project/thesis work over the summer (9th) semester; and (c) they undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

**School of Electrical Engineering and Telecommunications**

**Head of School:** Professor BG Celler

**Director of Academic Studies:** Associate Professor E Ambikairajah

**Administrative Officers:** Ms. G. Fong

The School comprises several discipline areas indicating shared research interests and teaching commitments: Telecommunications; Signal Processing; Energy Systems; Microelectronics; Photonics; Systems and Control. Electrical Engineering and Telecommunications has close links with the pure sciences and mathematics. Its technology is changing rapidly and the School's teaching and research programs are constantly being updated to meet the challenges of present and future needs.

The School offers undergraduate and graduate training in all branches of the professions of electrical engineering and telecommunications. Our degree programs are accredited by the Institution of Engineers, Australia, as meeting the requirements for admission to graduate membership. The School is also associated with the Australian Photonics Co-operative Research Centre which conducts research into optical fibre communication devices and technology.

A very vibrant Co-op program is offered for Electrical Engineering and Telecommunications students. Co-operative scholarships are funded by Australia's premier industries.

**Summary of Undergraduate Programs****Normal full-time**

| Single Degree Programs            | Duration |
|-----------------------------------|----------|
| 3640 BE in Electrical Engineering | 4 years  |
| 3643 BE in Telecommunications     | 4 years  |
| 3644 BE in Photonic Engineering   | 4 years  |

**Combined Degree Programs**

|                                        |           |
|----------------------------------------|-----------|
| 3646 BE BA in Telecommunications       | 5 years   |
| 3720 BE BA in Electrical Engineering   | 5 years   |
| 3725 BE BSc in Electrical Engineering  | 5 years   |
| 3641 BE BSc in Telecommunications      | 5 years   |
| 3634 BE BSc in Photonic Engineering    | 5 years   |
| 3715 BE BCom in Electrical Engineering | 5.5 years |
| 3715 BE BCom in Photonic Engineering   | 5.5 years |
| 3715 BE BCom in Telecommunications     | 5.5 years |

**Fast-Track Programs**

|                                          |           |
|------------------------------------------|-----------|
| 3640 BE MEngSc in Electrical Engineering | 4.5 years |
| 3643 BE MEngSc in Telecommunications     | 4.5 years |

**Concurrent Degree Programs**

|                                            |         |
|--------------------------------------------|---------|
| 3723 BE MBiomedE in Telecommunications     | 5 years |
| 3727 BE MBiomedE in Electrical Engineering | 5 years |

Options within Electrical Engineering include: Telecommunications, Computer Systems, Systems & Control, Energy Systems, Microelectronics, Signal Processing.

The undergraduate curricula are progressively revised to provide flexible training to suit the future needs of students. Individual student needs can be further met by substitution provisions within the programs.

**Combined Degree Programs**

Combined degree programs lead to the award of the Bachelor of Engineering in either Electrical Engineering or Telecommunications, combined with a Bachelor degree in Arts or Science (usually Computer Science, Mathematics or Physics). There is a fast-track degree available which leads to the awards of Bachelor of Engineering in either Electrical Engineering or Telecommunications and Master of Engineering Science. With the Graduate School of Biomedical Engineering, there is also available a concurrent degree program leading to the award of Bachelor of Engineering/Master of Biomedical Engineering. Students who are in combined degree programs must maintain a Credit average performance (i.e. 65% weighted average mark) in order to stay in the program.

**Guidelines for Substitution of Courses**

To suit the special abilities or needs of individual students, a limited number of course substitutions is permitted within each program. Any such substitution must have prior approval of the Head of School.

1. The substituted course is of at least the same length and level as the prescribed course.
2. Core courses are normally substituted with courses covering similar material.

3. Students may substitute for two of the Professional Electives, courses of suitable level and difficulty from areas relevant to the profession of Electrical Engineering. One of these substitutions may be a Year 3 elective from within the School. Substitution of one postgraduate course within the School is permitted, provided that the student has passed Year 3 Electrical Engineering and Telecommunications courses at an adequate level and a similar course is not offered at the undergraduate level.

4. Substitution is not permitted if it unduly restricts the range of courses studied to only one area of electrical engineering or computer systems.

5. Substitution is normally not permitted in Year 1 or Year 2.

#### Guide to Industrial Training Requirement

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should be involved in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the company.

Industrial training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3640 Electrical Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The School offers undergraduate and graduate training in all branches of the professions of electrical engineering and telecommunications. The Degree programs are accredited by The Institution of Engineers, Australia as meeting the requirements for admission to graduate membership. The School is also associated with the Australian Photonics Co-operative Research Centre which conducts research into Optical Fibre communication devices and technology.

A very vibrant Co-op program is offered for Electrical Engineering and Telecommunications students. Co-operative scholarships are funded by Australia's premier industries.

Options within Electrical Engineering include: Telecommunications, Photonics, Systems & Control, Energy Systems, Microelectronics, Signal Processing.

The undergraduate curricula are being progressively revised to provide flexible training to suit the future needs of students. Individual student needs can be further met by substitution provisions within the programs.

### Program Structure

#### Year 1

##### Session One

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| ELEC1010 | Introduction to Electrical Engineering        | (3 UOC) |
| ELEC1011 | Electrical Engineering 1                      | (6 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |
| MATH1141 | Higher Mathematics 1A                         | (6 UOC) |
| PHYS1131 | Higher Physics 1A                             | (6 UOC) |

#### Session Two

|          |                                |         |
|----------|--------------------------------|---------|
| COMP1091 | Solving Problems with Software | (6 UOC) |
| ELEC1041 | Digital Circuits               | (6 UOC) |
| MATH1241 | Higher Mathematics 1B          | (6 UOC) |
| PHYS1231 | Higher Physics 1B              | (6 UOC) |

**Note:** MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).

#### Year 2

##### Session One

|          |                                    |         |
|----------|------------------------------------|---------|
| COMP2091 | Computing 2                        | (6 UOC) |
| ELEC2031 | Circuits and Systems               | (3 UOC) |
| MATH2111 | Higher Several Variable Calculus   | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |

##### Session Two

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC2015 | Electromagnetic Applications            | (3 UOC) |
| ELEC2032 | Electronics and Systems                 | (3 UOC) |
| ELEC2042 | Real Time Instrumentation               | (3 UOC) |
| MATH2509 | Linear Algebra for Engineers            | (3 UOC) |
| MATH2620 | Higher Complex Analysis                 | (3 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

And TWO General Education courses in Session 1 and TWO General Education courses in Session 2.

**Note:** MATH2620 and MATH2111 may be taken at the ordinary level (MATH2520 and MATH2011).

#### Year 3

##### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC2041 | Microprocessors & Interfacing           | (6 UOC) |
| ELEC3004 | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3005 | Electric Energy 1                       | (6 UOC) |
| ELEC3006 | Electronics A                           | (6 UOC) |

##### Session Two

|          |                               |         |
|----------|-------------------------------|---------|
| ELEC3014 | Systems and Control 1         | (6 UOC) |
| ELEC3017 | Electrical Engineering Design | (6 UOC) |

TWO Electives from the following:

|          |                             |         |
|----------|-----------------------------|---------|
| COMP2011 | Data Organisation           | (6 UOC) |
| ELEC3015 | Electric Energy 2           | (6 UOC) |
| ELEC3016 | Electronics B               | (6 UOC) |
| ELEC3041 | Real Time Engineering       | (6 UOC) |
| TELE3013 | Telecommunication Systems 1 | (6 UOC) |
| TELE3018 | Data Networks 1             | (6 UOC) |

Students who intend to major in particular disciplines should note that certain Year 3 elective courses may be prerequisites for the Professional Electives they choose in Year 4. COMP2011 may be taken at the higher level (COMP2711).

#### Year 4

##### Session One

|          |                                              |         |
|----------|----------------------------------------------|---------|
| ELEC4010 | Project Management for Professional Services | (3 UOC) |
| ELEC4910 | Thesis Part A                                | (3 UOC) |

And THREE Professional Electives

##### Session Two

|          |                              |         |
|----------|------------------------------|---------|
| ELEC4011 | Ethics & Elec. Eng. Practice | (3 UOC) |
| ELEC4911 | Thesis Part B                | (9 UOC) |

And TWO Professional Electives

**Note:** The Thesis may only be taken by students with an Honours-level weighted average at the end of Year 3. Other students enrol in the Group Thesis (ELEC4914 and ELEC4915).

Students who intend to major in particular disciplines should note that certain Year 3 elective courses may be prerequisites for the Professional Electives they choose in Year 4.

COMP2011 may be taken at the higher level (COMP2711).

### Professional Electives

#### Microelectronics

|          |                                        |         |
|----------|----------------------------------------|---------|
| ELEC4503 | Electronics C                          | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology | (6 UOC) |
| ELEC4532 | Integrated Digital Systems             | (6 UOC) |

#### Systems and Control

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC4412 | Control of Continuous-time Systems | (6 UOC) |
| ELEC4413 | Control of Discrete-time Systems   | (6 UOC) |

**Energy Systems**

|          |                           |         |
|----------|---------------------------|---------|
| ELEC4205 | Electrical Energy Systems | (6 UOC) |
| ELEC4216 | Electrical Drive Systems  | (6 UOC) |
| ELEC4240 | Power Electronics         | (6 UOC) |
| SOLA3540 | Applied Photovoltaics     | (6 UOC) |

**Signal Processing**

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| ELEC4042 | Signal Processing 2                                | (6 UOC) |
| ELEC4483 | Biomedical Instrumentation, Measurement and Design | (6 UOC) |

**Telecommunications**

|          |                                            |         |
|----------|--------------------------------------------|---------|
| TELE4313 | Optical Communications                     | (6 UOC) |
| TELE4323 | Digital Modulation and Coding              | (6 UOC) |
| TELE4333 | Wireless Data Communication Systems        | (6 UOC) |
| TELE4343 | Source Coding and Compression              | (6 UOC) |
| TELE4352 | Data Networks 2                            | (6 UOC) |
| TELE4353 | Mobile and Satellite Communication Systems | (6 UOC) |
| TELE4354 | Network Management                         | (6 UOC) |
| TELE4363 | Telecommunications Systems 2               | (6 UOC) |

**Computer Systems**

|          |                                |         |
|----------|--------------------------------|---------|
| COMP3111 | Software Engineering           | (6 UOC) |
| COMP3211 | Computer Architecture          | (6 UOC) |
| COMP3231 | Operating Systems              | (6 UOC) |
| COMP3311 | Database Systems               | (6 UOC) |
| COMP3411 | Artificial Intelligence        | (6 UOC) |
| MATH3411 | Information, Codes and Ciphers | (6 UOC) |

**Business Administration**

|          |                       |         |
|----------|-----------------------|---------|
| ELEC4444 | New Business Creation | (6 UOC) |
|----------|-----------------------|---------|

Professional Elective courses in Computer Systems area require either COMP2011 or COMP2021 as a prerequisite.

Because of timetable clashes, not all combinations of courses are possible.

The program selected by each student must be approved by the Head of School. Not all electives are offered each session, nor is the full range available to part-time students. Students are advised each year of the timetable of available electives.

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Honours**

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Training**

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial Training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of Engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the company.

Industrial Training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

**Part-time Programs**

After completing Year 1 full-time, it is possible for students to progress with a program which has a part-time load (less than 18 units of credit in any session). Very few undergraduate courses are offered in the evenings and students need to be able to attend classes as the timetable demands. Formal part-time programs, that provide courses at times suited to part-time students, are not offered.

**Further Information****Guidelines for Substitution of Courses**

To suit the special abilities or needs of individual students a limited number of course substitutions is permitted within each program. Any such substitution must have prior approval of the Head of School.

1. The substituted course is of at least the same length and level as the prescribed course.
2. Core courses are normally substituted with courses covering similar material.
3. Students may substitute for two of the Professional Electives, courses of suitable level and difficulty from areas relevant to the profession of Electrical Engineering. One of these substitutions may be a Year 3 elective from within the School. Substitution of one postgraduate course within the School is permitted, provided that the student has passed Year 3 Electrical Engineering and Telecommunications courses at an adequate level and a similar course is not offered at the undergraduate level.
4. Substitution is not permitted if it unduly restricts the range of courses studied to only one area of electrical engineering or computer systems.
5. Substitution is normally not permitted in Year 1 or Year 2.

**Computing Requirements**

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office or the School's computer resources website.

---

**3643 Telecommunications****Bachelor of Engineering BE****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

The School offers undergraduate and graduate training in all branches of the professions of electrical engineering and telecommunications. The Degree programs are accredited by The Institution of Engineers, Australia as meeting the requirements for admission to graduate membership. The School is also associated with the Australian Photonics Co-operative Research Centre which conducts research into Optical Fibre communication devices and technology.

A very vibrant Co-op program is offered for Electrical Engineering and Telecommunications students. Co-operative scholarships are funded by Australia's premier industries.

Options within Electrical Engineering include: Telecommunications, Photonics, Systems & Control, Energy Systems, Microelectronics, Signal Processing.

The undergraduate curricula are being progressively revised to provide flexible training to suit the future needs of students. Individual student needs can be further met by substitution provisions within the programs.

## Program Structure

### Year 1

#### Session One

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| ELEC1011 | Electrical Engineering 1                      | (6 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |
| MATH1141 | Higher Mathematics 1A                         | (6 UOC) |
| PHYS1131 | Higher Physics 1A                             | (6 UOC) |
| TELE1010 | Introduction to Telecommunications            | (3 UOC) |

#### Session Two

|          |                                |         |
|----------|--------------------------------|---------|
| COMP1091 | Solving Problems with Software | (6 UOC) |
| ELEC1041 | Digital Circuits               | (6 UOC) |
| MATH1241 | Higher Complex Analysis        | (6 UOC) |
| PHYS1231 | Higher Physics 1B              | (6 UOC) |

**Note:** MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).

### Year 2

#### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| COMP2091 | Computing 2                             | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| ELEC2041 | Microprocessors & Interfacing           | (6 UOC) |
| MATH2111 | Higher Several Variable Calculus        | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

#### Session Two

|                               |                              |         |
|-------------------------------|------------------------------|---------|
| ELEC2032                      | Electronics and Systems      | (3 UOC) |
| ELEC2042                      | Real Time Instrumentation    | (3 UOC) |
| MATH2509                      | Linear Algebra for Engineers | (3 UOC) |
| MATH2620                      | Higher Complex Analysis      | (3 UOC) |
| TELE3018                      | Data Networks 1              | (6 UOC) |
| Two General Education courses |                              | (6 UOC) |

**Note:** MATH2620 and MATH2111 may be taken at the ordinary level (MATH2520 and MATH2011).

### Year 3

#### Session One

|                              |                                    |         |
|------------------------------|------------------------------------|---------|
| ELEC3006                     | Electronics A                      | (6 UOC) |
| PHYS2939                     | Physics 2 (Electrical Engineering) | (3 UOC) |
| TELE3013                     | Telecommunication Systems 1        | (6 UOC) |
| TELE4352                     | Data Networks 2                    | (6 UOC) |
| One General Education course |                                    | (3 UOC) |

#### Session Two

|                              |                                         |         |
|------------------------------|-----------------------------------------|---------|
| ELEC3004                     | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3017                     | Electrical Engineering Design           | (6 UOC) |
| TELE3015                     | High Freq Electromagnetics              | (3 UOC) |
| One General Education course |                                         | (3 UOC) |

ONE Elective from the following:

|          |                       |         |
|----------|-----------------------|---------|
| COMP2011 | Data Organisation     | (6 UOC) |
| ELEC3014 | Systems and Control 1 | (6 UOC) |
| ELEC3016 | Electronics B         | (6 UOC) |
| ELEC3041 | Real Time Engineering | (6 UOC) |

**Notes:** Students who intend to major in particular disciplines should note that certain Year 3 elective courses may be prerequisites for the Professional Electives they choose in Year 4.

COMP2011 may be taken at the higher level (COMP2711)

### Year 4

#### Session One

|                           |                                              |         |
|---------------------------|----------------------------------------------|---------|
| ELEC4010                  | Project Management for Professional Services | (3 UOC) |
| TELE4354                  | Network Management                           | (6 UOC) |
| TELE4363                  | Telecommunications Systems 2                 | (6 UOC) |
| TELE4910                  | Thesis Part A                                | (3 UOC) |
| ONE Professional Elective |                                              | (6 UOC) |

#### Session Two

|                            |                                            |          |
|----------------------------|--------------------------------------------|----------|
| ELEC4011                   | Ethics and Electrical Engineering Practice | (3 UOC)  |
| TELE4911                   | Thesis Part B                              | (9 UOC)  |
| TWO Professional Electives |                                            | (12 UOC) |

**Note:** The Thesis is taken by students with an Honours-level weighted average at the end of Year 3. Other students enrol in the Group Thesis (TELE4914 and TELE4915).

## Professional Electives

### Microelectronics

|          |                                        |         |
|----------|----------------------------------------|---------|
| ELEC4503 | Electronics C                          | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology | (6 UOC) |
| ELEC4532 | Integrated Digital Systems             | (6 UOC) |

## Systems & Control

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC4412 | Control of Continuous-time Systems | (6 UOC) |
| ELEC4413 | Control of Discrete-time Systems   | (6 UOC) |

## Signal Processing

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| ELEC4042 | Signal Processing 2                                | (6 UOC) |
| ELEC4483 | Biomedical Instrumentation, Measurement and Design | (6 UOC) |

## Telecommunications

|          |                                            |         |
|----------|--------------------------------------------|---------|
| TELE4313 | Optical Communications                     | (6 UOC) |
| TELE4323 | Digital Modulation and Coding              | (6 UOC) |
| TELE4333 | Wireless Data Communication Systems        | (6 UOC) |
| TELE4352 | Data Networks 2                            | (6 UOC) |
| TELE4343 | Source Coding and Compression              | (6 UOC) |
| TELE4353 | Mobile and Satellite Communication Systems | (6 UOC) |
| TELE4354 | Network Management                         | (6 UOC) |
| TELE4363 | Telecommunications Systems 2               | (6 UOC) |

**Note:** TELE4363, TELE4352 and TELE4354 are Core courses for BE in Telecommunications students.

## Computer Systems

|          |                                |         |
|----------|--------------------------------|---------|
| COMP3111 | Software Engineering           | (6 UOC) |
| COMP3211 | Computer Architecture          | (6 UOC) |
| COMP3231 | Operating Systems              | (6 UOC) |
| COMP3311 | Database Systems               | (6 UOC) |
| COMP3411 | Artificial Intelligence        | (6 UOC) |
| MATH3411 | Information, Codes and Ciphers | (6 UOC) |

## Business Administration

|          |                       |         |
|----------|-----------------------|---------|
| ELEC4444 | New Business Creation | (6 UOC) |
|----------|-----------------------|---------|

Professional Elective courses in the Computer Systems area require either COMP2011 or COMP2021 as a prerequisite.

Because of timetable clashes, not all combinations of courses are possible.

The program selected by each student must be approved by the Head of School. Not all electives are offered each session, nor is the full range available to part-time students. Students are advised each year of the timetable of available electives.

## General Education

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

## Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

## Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Training Requirements

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial Training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of Engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the Company

Industrial Training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

## Further Information

### Guidelines for Substitution of Courses

To suit the special abilities or needs of individual students a limited number of course substitutions is permitted within each program. Any such substitution must have prior approval of the Head of School.

1. The substituted course is of at least the same length and level as the prescribed course.
2. Core courses are normally substituted with courses covering similar material.
3. Students may substitute for two of the Professional Electives, courses of suitable level and difficulty from areas relevant to the profession of Electrical Engineering. One of these substitutions may be a Year 3 elective from within the School. Substitution of one postgraduate course within the School is permitted, provided that the student has passed Year 3 Electrical Engineering and Telecommunications courses at an adequate level and a similar course is not offered at the undergraduate level.
4. Substitution is not permitted if it unduly restricts the range of courses studied to only one area of electrical engineering or computer systems.
5. Substitution is normally not permitted in Year 1 or Year 2.

### Computing Requirements

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office or the School's computer resources website.

## 3644 Photonic Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The School offers undergraduate and graduate training in all branches of the professions of electrical engineering and telecommunications. The Degree programs are accredited by The Institution of Engineers, Australia as meeting the requirements for admission to graduate membership. The School is also associated with the Australian Photonics Co-operative Research Centre which conducts research into Optical Fibre communication devices and technology.

A very vibrant Co-op program is offered for Electrical Engineering and Telecommunications students. Co-operative scholarships are funded by Australia's premier industries.

Options within Electrical Engineering include: Telecommunications, Photonics, Systems & Control, Energy Systems, Microelectronics, Signal Processing.

The undergraduate curricula are being progressively revised to provide flexible training to suit the future needs of students. Individual student needs can be further met by substitution provisions within the programs.

### Program Structure

#### Year 1

##### Session One

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| ELEC1011 | Electrical Engineering 1                      | (6 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |
| MATH1141 | Higher Mathematics 1A                         | (6 UOC) |

|          |                           |         |
|----------|---------------------------|---------|
| PHTN1010 | Introduction to Photonics | (3 UOC) |
| PHYS1131 | Higher Physics 1A         | (6 UOC) |

##### Session Two

|          |                                |         |
|----------|--------------------------------|---------|
| COMP1091 | Solving Problems with Software | (6 UOC) |
| ELEC1041 | Digital Circuits               | (6 UOC) |
| MATH1241 | Higher Mathematics 1B          | (6 UOC) |
| PHYS1231 | Higher Physics 1B              | (6 UOC) |

**Note:** MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231)

#### Year 2

##### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| COMP2091 | Computing 2                             | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| MATH2111 | Higher Several Variable Calculus        | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |
| PHYS2030 | Laboratory A                            | (3 UOC) |
| PHYS2040 | Quantum Physics                         | (3 UOC) |

##### Session Two

|                   |                                                        |         |
|-------------------|--------------------------------------------------------|---------|
| ELEC2032          | Electronics and Systems                                | (3 UOC) |
| ELEC2042          | Real Time Instrumentation                              | (3 UOC) |
| MATH2130          | Higher Mathematical Methods for Differential Equations | (3 UOC) |
| MATH2509          | Linear Algebra for Engineers                           | (3 UOC) |
| MATH2620          | Higher Complex Analysis                                | (3 UOC) |
| PHYS2050          | Electromagnetism                                       | (3 UOC) |
| General Education |                                                        | (6 UOC) |

**Note:** MATH2111, MATH2620 and MATH2130 may be taken at the ordinary level (MATH2011, MATH2520 and MATH2120).

#### Year 3

##### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC3004 | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3006 | Electronics A                           | (6 UOC) |
| PHYS3030 | Electromagnetism (Advanced)             | (3 UOC) |
| PHYS3770 | Laser and Spectroscopy Lab              | (3 UOC) |

One 6UOC General Education Courses needs to be taken in Year 3 Session 1.

##### Session Two

|          |                                |         |
|----------|--------------------------------|---------|
| ELEC3017 | Electrical Engineering Design  | (6 UOC) |
| PHYS3060 | Advanced Optics                | (3 UOC) |
| PHYS3310 | Physics of Solid State Devices | (3 UOC) |
| TELE3013 | Telecommunication Systems 1    | (6 UOC) |

6 UOC electives from the following courses:

|          |                               |         |
|----------|-------------------------------|---------|
| COMP2011 | Data Organisation             | (6 UOC) |
| ELEC2041 | Microprocessors & Interfacing | (6 UOC) |
| ELEC3014 | Systems and Control 1         | (6 UOC) |
| PHYS3010 | Quantum Mechanics (Advanced)  | (3 UOC) |
| PHYS3080 | Solid State Physics           | (3 UOC) |
| TELE3018 | Data Networks 1               | (6 UOC) |

**Notes:** The elective courses ELEC2041, PHYS3010 and PHYS3080 are scheduled in Session 1 only. In this case, the General Education elective can be moved to Session 2.

PHYS3030 may be taken at the ordinary level (PHYS3230).

#### Year 4

##### Session One

|                           |                                              |         |
|---------------------------|----------------------------------------------|---------|
| ELEC4010                  | Project Management for Professional Services | (3 UOC) |
| ELEC4910                  | Thesis Part A                                | (3 UOC) |
| PHYS4979                  | Photonic Devices                             | (6 UOC) |
| TELE4313                  | Optical Communications                       | (6 UOC) |
| One Professional Elective |                                              | (6 UOC) |

##### Session Two

|                            |                                            |         |
|----------------------------|--------------------------------------------|---------|
| ELEC4011                   | Ethics and Electrical Engineering Practice | (3 UOC) |
| ELEC4911                   | Thesis Part B                              | (9 UOC) |
| Two Professional Electives |                                            | (12UOC) |

**Notes:** The Thesis may only be taken by students with an Honours level weighted average at the end of Year 3. Other students should enrol in the Group Thesis (ELEC4914 and ELEC4915).

Students who intend to major in particular disciplines should note that certain Year 3 elective courses may be prerequisites for the Professional Electives they choose in Year 4.

**Professional Electives****Microelectronics**

|          |                                        |         |
|----------|----------------------------------------|---------|
| ELEC4503 | Electronics C                          | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology | (6 UOC) |

**Energy Systems**

|          |                   |         |
|----------|-------------------|---------|
| ELEC4240 | Power Electronics | (6 UOC) |
|----------|-------------------|---------|

**Systems and Control**

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC4412 | Control of Continuous-time Systems | (6 UOC) |
| ELEC4413 | Control of Discrete-time Systems   | (6 UOC) |

**Signal Processing**

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| ELEC4042 | Signal Processing 2                                | (6 UOC) |
| ELEC4483 | Biomedical Instrumentation, Measurement and Design | (6 UOC) |
| PHTN4310 | Optical Signal Processing                          | (6 UOC) |

**Telecommunications**

|          |                                            |         |
|----------|--------------------------------------------|---------|
| TELE4314 | Optical Communication Systems              | (6 UOC) |
| TELE4323 | Digital Modulation and Coding              | (6 UOC) |
| TELE4333 | Wireless Data Communication Systems        | (6 UOC) |
| TELE4343 | Source Coding and Compression              | (6 UOC) |
| TELE4352 | Data Networks 2                            | (6 UOC) |
| TELE4353 | Mobile and Satellite Communication Systems | (6 UOC) |
| TELE4363 | Telecommunications Systems 2               | (6 UOC) |

**Computer Systems**

|          |                                |         |
|----------|--------------------------------|---------|
| COMP3111 | Software Engineering           | (6 UOC) |
| COMP3311 | Database Systems               | (6 UOC) |
| COMP3411 | Artificial Intelligence        | (6 UOC) |
| MATH3411 | Information, Codes and Ciphers | (6 UOC) |

**Business Administration**

|          |                       |         |
|----------|-----------------------|---------|
| ELEC4444 | New Business Creation | (6 UOC) |
|----------|-----------------------|---------|

**Physics**

|          |                            |         |
|----------|----------------------------|---------|
| PHYS4949 | Advanced Topics in Physics | (6 UOC) |
|----------|----------------------------|---------|

**Note:** Professional Elective courses in Computer Systems area require either COMP2011 or COMP2021 as a prerequisite.

Because of timetable clashes, not all combinations of courses are possible.

The program selected by each student must be approved by the Head of School. Not all electives are offered each session, nor is the full range available to part-time students. Students are advised each year of the timetable of available electives.

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Training**

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial Training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of Engineering.

At the end of each period of employment every student must submit a report, typically 2000-30000 words, summarising the work done, the training received and including a description of the organisation of the Company.

Industrial Training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

**Further Information****Guidelines for Substitution of Courses**

To suit the special abilities or needs of individual students a limited number of course substitutions is permitted within each program. Any such substitution must have prior approval of the Head of School.

1. The substituted course is of at least the same length and level as the prescribed course.

2. Core courses are normally substituted with courses covering similar material.

3. Students may substitute for two of the Professional Electives, courses of suitable level and difficulty from areas relevant to the profession of Electrical Engineering. One of these substitution may be a Year 3 elective from within the School. Substitution of one postgraduate course within the School is permitted, provided that the student has passed Year 3 Electrical Engineering and Telecommunications courses at an adequate level and a similar course is not offered at the undergraduate level.

4. Substitution is not permitted if it unduly restricts the range of courses studied to only one area of electrical engineering or computer systems.

5. Substitution is normally not permitted in Year 1 and Year 2.

**Computer Requirements**

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office or the School's computer resource website.

**3725 Electrical Engineering/Bachelor of Science****Bachelor of Engineering Bachelor of Science BE BSc****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Combined degree programs lead to the award of the Bachelor of Engineering in either Electrical Engineering or Telecommunications, combined with a Bachelor degree in Arts or Science (usually Computer Science, Mathematics or Physics). Students who are in the combined degrees program must maintain a credit average performance (i.e. 65% weighted average mark) in order to stay in the program.

These programs qualify candidates for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged.

**Program Structure****Year 1**

As for Program 3640

**Year 2****Session One**

|          |                                    |         |
|----------|------------------------------------|---------|
| COMP2091 | Computing 2                        | (6 UOC) |
| ELEC2031 | Circuits and Systems               | (3 UOC) |
| ELEC2041 | Microprocessors & Interfacing      | (6 UOC) |
| MATH2111 | Higher Several Variable Calculus   | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |

**Session Two**

Science Elective/Core

Science Elective

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC2015 | Electromagnetic Applications            | (3 UOC) |
| ELEC2032 | Electronics and Systems                 | (3 UOC) |
| MATH2620 | Higher Complex Analysis                 | (3 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

**Notes:** The Core/Elective course will be PHYS2999 for Science with a Physics major, COMP2011 or COMP2711 & COMP2041 for Computer Science, and is a free elective for either Science with a Mathematics major.

For a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

MATH2620 and MATH2111 may be taken at the ordinary level (MATH2520 and MATH2011).

**Year 3****Session One**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC3004 | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3005 | Electric Energy 1                       | (6 UOC) |
| ELEC3006 | Electronics A                           | (6 UOC) |

Year 2 Science Elective

**Session Two**

|          |                               |         |
|----------|-------------------------------|---------|
| ELEC2042 | Real Time Instrumentation     | (3 UOC) |
| ELEC3014 | Systems and Control 1         | (6 UOC) |
| ELEC3017 | Electrical Engineering Design | (6 UOC) |
| MATH2509 | Linear Algebra for Engineers  | (3 UOC) |

One ELEC Elective (Year 3)

**Year 4****Session One**

Four Year 3 Science Electives

**Session Two**

One Year 3 Science Elective

One ELEC Elective (Year 3)

Two Electives [Science, ELEC (Year 3)]

**Note:** ELEC (Year 3) electives are chosen from the Year 3 Elective list for 3640. It will be possible to delay/advance electives by 1 or more sessions to enable as flexible a choice as possible, providing the structure of the program (i.e. units of credit in each session) is maintained, and that ultimately all required core and elective courses are taken.

**Year 5**

As for Year 4 of Program 3640

**Honours**

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Training**

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should be involved in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the company.

Industrial training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

**Further Information****Guidelines for Substitution of Courses**

For 'Guidelines for Substitution of Courses', please refer to the program entry for 3640 Electrical Engineering.

**3720 Electrical Engineering/Bachelor of Arts****Bachelor of Engineering Bachelor of Arts BE BA****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Combined degree programs lead to the award of the Bachelor of Engineering in either Electrical Engineering or Telecommunications, combined with a Bachelor degree in Arts or Science (usually Computer Science, Mathematics or Physics). Students who are in the combined degrees program must maintain a credit average performance (i.e. 65% weighted average mark) in order to stay in the program.

These programs qualify candidates for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged.

All combined degree programs are administered by the School of Electrical Engineering and Telecommunications.

**Program Structure****Year 1**

As for Program 3640

**Year 2****Session One**

|          |                                    |         |
|----------|------------------------------------|---------|
| COMP2091 | Computing 2                        | (6 UOC) |
| ELEC2031 | Circuits and Systems               | (3 UOC) |
| ELEC2041 | Microprocessors & Interfacing      | (6 UOC) |
| MATH2111 | Higher Several Variable Calculus   | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |

**Session Two**

Arts Elective/Core

Arts Elective

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC2015 | Electromagnetic Applications            | (3 UOC) |
| ELEC2032 | Electronics and Systems                 | (3 UOC) |
| MATH2620 | Higher Complex Analysis                 | (3 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

**Note:** COMP2091 can be moved to Session 2 to enable a Session 1 elective to be taken. MATH2620 and MATH2111 may be taken at the ordinary level (MATH2520 and MATH2011). COMP1091 and COMP2091 may be taken at the ordinary level (COMP1711 and COMP1721).

**Year 3****Session One**

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC3004 | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3005 | Electric Energy 1                       | (6 UOC) |
| ELEC3006 | Electronics A                           | (6 UOC) |

Year 2 Arts Elective

**Session Two**

|          |                               |         |
|----------|-------------------------------|---------|
| ELEC2042 | Real Time Instrumentation     | (3 UOC) |
| ELEC3014 | Systems and Control 1         | (6 UOC) |
| ELEC3017 | Electrical Engineering Design | (6 UOC) |
| MATH2509 | Linear Algebra for Engineers  | (3 UOC) |

One ELEC Elective (Year 3)

**Year 4****Session One**

Four Year 3 Arts Electives

**Session Two**

One Year 3 Arts Elective

One ELEC Elective (Year 3)

Two Electives [Art, ELEC (Year 3)]

**Note:** ELEC (Year 3) electives are chosen from the Year 3 Elective list for 3640. It will be possible to delay/advance elective by 1 or more session to enable as flexible a choice as possible, providing the structure of the program (i.e. units of credit in each session) is maintained, and that ultimately all required core and elective courses are taken.

### Year 5

As for Year 4 of Program 3640

### Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

### Academic Rules

1. Students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. subjects designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one school of department.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
Environmental Studies\*  
European Studies  
Film  
French  
German Studies  
Greek  
History  
History and Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music  
Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology & Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

\*Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 level 1 units of credit in an approved course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.

3. Except for courses completed as part of the Environmental Studies major sequences, no more than 12 units of credit may be obtained from subjects in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No subject included for credit in the BE programs can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students must complete the full requirements of the program 3640 BE in Electrical Engineering except that they are exempt from the General Education requirement of the BE BSc program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE BA program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of an Honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is  $5 \times 48 = 240$ .

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' in this Handbook.

### Industrial Training

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should be involved in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the company.

Industrial training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

### Further Information

#### Computing Requirements

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office or the School's computer resources website.

#### Guidelines for Substitution of Courses

For 'Guidelines for Substitution of Courses', please refer to the program entry for 3640 Electrical Engineering.

## 3715 Electrical Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook. Information about the program structure can be found in the Online Handbook program entry for 3715 BE BCom under the area of specialisation Electrical Engineering.

## 3727 Electrical Engineering/Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBIomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

A Bachelor of Engineering degree in Electrical Engineering and a Master of Biomedical Engineering degree (BE MBIomedE) can both be completed in five years of concurrent study. Students must maintain a 65% Credit average to retain their enrolment in MBIomedE.

## Program Structure

### Year 1

#### Session One

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| BIOM1001 | Professional Biomedical Studies               | (3 UOC) |
| ELEC1011 | Electrical Engineering 1                      | (6 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |
| PHYS1131 | Higher Physics 1A                             | (6 UOC) |

and ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

#### Session Two

|          |                                 |         |
|----------|---------------------------------|---------|
| BIOM2010 | Biomedical Engineering Practice | (3 UOC) |
| CHEM1817 | Chemistry 1ME                   | (3 UOC) |
| COMP1091 | Solving Problems with Software  | (6 UOC) |
| PHYS1231 | Higher Physics 1B               | (6 UOC) |

and ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

### Year 2

#### Session One

|          |                                    |         |
|----------|------------------------------------|---------|
| BIOM9420 | Clinical Laboratory Science        | (6 UOC) |
| COMP2091 | Computing 2                        | (6 UOC) |
| ELEC2031 | Circuits and Systems               | (3 UOC) |
| MATH2011 | Several Variable Calculus          | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |

#### Session Two

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC1041 | Digital Circuits                        | (6 UOC) |
| ELEC2015 | Electromagnetic Applications            | (3 UOC) |
| ELEC2032 | Electronics and Systems                 | (3 UOC) |
| MATH2509 | Linear Algebra for Engineers            | (3 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

and ONE of the following courses:

|                   |                         |         |
|-------------------|-------------------------|---------|
| MATH2520          | Complex Analysis        | (3 UOC) |
| MATH2620          | Higher Complex Analysis | (3 UOC) |
| General Education |                         | (3 UOC) |

### Year 3

#### Session One

|                   |                                              |         |
|-------------------|----------------------------------------------|---------|
| ELEC2041          | Microprocessors & Interfacing                | (6 UOC) |
| ELEC3004          | Signal Processing and Transform Methods      | (6 UOC) |
| ELEC3006          | Electronics A                                | (6 UOC) |
| ELEC4010          | Project Management for Professional Services | (3 UOC) |
| General Education |                                              | (3 UOC) |

#### Session Two

|                                          |                                            |         |
|------------------------------------------|--------------------------------------------|---------|
| ELEC2042                                 | Real Time Instrumentation                  | (3 UOC) |
| ELEC3014                                 | Systems and Control 1                      | (6 UOC) |
| ELEC3017                                 | Electrical Engineering Design              | (6 UOC) |
| ELEC4011                                 | Ethics and Electrical Engineering Practice | (3 UOC) |
| Plus one Biomedical Engineering Elective |                                            | (6 UOC) |

### Year 4

#### Session One

|                                          |                          |         |
|------------------------------------------|--------------------------|---------|
| BIOM9430                                 | Electromedical Standards | (6 UOC) |
| ELEC3005                                 | Electric Energy 1        | (6 UOC) |
| PHPH2101                                 | Physiology 1A            | (6 UOC) |
| Plus one Biomedical Engineering Elective |                          | (6 UOC) |

#### Session Two

|                                                            |                                                    |         |
|------------------------------------------------------------|----------------------------------------------------|---------|
| BIOM5910                                                   | Thesis Part A                                      | (6 UOC) |
| ELEC4483                                                   | Biomedical Instrumentation, Measurement and Design | (6 UOC) |
| PHPH2201                                                   | Physiology 1B                                      | (6 UOC) |
| Plus one Electrical Engineering Elective from Stage 3 List |                                                    |         |

### Year 5

#### Session One

|                                                  |               |          |
|--------------------------------------------------|---------------|----------|
| BIOM5911                                         | Thesis Part B | (6 UOC)  |
| Two Biomedical Engineering Electives             |               | (12 UOC) |
| One Electrical Engineering Professional Elective |               | (6 UOC)  |

#### Session Two

|                                                            |                               |          |
|------------------------------------------------------------|-------------------------------|----------|
| BIOM9410                                                   | Regulatory Req of Biomed Tech | (6 UOC)  |
| BIOM9913                                                   | Project Report                | (12 UOC) |
| Plus one Electrical Engineering Elective from Stage 3 List |                               |          |

## Preferred Biomedical Engineering Electives

### Session Two

|          |                 |         |
|----------|-----------------|---------|
| BIOM9027 | Medical Imaging | (6 UOC) |
|----------|-----------------|---------|

### Other Biomedical Engineering Electives

#### Session One

|          |                                       |         |
|----------|---------------------------------------|---------|
| BIOM9060 | Biomedical Systems Analysis           | (6 UOC) |
| BIOM9510 | Introductory Biomechanics             | (6 UOC) |
| BIOM9701 | Dynamics of the Cardiovascular System | (6 UOC) |
| SESC9451 | Experimental Biomechanics             | (6 UOC) |

#### Session Two

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ANAT2511 | Fundamentals of Anatomy                 | (6 UOC) |
| BIOM9321 | Physiological Fluid Mechanics           | (6 UOC) |
| BIOM9332 | Biocompatibility                        | (6 UOC) |
| BIOM9440 | Biomedical Practical Measures           | (6 UOC) |
| BIOM9450 | Clinical Information Systems            | (6 UOC) |
| BIOM9541 | Mechanics of the Human Body             | (6 UOC) |
| BIOM9551 | Biomechanics of Physical Rehabilitation | (6 UOC) |
| BIOM9561 | Mechanical Properties of Biomaterials   | (6 UOC) |

## Electrical Engineering & Telecommunications Stage 3 Elective List

### Electronics

|          |               |         |
|----------|---------------|---------|
| ELEC3016 | Electronics B | (6 UOC) |
|----------|---------------|---------|

### Energy Systems

|          |                   |         |
|----------|-------------------|---------|
| ELEC3015 | Electric Energy 2 | (6 UOC) |
|----------|-------------------|---------|

### Control

|          |                       |         |
|----------|-----------------------|---------|
| ELEC3014 | Systems and Control 1 | (6 UOC) |
| ELEC3041 | Real Time Engineering | (6 UOC) |

### Telecommunications

|          |                             |         |
|----------|-----------------------------|---------|
| TELE3013 | Telecommunication Systems 1 | (6 UOC) |
| TELE3018 | Data Networks 1             | (6 UOC) |

### Computer Systems

|          |                           |         |
|----------|---------------------------|---------|
| COMP2021 | Digital System Structures | (6 UOC) |
| COMP2711 | Higher Data Organisation  | (6 UOC) |

## Electrical Engineering & Telecommunications Professional Electives

### Electronics

|          |                                        |         |
|----------|----------------------------------------|---------|
| ELEC4503 | Electronics C                          | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology | (6 UOC) |
| ELEC4532 | Integrated Digital Systems             | (6 UOC) |

### Control

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC4412 | Control of Continuous-time Systems | (6 UOC) |
| ELEC4413 | Control of Discrete-time Systems   | (6 UOC) |

### Energy Systems

|          |                           |         |
|----------|---------------------------|---------|
| ELEC4205 | Electrical Energy Systems | (6 UOC) |
| ELEC4216 | Electrical Drive Systems  | (6 UOC) |
| ELEC4240 | Power Electronics         | (6 UOC) |
| SOLA3540 | Applied Photovoltaics     | (6 UOC) |

### Signal Processing

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| ELEC4042 | Signal Processing 2                                | (6 UOC) |
| ELEC4483 | Biomedical Instrumentation, Measurement and Design | (6 UOC) |

### Business Administration

|          |                       |         |
|----------|-----------------------|---------|
| ELEC4444 | New Business Creation | (6 UOC) |
|----------|-----------------------|---------|

### Telecommunications

|          |                                            |         |
|----------|--------------------------------------------|---------|
| TELE4313 | Optical Communications                     | (6 UOC) |
| TELE4323 | Digital Modulation and Coding              | (6 UOC) |
| TELE4333 | Wireless Data Communication Systems        | (6 UOC) |
| TELE4343 | Source Coding and Compression              | (6 UOC) |
| TELE4352 | Data Networks 2                            | (6 UOC) |
| TELE4353 | Mobile and Satellite Communication Systems | (6 UOC) |
| TELE4354 | Network Management                         | (6 UOC) |
| TELE4363 | Telecommunications Systems 2               | (6 UOC) |

### Computer Systems

|          |                                |         |
|----------|--------------------------------|---------|
| COMP3231 | Operating Systems              | (6 UOC) |
| COMP3411 | Artificial Intelligence        | (6 UOC) |
| COMP3111 | Software Engineering           | (6 UOC) |
| COMP3211 | Computer Architecture          | (6 UOC) |
| COMP3311 | Database Systems               | (6 UOC) |
| MATH3411 | Information, Codes and Ciphers | (6 UOC) |

## General Education Requirements

Students in this program must also satisfy the General Education requirements. This is usually 12 UOC taken in second and third year studies.

Each Faculty has responsibility for deciding what courses are able to be counted towards the General Education requirement for their students. The Faculty of Engineering is committed to providing the widest range of choice of general education electives for its students. It strongly encourages students to make the best use of this flexibility. Please contact your School Office for further information on General Education electives available to you.

For further information, please refer to the General Education section in this Handbook.

## Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Electrical Engineering and Telecommunications for more information.

## 3641 Telecommunications/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

Combined degree programs lead to the award of the Bachelor of Engineering in either Electrical Engineering or Telecommunications, combined with a Bachelor degree in Arts or Science (usually Computer Science, Mathematics or Physics). Students who are in the combined degrees program must maintain a credit average performance (i.e. 65% weighted average mark) in order to stay in the program.

These programs qualify candidates for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged.

## Program Structure

### Year 1

As for Program 3643

### Year 2

#### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| COMP2091 | Computing 2                             | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| ELEC2041 | Microprocessors & Interfacing           | (6 UOC) |
| MATH2111 | Higher Several Variable Calculus        | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

#### Session Two

|                       |                         |         |
|-----------------------|-------------------------|---------|
| ELEC2032              | Electronics and Systems | (3 UOC) |
| MATH2620              | Higher Complex Analysis | (3 UOC) |
| TELE3018              | Data Networks 1         | (6 UOC) |
| Science Core/Elective |                         | (6 UOC) |
| Science Elective      |                         | (6 UOC) |

**Notes:** The Core/Elective subject will be PHYS2999 for Science with a Physics major, COMP2011 or COMP2711 and COMP2041 for Computer Science, and is a free elective for either Science with a Mathematics major.

For a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

MATH2620 and MATH2111 may be taken at the ordinary level (MATH2520 and MATH2011).

### Year 3

#### Session One

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC2042 | Real Time Instrumentation          | (3 UOC) |
| ELEC3006 | Electronics A                      | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |
| TELE3013 | Telecommunication Systems 1        | (6 UOC) |
| TELE4352 | Data Networks 2                    | (6 UOC) |

### Session Two

|                  |                                         |         |
|------------------|-----------------------------------------|---------|
| ELEC3004         | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3017         | Electrical Engineering Design           | (6 UOC) |
| MATH2509         | Linear Algebra for Engineers            | (3 UOC) |
| TELE3015         | High Freq Electromagnetics              | (3 UOC) |
| Science Elective |                                         | (6 UOC) |

### Year 4

#### Session One

|                               |          |
|-------------------------------|----------|
| FOUR Year 3 Science Electives | (24 UOC) |
|-------------------------------|----------|

#### Session Two

|                                  |                       |         |
|----------------------------------|-----------------------|---------|
| ELEC3041                         | Real Time Engineering | (6 UOC) |
| THREE Year 3/4 Science Electives | (18 UOC)              |         |

**Note:** It will be possible to delay/advance electives by 1 or more sessions to enable as flexible a choice as possible, providing the structure of the program (i.e units of credit in each session) is maintained, and that ultimately all required core and elective courses are taken.

### Year 5

As for Year 4 of Program 3643.

## Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

## Academic Rules

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Training Requirements

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should be involved in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the company.

Industrial training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

## Further Information

### Computing Requirements

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office or the School's computer resources website.

### Guidelines for Substitution of Courses

For 'Guidelines for Substitution of Courses', please refer to the program entry for 3643 Telecommunications.

## 3646 Telecommunications/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BA

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Combined degree programs lead to the award of the Bachelor of Engineering in either Electrical Engineering or Telecommunications, combined with a Bachelor degree in Arts or Science (usually Computer Science, Mathematics or Physics). Students who are in the combined degrees program must maintain a Credit average performance (i.e. 65% weighted average mark) in order to stay in the program.

These programs qualify candidates for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged.

All combined degree programs are administered by the School of Electrical Engineering and Telecommunications.

### Program Structure

#### Year 1

As for Program 3643

#### Year 2

##### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| COMP2091 | Computing 2                             | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| ELEC2041 | Microprocessors & Interfacing           | (6 UOC) |
| MATH2111 | Higher Several Variable Calculus        | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

##### Session Two

|                      |                         |         |
|----------------------|-------------------------|---------|
| ELEC2032             | Electronics and Systems | (3 UOC) |
| MATH2620             | Higher Complex Analysis | (3 UOC) |
| TELE3018             | Data Networks 1         | (6 UOC) |
| Arts /Core/ Elective |                         | (6 UOC) |
| Arts Elective        |                         | (6 UOC) |

**Note:** The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 or COMP2711 & COMP2041 for Computer Science, and is a free elective for either Science with a Mathematics major or Arts.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

MATH2620 and MATH2111 may be taken at the ordinary level (MATH2520 and MATH2011).

#### Year 3

##### Session One

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC2042 | Real Time Instrumentation          | (3 UOC) |
| ELEC3006 | Electronics A                      | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |
| TELE3013 | Telecommunication Systems 1        | (6 UOC) |
| TELE4352 | Data Networks 2                    | (6 UOC) |

##### Session Two

|               |                                         |         |
|---------------|-----------------------------------------|---------|
| ELEC3004      | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3017      | Electrical Engineering Design           | (6 UOC) |
| MATH2509      | Linear Algebra for Engineers            | (3 UOC) |
| TELE3015      | High Freq Electromagnetics              | (3 UOC) |
| Arts/Elective |                                         | (6 UOC) |

#### Year 4

##### Session One

|                            |          |
|----------------------------|----------|
| FOUR Year 3 Arts Electives | (24 UOC) |
|----------------------------|----------|

##### Session Two

|                               |                       |          |
|-------------------------------|-----------------------|----------|
| ELEC3041                      | Real Time Engineering | (6 UOC)  |
| THREE Year 3/4 Arts Electives |                       | (18 UOC) |

**Note:** It will be possible to delay/advance electives by 1 or more sessions to enable as flexible a choice as possible, providing the structure of the program (i.e. units of credit in each session) is maintained, and that ultimately all required core and elective courses are taken.

#### Year 5

As for Year 4 of Program 3643.

### Academic Rules

For Arts, in addition to the BE course, students must complete 60 units of credit offered by the Arts faculty, comprising a major sequence within Arts.

General Education is not required for a combined degree program, with the exception of the BE MBiomedE program.

A mathematics major is not normally permitted for the BA. The BE BSc combined degree is more appropriate for this.

There will be a testamur for each part of a combined degree program.

Testamurs for the BE BA, the BE BSc and the BE MBiomedE are awarded at a single graduation ceremony.

## 3715 Telecommunications/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook. Information about the program structure can be found in the Online Handbook program entry for 3715 BE BCom under the area of specialisation Telecommunications.

## 3723 Telecommunications/Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

A Bachelor of Telecommunications degree in Electrical Engineering and a Master of Biomedical Engineering degree (BE MBiomedE) can both be completed in five years of concurrent study. Students must maintain a 65% Credit average to retain their enrolment in MBiomedE.

### Program Structure

#### Year 1

##### Session One

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| BIOM1001 | Professional Biomedical Studies               | (3 UOC) |
| ELEC1011 | Electrical Engineering 1                      | (6 UOC) |
| MATH1090 | Discrete Mathematics for Electrical Engineers | (3 UOC) |
| PHYS1131 | Higher Physics 1A                             | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

##### Session Two

|          |                                 |         |
|----------|---------------------------------|---------|
| BIOM2010 | Biomedical Engineering Practice | (3 UOC) |
| CHEM1817 | Chemistry 1ME                   | (3 UOC) |
| COMP1091 | Solving Problems with Software  | (6 UOC) |
| PHYS1231 | Higher Physics 1B               | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

#### Year 2

##### Session One

|          |                                         |         |
|----------|-----------------------------------------|---------|
| BIOM9420 | Clinical Laboratory Science             | (6 UOC) |
| COMP2091 | Computing 2                             | (6 UOC) |
| ELEC2031 | Circuits and Systems                    | (3 UOC) |
| MATH2011 | Several Variable Calculus               | (6 UOC) |
| MATH2859 | Probability, Statistics and Information | (3 UOC) |

**Session Two**

|          |                              |         |
|----------|------------------------------|---------|
| ELEC1041 | Digital Circuits             | (6 UOC) |
| ELEC2032 | Electronics and Systems      | (3 UOC) |
| ELEC2042 | Real Time Instrumentation    | (3 UOC) |
| MATH2509 | Linear Algebra for Engineers | (3 UOC) |
| TELE3018 | Data Networks 1              | (6 UOC) |

And ONE of the following courses:

|          |                         |         |
|----------|-------------------------|---------|
| MATH2520 | Complex Analysis        | (3 UOC) |
| MATH2620 | Higher Complex Analysis | (3 UOC) |

**Year 3****Session One**

|          |                                              |         |
|----------|----------------------------------------------|---------|
| ELEC3004 | Signal Processing and Transform Methods      | (6 UOC) |
| ELEC3006 | Electronics A                                | (6 UOC) |
| ELEC4010 | Project Management for Professional Services | (3 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering)           | (3 UOC) |
| TELE4352 | Data Networks 2                              | (6 UOC) |

**Session Two**

|                         |                                            |         |
|-------------------------|--------------------------------------------|---------|
| ELEC3017                | Electrical Engineering Design              | (6 UOC) |
| ELEC4011                | Ethics and Electrical Engineering Practice | (3 UOC) |
| TELE3013                | Telecommunication Systems 1                | (6 UOC) |
| TELE3015                | High Freq Electromagnetics                 | (3 UOC) |
| One Biomedical Elective |                                            | (6 UOC) |

**Year 4****Session One**

|                                                       |                               |         |
|-------------------------------------------------------|-------------------------------|---------|
| BIOM9430                                              | Electromedical Standards      | (6 UOC) |
| ELEC2041                                              | Microprocessors & Interfacing | (6 UOC) |
| PHPH2101                                              | Physiology 1A                 | (6 UOC) |
| One Electrical Engineering Elective from Stage 3 List |                               | (6 UOC) |

**Session Two**

|                   |                    |         |
|-------------------|--------------------|---------|
| BIOM5910          | Thesis Part A      | (6 UOC) |
| PHPH2201          | Physiology 1B      | (6 UOC) |
| TELE4354          | Network Management | (6 UOC) |
| General Education |                    | (6 UOC) |

**Year 5****Session One**

|                                      |                              |         |
|--------------------------------------|------------------------------|---------|
| BIOM5911                             | Thesis Part B                | (6 UOC) |
| TELE4363                             | Telecommunications Systems 2 | (6 UOC) |
| One Biomedical Engineering Elective  |                              | (6 UOC) |
| or                                   |                              | (6 UOC) |
| One Electrical Professional Elective |                              | (6 UOC) |

**Year 5****Session Two**

|          |                               |         |
|----------|-------------------------------|---------|
| BIOM9410 | Regulatory Req of Biomed Tech | (6 UOC) |
|----------|-------------------------------|---------|

ONE of the following options:

|          |                |          |
|----------|----------------|----------|
| BIOM9913 | Project Report | (12 UOC) |
|----------|----------------|----------|

or

|                          |  |          |
|--------------------------|--|----------|
| Two Biomedical Electives |  | (12 UOC) |
|--------------------------|--|----------|

|                                          |  |         |
|------------------------------------------|--|---------|
| Plus One Biomedical Engineering Elective |  | (6 UOC) |
|------------------------------------------|--|---------|

**Preferred Biomedical Engineering Electives****Session One**

|          |                         |         |
|----------|-------------------------|---------|
| BIOM9613 | Medical Instrumentation | (6 UOC) |
|----------|-------------------------|---------|

**Session Two**

|          |                               |         |
|----------|-------------------------------|---------|
| BIOM9027 | Medical Imaging               | (6 UOC) |
| BIOM9440 | Biomedical Practical Measures | (6 UOC) |

**Other Biomedical Engineering Electives****Session One**

|          |                                             |         |
|----------|---------------------------------------------|---------|
| BIOM9060 | Biomedical Systems Analysis                 | (6 UOC) |
| BIOM9510 | Introductory Biomechanics                   | (6 UOC) |
| BIOM9601 | Biomedical Applications of Microcomputers 1 | (6 UOC) |
| BIOM9701 | Dynamics of the Cardiovascular System       | (6 UOC) |
| SESC9451 | Experimental Biomechanics                   | (6 UOC) |

**Session Two**

|          |                               |         |
|----------|-------------------------------|---------|
| ANAT2511 | Fundamentals of Anatomy       | (6 UOC) |
| BIOM9311 | Mass Transfer in Medicine     | (6 UOC) |
| BIOM9321 | Physiological Fluid Mechanics | (6 UOC) |
| BIOM9332 | Biocompatibility              | (6 UOC) |
| BIOM9450 | Clinical Information Systems  | (6 UOC) |
| BIOM9541 | Mechanics of the Human Body   | (6 UOC) |

|          |                                         |         |
|----------|-----------------------------------------|---------|
| BIOM9551 | Biomechanics of Physical Rehabilitation | (6 UOC) |
| BIOM9561 | Mechanical Properties of Biomaterials   | (6 UOC) |

**Electrical Engineering & Telecommunications Stage 3 Elective List****Electronics**

|          |               |         |
|----------|---------------|---------|
| ELEC3016 | Electronics B | (6 UOC) |
|----------|---------------|---------|

**Energy Systems**

|          |                   |         |
|----------|-------------------|---------|
| ELEC3015 | Electric Energy 2 | (6 UOC) |
|----------|-------------------|---------|

**Control**

|          |                       |         |
|----------|-----------------------|---------|
| ELEC3014 | Systems and Control 1 | (6 UOC) |
| ELEC3041 | Real Time Engineering | (6 UOC) |

**Telecommunications**

|          |                             |         |
|----------|-----------------------------|---------|
| TELE3013 | Telecommunication Systems 1 | (6 UOC) |
| TELE3018 | Data Networks 1             | (6 UOC) |

**Computer Systems**

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

**Electrical Engineering & Telecommunications Professional Electives****Electronics**

|          |                                        |         |
|----------|----------------------------------------|---------|
| ELEC4503 | Electronics C                          | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology | (6 UOC) |
| ELEC4532 | Integrated Digital Systems             | (6 UOC) |

**Control**

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC4412 | Control of Continuous-time Systems | (6 UOC) |
| ELEC4413 | Control of Discrete-time Systems   | (6 UOC) |

**Energy Systems**

|          |                           |         |
|----------|---------------------------|---------|
| ELEC4205 | Electrical Energy Systems | (6 UOC) |
| ELEC4216 | Electrical Drive Systems  | (6 UOC) |
| ELEC4240 | Power Electronics         | (6 UOC) |
| SOLA3540 | Applied Photovoltaics     | (6 UOC) |

**Signal Processing**

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| ELEC4042 | Signal Processing 2                                | (6 UOC) |
| ELEC4483 | Biomedical Instrumentation, Measurement and Design | (6 UOC) |

**Business Administration**

|          |                       |         |
|----------|-----------------------|---------|
| ELEC4444 | New Business Creation | (6 UOC) |
|----------|-----------------------|---------|

**Telecommunications**

|          |                                            |         |
|----------|--------------------------------------------|---------|
| TELE4313 | Optical Communications                     | (6 UOC) |
| TELE4323 | Digital Modulation and Coding              | (6 UOC) |
| TELE4333 | Wireless Data Communication Systems        | (6 UOC) |
| TELE4343 | Source Coding and Compression              | (6 UOC) |
| TELE4352 | Data Networks 2                            | (6 UOC) |
| TELE4353 | Mobile and Satellite Communication Systems | (6 UOC) |
| TELE4354 | Network Management                         | (6 UOC) |
| TELE4363 | Telecommunications Systems 2               | (6 UOC) |

**Computer Systems**

|          |                                |         |
|----------|--------------------------------|---------|
| COMP3111 | Software Engineering           | (6 UOC) |
| COMP3211 | Computer Architecture          | (6 UOC) |
| COMP3231 | Operating Systems              | (6 UOC) |
| COMP3311 | Database Systems               | (6 UOC) |
| COMP3411 | Artificial Intelligence        | (6 UOC) |
| MATH3411 | Information, Codes and Ciphers | (6 UOC) |

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Academic Rules**

For academic requirements relating to this program, please refer to Program Structure and contact the School of Electrical Engineering and Telecommunications for more information.

## 3634 Photonic Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

**Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

This combined degree program leads to the award of the Bachelor of Engineering in Photonic Engineering, combined with a Bachelor degree in Science (usually Computer Science, Mathematics or Physics). Students who are in the combined degrees program must maintain a Credit average performance (i.e. 65% weighted average mark) in order to stay in the program.

These programs qualify candidates for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged.

**Program Structure****Year 1****Session One**

|          |                             |        |
|----------|-----------------------------|--------|
| ELEC1011 | Electrical Engineering 1    | (6UOC) |
| MATH1090 | Discrete Maths for Elec Eng | (3UOC) |
| PHTN1010 | Intro to Photonics          | (3UOC) |
| PHYS1131 | Higher Physics 1A           | (6UOC) |

And one of the following courses:

|          |                       |        |
|----------|-----------------------|--------|
| MATH1131 | Mathematics 1A        | (6UOC) |
| MATH1141 | Higher Mathematics 1A | (6UOC) |

**Session Two**

|          |                                |        |
|----------|--------------------------------|--------|
| COMP1091 | Solving Problems with Software | (6UOC) |
| ELEC1041 | Digital Circuits               | (6UOC) |
| PHYS1231 | Higher Physics 1B              | (6UOC) |

And one of the following courses:

|          |                       |        |
|----------|-----------------------|--------|
| MATH1231 | Mathematics 1B        | (6UOC) |
| MATH1241 | Higher Mathematics 1B | (6UOC) |

**Year 2****Session One**

|          |                             |        |
|----------|-----------------------------|--------|
| COMP2091 | Computing 2                 | (6UOC) |
| ELEC2031 | Circuits and Systems        | (3UOC) |
| MATH2859 | Prob. Stats and Information | (3UOC) |
| PHYS2030 | Laboratory A                | (3UOC) |
| PHYS2040 | Quantum Physics             | (3UOC) |

And one of the following courses:

|          |                                |        |
|----------|--------------------------------|--------|
| MATH2011 | Several Variable Calculus      | (6UOC) |
| MATH2111 | Higher Severable Variable Calc | (6UOC) |

**Session Two**

|          |                              |        |
|----------|------------------------------|--------|
| ELEC2032 | Electronics and Systems      | (3UOC) |
| MATH2130 | Higher Math Methods for DEs  | (3UOC) |
| MATH2509 | Linear Algebra for Engineers | (3UOC) |
| PHYS2050 | Electromagnetism             | (3UOC) |

Plus two Science Core Courses 6 UOC, totalling 12 UOC

**Year 3****Session One**

|          |                             |        |
|----------|-----------------------------|--------|
| ELEC2042 | Real Time Instrumentation   | (3UOC) |
| ELEC3006 | Electronics A               | (6UOC) |
| PHYS3030 | Electromagnetism (Advanced) | (3UOC) |
| PHYS3770 | Laser and Spectroscopy Lab  | (3UOC) |

And one of the following courses:

|          |                         |        |
|----------|-------------------------|--------|
| MATH2520 | Complex Analysis        | (3UOC) |
| MATH2620 | Higher Complex Analysis | (3UOC) |

Plus one Science Elective (6 UOC)

**Session Two**

|                                                               |                                |        |
|---------------------------------------------------------------|--------------------------------|--------|
| ELEC3004                                                      | Signal Processing & Transform  | (6UOC) |
| ELEC3017                                                      | Electrical Engineering Design  | (6UOC) |
| PHYS3060                                                      | Advanced Optics                | (3UOC) |
| PHYS3310                                                      | Physics of Solid State Devices | (3UOC) |
| Plus one 3 <sup>rd</sup> Year Electrical Engineering Elective |                                | (6UOC) |

**Year 4****Session One**

Four Year 3 Science Electives 6 UOC each, totaling 24 UOC

**Session Two**

|                                                    |                              |        |
|----------------------------------------------------|------------------------------|--------|
| TELE3013                                           | Telecommunications Systems 1 | (6UOC) |
| Plus one Year 3 Science Elective                   |                              | (6UOC) |
| Plus two Science Electives 6 UOC, totalling 12 UOC |                              |        |

**Year 5****Session One**

|          |                               |        |
|----------|-------------------------------|--------|
| ELEC4010 | Project Mgt for Pro. Services | (3UOC) |
| PHYS4979 | Photonic Devices              | (6UOC) |
| TELE4313 | Optical Communications        | (6UOC) |

And one of the following courses:

|          |               |        |
|----------|---------------|--------|
| ELEC4910 | Thesis Part A | (3UOC) |
|----------|---------------|--------|

|                                                       |                     |         |
|-------------------------------------------------------|---------------------|---------|
| ELEC4914                                              | Group Thesis Part A | (3UOC)  |
| Plus one Electrical Engineering Professional Elective |                     | (6 UOC) |

**Session Two**

|          |                              |        |
|----------|------------------------------|--------|
| ELEC4011 | Ethics & Elec. Eng. Practice | (3UOC) |
|----------|------------------------------|--------|

And one of the following courses:

|          |                     |        |
|----------|---------------------|--------|
| ELEC4911 | Thesis Part B       | (9UOC) |
| ELEC4915 | Group Thesis Part B | (9UOC) |

Plus two Electrical Engineering Professional Electives 6 UOC each, totaling 12 UOC

**Academic Rules**

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**3715 Photonic Engineering/Bachelor of Commerce****BE BCom**

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook. Information about the program structure can be found in the Online Handbook program entry for 3715 BE BCom under the area of specialisation Photonic Engineering.

**Fast Track Programs with Master of Engineering Science****3640 Electrical Engineering/Master of Engineering Science – Plan ELECD13640**

**Bachelor of Engineering Master of Engineering Science BE MEng Sc**

**3643 Telecommunications/Master of Engineering Science – Plan TELED13643**

**Bachelor of Engineering Master of Engineering Science BE MEng Sc**

Students may undertake a 4.5 years (10 semesters) full-time fast-track program leading to the awards of a Bachelor of Engineering and a Master of Engineering Science in Electrical Engineering or Telecommunications.

Students undertake the first three years (6 semesters) of the BE program in Electrical Engineering or Telecommunications. Subject to satisfying a minimum performance over these three years (see Rules for progression and the Award of Degrees), they (a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year; (b) undertake a 12 units of credit of project/thesis work over the Summer (9th) semester; and (c) undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

**School of Mechanical and Manufacturing Engineering (incorporating Aerospace Engineering, Mechatronic Engineering and Naval Architecture)**

**Head of School:** Professor H Kaebernick

**Executive Assistant to Head of School:** Associate Professor P Mathew

**Administrative Officer:** Mrs G Jance

The School offers a Bachelor of Engineering program with plans in Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering and Naval Architecture. Also offered are combined degree programs with Science or Arts, and Bachelor/Master degree programs with Biomedical Engineering or Engineering Science.

No formal part-time programs are offered by the School. However, it is possible for students to undertake studies with a reduced load of courses. Students intending to take a reduced load are advised that very few undergraduate courses are offered in the evening.

### Summary of Programs and Plans

The plans under program 3710, which lead to the award of the degree of Bachelor of Engineering (BE), are designed to provide the appropriate academic training for the professional engineer in the fields of Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering and Naval Architecture. The first two years of these plans are identical, whilst the third and fourth years of the plans contain a number of common courses. Elective courses provide for a limited degree of specialisation in the fourth year of the Mechanical Engineering and Mechatronic Engineering plans. The Aerospace Engineering, Manufacturing Engineering and Management, and Naval Architecture plans do not have elective components. Each student is required to submit a thesis at the end of the final year and to present a seminar on the topic of the thesis.

The School also offers combined programs with Science (3711) or Arts (3712) leading to the award of the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc) and Bachelor of Engineering and Bachelor of Arts (BE BA) respectively. These combined programs enable students to major in the areas of Computer Science, Materials Science, Mathematics, Physics, Statistics or another relevant field, in addition to studying their chosen Engineering plan.

The School, in addition, offers combined programs with Commerce (3715) under the faculty with the following areas of specialisations – Manufacturing Engineering and Management, Mechanical Engineering and Mechatronic Engineering, leading to the award of the degrees of Bachelor of Engineering and Bachelor of Commerce. For rules for progression in this program, the student's attention is directed to the 'Faculty Rules of Progression' for program 3715 contained in this Handbook.

Bachelor/Masters programs are also available. After five years of study, Mechanical and Mechatronic Engineering students may obtain a Bachelor of Engineering/Master of Biomedical Engineering (BE MBiomedE) degree. After four and a half years of study, Manufacturing Engineering and Management, Mechanical Engineering and Mechatronic Engineering students may obtain a Bachelor of Engineering/Master of Engineering Science (BE MEngSc) degree.

### Industrial Experience

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete a total of 60 working days of industrial experience. A written report describing this experience is a requirement to passing the common, fourth year course MECH4001, Communications for Professional Engineers.

### Recognition

The Institution of Engineers, Australia, recognises the degree of BE in any of the undergraduate programs offered by the School as meeting the examination requirements for admission to graduate and corporate membership. Substantial or complete recognition is accorded to the BE degree programs by overseas engineering institutions.

The award of the BE degree in Aerospace Engineering is recognised by the Royal Aeronautical Society as giving exemption from the formal examination requirements for corporate membership. Advancement from graduate membership to associate membership grade is awarded on a case by case basis after a further period of some years of professional experience.

The award of the BE degree in Naval Architecture is recognised by the Royal Institution of Naval Architects (RINA), London, as the academic qualification for corporate membership of that body.

### Program Progression Guidelines

The student's attention is directed to the 'Faculty Rules for Progression' under "Rules for Progression and Award of Degrees" in this Handbook. In addition, the following points should be noted:

A student who is faced with compiling a timetable comprising courses from two academic years must give preference to courses from the lower year.

### General Education

For students taking the Manufacturing Engineering and Management plan, the accounting courses GENC1001, GENC1002 or GENC1003 should not be chosen as they partially duplicate core course ACCT9003.

### Thesis Arrangements

- The course MECH4001 Communications for Professional Engineers must only be taken in conjunction with either MECH4003 Thesis A or MECH4004 Thesis B.

- MECH4003 and MECH4004 must be undertaken in two consecutive sessions which are the final two sessions of candidature.
- A student must not be enrolled in more than 24 units of credit in any session involving MECH4003 and MECH4004.
- A single thesis project is commenced in MECH4003 and completed in MECH4004. MECH4004 carries the mark for the thesis project.
- MECH4003 is graded satisfactory (SY)/ failure (FN). If a student receives a failure (FN) in MECH4003, a student cannot proceed with MECH4004.
- If the project is abandoned during MECH4004, or if MECH4004 is failed, then the satisfactory (SY) for MECH4003 is changed to failure (FN). To complete the degree, a completely new topic must be chosen and the student must enrol again in both MECH4003 and MECH4004. (For BE MBiomedE students, read BIOM5001 instead of MECH4003 and BIOM5002 instead of MECH4004)

### Programs and Plans

UNSW terminology uses the concept of "plans" within "programs". Most students are in one plan within a program. For example, a BE mechanical engineering student in program 3710 is in plan MECHA13710. The fifth character "A" indicates the "standard" plan. Other examples are:

BE Aerospace Engineering  
AEROA13710

BE Mechatronic Engineering  
MTRNA13710.

Combined degree BE BA and BE BSc students and BE MBiomedE students are in two plans simultaneously throughout their five years; one engineering and the other arts, science or biomedical engineering respectively. For example:

BE Manufacturing Engineering/BA French major  
MANFA13712 and FRENA13712

BE Naval Architecture/BSc Physics major  
NAVLA13711 and PHYSA13711

BE Mechatronic Engineering/MBiomedE  
MTRNA13688 and BIOMA13688.

The BE degree is only completed after five years.

BE MEngSc students are in the standard single degree plan and program for the first three years. In fourth year they transfer to a special plan within the same program. For example:

BE Mechatronic Engineering/MEngSc  
MTRNA13710 (Years 1–3), MTRNL13710 (Year 4).

The BE degree is completed after four years. In fifth year they transfer to the appropriate postgraduate program described in the Postgraduate Handbook.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3710 Bachelor of Engineering BE

**Aerospace Engineering (plan AEROA13710)**

**Manufacturing Engineering and Management (plan MANFA13710)**

**Mechanical Engineering (plan MECHA13710)**

**Mechatronic Engineering (plan MTRNA13710)**

**Naval Architecture (plan NAVLA13710)**

### Typical Duration

4 years

### Minimum UOC for Award

192 units of credit

### Typical UOC per Session

24 units of credit

### Program Description

The plans under program 3710, which lead to the award of the degree of Bachelor of Engineering (BE), are designed to provide the appropriate academic training for the professional engineer in the fields of Aerospace Engineering, Manufacturing Engineering and Management, Mechanical

Engineering, Mechatronic Engineering and Naval Architecture. The first two years of these plans are identical whilst the third and fourth years of the plans contain a number of common courses. Elective courses provide for a limited degree of specialisation in the fourth year of the Mechanical Engineering and Mechatronic Engineering plans. The Aerospace Engineering, Manufacturing Engineering and Management, and Naval Architecture plans do not have elective components. Each student is required to submit a thesis at the end of the final year and to deliver a seminar on the topic of the thesis.

The School also offers combined programs with Science, 3711, Arts, 3712 or Commerce, 3715, leading to the award of the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc), Bachelor of Engineering and Bachelor of Arts (BE BA) or Bachelor of Engineering and Bachelor of Commerce (BE BCom) respectively. These combined programs enable students to major in the area of computer science, materials science, mathematics, physics, statistics, commerce or another relevant field, in addition to studying their chosen engineering plan.

Bachelor/Masters programs are also available. After five years of study, Mechanical and Mechatronic Engineering students may obtain Bachelor of Engineering/Master of Biomedical Engineering (BE MBiomedE) degrees. After four and a half years of study, Manufacturing Engineering and Management, Mechanical Engineering and Mechatronic Engineering students may obtain Bachelor of Engineering/Master of Engineering Science (BE MEngSc) degree.

### Programs and Plans

The University's New South Solutions computer software uses the concept of "plans" within "programs". Most students are in one plan within a program. For example, a BE mechanical engineering student in program 3710 is in plan MECHA13710. The fifth character "A" indicates the "standard" plan. Other examples are: BE Aerospace engineering AEROA13710; BE Manufacturing Engineering and Management MANFA13710; BE Mechatronic Engineering MTRNA13710; BE Naval Architecture NAVLA13710.

Double degree BE BA, BE BSc and BE MBiomedE students are in two plans simultaneously throughout their five years; one engineering and the other arts, science or biomedical engineering respectively. For example

BE Manufacturing Engineering/BA French major  
MANFA13712 and FRENA13712

BE Naval Architecture/BSc Physics major  
NAVLA13711 and PHYSA13711

BE Mechatronic Engineering/MBiomedE  
MTRNA13688 and BIOMA13688

The BE degree is only completed after five years.

Double degree BE MEngSc students are in the standard degree plan and program for the first three years. In fourth year they transfer to a special plan within the same program. For example:

BE Mechatronic Engineering/MEngSc MTRNA13710 (years 1-3),  
MTRNL13710 (year 4).

The BE degree is completed after four years. In fifth year they transfer to the appropriate postgraduate program described in the Postgraduate Handbook.

### Program Structure

#### Year 1

##### Year 1 of all plans

|          |                                       |         |
|----------|---------------------------------------|---------|
| CHEM1817 | Chemistry 1ME                         | (3 UOC) |
| MANF1130 | Introduction to Manufacturing         | (6 UOC) |
| MATH1131 | Mathematics 1A                        | (6 UOC) |
| MATH1231 | Mathematics 1B                        | (6 UOC) |
| MATS9520 | Engineering Materials                 | (3 UOC) |
| MECH1120 | Design and the Engineering Profession | (3 UOC) |
| MECH1300 | Engineering Mechanics 1               | (6 UOC) |
| MECH1400 | Mechanics of Solids 1                 | (6 UOC) |
| MECH1500 | Computing 1M                          | (3 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng)       | (6 UOC) |

#### Year 2

##### Year 2 of all plans

|          |                            |         |
|----------|----------------------------|---------|
| ELEC0807 | Electrical Engineering 1E  | (6 UOC) |
| MATH2029 | Engineering Mathematics 2A | (6 UOC) |
| MATH2039 | Engineering Mathematics 2B | (3 UOC) |
| MATH2839 | Statistics SM              | (3 UOC) |
| MECH2101 | Machine Design A           | (3 UOC) |
| MECH2102 | Machine Design B           | (3 UOC) |

|                            |                         |         |
|----------------------------|-------------------------|---------|
| MECH2300                   | Engineering Mechanics 2 | (3 UOC) |
| MECH2411                   | Mechanics of Solids 2A  | (3 UOC) |
| MECH2412                   | Mechanics of Solids 2B  | (3 UOC) |
| MECH2611                   | Fluid Mechanics A       | (3 UOC) |
| MECH2612                   | Fluid Mechanics B       | (3 UOC) |
| MECH2711                   | Thermodynamics A        | (3 UOC) |
| MECH2712                   | Thermodynamics B        | (3 UOC) |
| General Education Elective |                         | (3 UOC) |

### Aerospace Engineering (plan AEROA13710)

#### Years 3 and 4

The Aerospace Engineering plan covers the analysis, design and operation of aircraft and spacecraft. Graduates work mainly on the design and manufacture of flight vehicles, their operation with major or satellite airlines and research for civil and military aerospace organisations. Owing to the international nature of the aerospace industry, the topics studied cover a similar area and, in general, to the same depth of understanding as professional training programs in aerospace in other industrial countries. The aerospace industry is one of Australia's major exporters of high value added manufactured goods.

The Faculty has approved an arrangement whereby students who satisfy the requirements of the first two years of a Mechanical Engineering four year degree program at any Australasian tertiary institution may be admitted to Years 3 and 4 of the plan leading to the Bachelor of Engineering degree in Aerospace Engineering. The proviso is that the Head of the School is satisfied that the courses studied at the other institution are equivalent and gives their recommendation.

|               |                                           | HPW |    | UOC |
|---------------|-------------------------------------------|-----|----|-----|
|               |                                           | S1  | S2 |     |
| <b>Year 3</b> |                                           |     |    |     |
| AERO3101      | Aerospace Design 1A                       | 3   | -  | 3   |
| AERO3102      | Aerospace Design 1B                       | -   | 3  | 3   |
| AERO3400      | Analysis of Aerospace Structures 1        | -   | 3  | 3   |
| AERO3610      | Aerodynamics and Propulsion               | -   | 6  | 6   |
| AERO3620      | Flight Dynamics and Systems               | 3   | -  | 3   |
| MECH3000      | Professional Responsibilities             | -   | 3  | 3   |
| MECH3203      | Engineering Experimentation A             | 2   | -  | 3   |
| MECH3211      | Linear Systems Analysis                   | 3   | -  | 3   |
| MECH3330      | Vibration Analysis                        | -   | 3  | 3   |
| MECH3400      | Mechanics of Solids 3                     | 3   | -  | 3   |
| MECH3520      | Programming and Numerical Methods         | 3   | -  | 3   |
| MTRN3212      | Principles of Control                     | -   | 3  | 3   |
|               | General Education Elective                | 2   | -  | 3   |
|               | General Education Elective                | 2   | -  | 3   |
|               | General Education Elective                | -   | 2  | 3   |
| <b>Year 4</b> |                                           |     |    |     |
| AERO4101      | Aerospace Design 2A                       | 3   | -  | 3   |
| AERO4102      | Aerospace Design 2B                       | -   | 3  | 3   |
| AERO4401      | Analysis of Aerospace Structures 2A       | 3   | -  | 3   |
| AERO4402      | Analysis of Aerospace Structures 2B       | -   | 3  | 3   |
| AERO4610      | Advanced Aerodynamics and Propulsion      | 6   | -  | 6   |
| AERO4620      | Aerospace Vehicle Dynamics and Avionics   | -   | 6  | 6   |
| MANF4430      | Management for Engineers                  | 6   | -  | 6   |
| MECH4001      | Communications for Professional Engineers | -   | 3  | 3   |
| MECH4003      | Thesis A                                  | 0   | -  | 6   |
| MECH4004      | Thesis B                                  | -   | 0  | 9   |

### Manufacturing Engineering and Management (plan MANFA13710)

#### Years 3 and 4

The Manufacturing Engineering and Management plan is designed for students with engineering ability whose interests lie in the planning, development and control of manufacturing or service operations.

In the Manufacturing Engineering and Management courses, the problems associated with the practical economics of manufacturing operations are stressed. The aim is to provide students with the education necessary to carry out an industrial job and to examine it critically in the light of economic efficiency.

Traditional engineering programs do not embrace the problems which are characteristic of Manufacturing Engineering and Management. These problems include the analysis of a product to ensure satisfactory functioning with regard to methods and sequence of manufacturing operations; the disposition of buildings and of equipment within them to permit efficient handling of materials; the avoidance of bottlenecks; the related problems of quality and cost control, testing and inspection;

labour and personnel relations; and, finally, the problem of distribution and sales.

The financial and economic aspects are studied as the problem in manufacturing has not been solved until the final translation of the product into money has been accomplished successfully. While it is not intended to develop an expert in accounting practice or economics, it is intended to produce an engineer with an appreciation of the problems of cost and one who can apply considerations of ultimate economy to all industrial problems. The techniques of operations research may be applied here, where mathematical models of real-life situations are constructed and manipulated to yield optimal solutions as guides to management.

An engineer trained in Manufacturing Engineering and Management may initially be employed in any of the following major areas of industrial activity: industrial economic analysis; planning and control of production; product and process design; methods engineering; operations research.

|          |                                              | HPW |    | UOC |
|----------|----------------------------------------------|-----|----|-----|
| Year 3   |                                              | S1  | S2 |     |
| ACCT9003 | Introduction to Accounting Principles        | 2   | -  | 3   |
| MANF3210 | Product Manufacture                          | 6   | -  | 6   |
| MANF3300 | Design of Manufacturing Facilities 1         | -   | 4  | 6   |
| MANF3420 | Industrial Experimentation                   | -   | 2  | 3   |
| MANF3500 | Computers in Manufacturing 1                 | -   | 3  | 3   |
| MANF3601 | Manufacturing Operations Analysis A          | 3   | -  | 3   |
| MANF3602 | Manufacturing Operations Analysis B          | -   | 3  | 3   |
| MECH3000 | Professional Responsibilities                | -   | 3  | 3   |
| MECH3211 | Linear Systems Analysis                      | 3   | -  | 3   |
| MTRN3212 | Principles of Control                        | -   | 3  | 3   |
| MTRN3530 | Computing Applications in Mechanical Systems | 3   | -  | 3   |
|          | General Education Elective                   | 2   | -  | 3   |
|          | General Education Elective                   | 2   | -  | 3   |
|          | General Education Elective                   | -   | 2  | 3   |

|          |                                           | HPW |    | UOC |
|----------|-------------------------------------------|-----|----|-----|
| Year 4   |                                           | S1  | S2 |     |
| MANF4011 | Analysis of Manufacturing Systems A       | 2   | -  | 3   |
| MANF4012 | Analysis of Manufacturing Systems B       | -   | 2  | 3   |
| MANF4300 | Design of Manufacturing Facilities 2      | -   | 4  | 6   |
| MANF4430 | Management for Engineers                  | 6   | -  | 6   |
| MANF4440 | Strategic Manufacturing Management        | 3   | -  | 3   |
| MANF4500 | Computers in Manufacturing 2              | 3   | -  | 3   |
| MANF4601 | Computer Aided Production Management A    | 3   | -  | 3   |
| MANF4602 | Computer Aided Production Management B    | -   | 3  | 3   |
| MECH4001 | Communications for Professional Engineers | -   | 3  | 3   |
| MECH4003 | Thesis A                                  | 0   | -  | 6   |
| MECH4004 | Thesis B                                  | -   | 0  | 9   |

### Mechanical Engineering (plan MECHA13710)

#### Years 3 and 4

The Mechanical Engineering plan provides a versatile, comprehensive coverage of areas involving the conception and design of machinery and mechanical plant, the supervision of its construction, operation and maintenance, the planning and supervision of large engineering projects, and general engineering management. Due to its wide range, a number of options are provided as Technical Elective courses in the final year. These are preferentially linked to provide a direction appropriate to the needs of Australian industry and to the specific interests of students, although some flexibility is available if required. Typical fields which may be encompassed by the plan include building services, computer-aided design, power generation, energy and environmental systems, gas and liquid handling, bio-mechanics, materials handling, control systems, and transport. An emphasis is placed on the application of engineering science, development and management in these fields.

|          |                               | HPW |    | UOC |
|----------|-------------------------------|-----|----|-----|
| Year 3   |                               | S1  | S2 |     |
| MECH3000 | Professional Responsibilities | -   | 3  | 3   |
| MECH3101 | Machine Systems Design A      | 3   | -  | 3   |
| MECH3102 | Machine Systems Design B      | -   | 3  | 3   |
| MECH3203 | Engineering Experimentation A | 2   | -  | 3   |
| MECH3204 | Engineering Experimentation B | -   | 2  | 3   |
| MECH3211 | Linear Systems Analysis       | 3   | -  | 3   |
| MECH3300 | Engineering Mechanics 3       | -   | 3  | 3   |
| MECH3330 | Vibration Analysis            | -   | 3  | 3   |

|          |                                   |   |   |   |
|----------|-----------------------------------|---|---|---|
| MECH3400 | Mechanics of Solids 3             | 3 | - | 3 |
| MECH3520 | Programming and Numerical Methods | 3 | - | 3 |
| MECH3601 | Thermofluid System Design         | 3 | - | 3 |
| MECH3602 | Advanced Thermodynamics           | - | 3 | 3 |
| MTRN3212 | Principles of Control             | - | 3 | 3 |
|          | General Education Elective        | 2 | - | 3 |
|          | General Education Elective        | 2 | - | 3 |
|          | General Education Elective        | - | 2 | 3 |

#### Year 4

|          |                                           |   |   |    |
|----------|-------------------------------------------|---|---|----|
| MANF4430 | Management for Engineers                  | 6 | - | 6  |
| MECH4001 | Communications for Professional Engineers | - | 3 | 3  |
| MECH4003 | Thesis A                                  | 0 | - | 6  |
| MECH4004 | Thesis B                                  | - | 0 | 9  |
|          | Technical Electives                       | 6 | - | 12 |
|          | Technical Electives                       | - | 6 | 12 |

### Mechanical Engineering Technical Electives

24 units of credit of Technical Elective courses are required. They may be selected from the postgraduate list of courses of the School or from Years 3 and 4 courses from other plans run by the School. Prerequisite and corequisite requirements must be satisfied.

Approval is required for the selection of any course from outside the School.

Due to staff availability and to demand, it is likely that not all of the Technical Electives will be always on offer. Students are advised in November which Technical Electives will be offered in the following year.

### Mechatronic Engineering (plan MTRNA13710)

#### Years 3 and 4

The Mechatronic Engineering plan provides the student with the ability to acquire a hybrid range of skills based on mechanics, electronics and computing. Whilst there is a comprehensive coverage of mechanical engineering and design areas, the plan enables a deeper understanding of the principles supporting the conception, design, construction, maintenance, integration and repair of intelligent machines. Typical examples of these machines are robots, white goods, cameras, automated test equipment and transport vehicles.

Typical fields which may be encompassed by the plan include building services, computer controlled plant, manufacturing, robotics and materials handling. An emphasis is placed on the application of engineering science, development and management in these fields.

|          |                                              | HPW |    | UOC |
|----------|----------------------------------------------|-----|----|-----|
| Year 3   |                                              | S1  | S2 |     |
| ELEC2042 | Real Time Instrumentation                    | -   | 3  | 3   |
| MECH3000 | Professional Responsibilities                | -   | 3  | 3   |
| MECH3101 | Machine Systems Design A                     | 3   | -  | 3   |
| MECH3203 | Engineering Experimentation A                | 2   | -  | 3   |
| MECH3204 | Engineering Experimentation B                | -   | 2  | 3   |
| MECH3211 | Linear Systems Analysis                      | 3   | -  | 3   |
| MECH3300 | Engineering Mechanics 3                      | -   | 3  | 3   |
| MECH3330 | Vibration Analysis                           | -   | 3  | 3   |
| MECH3400 | Mechanics of Solids 3                        | 3   | -  | 3   |
| MTRN3201 | Digital Logic for Mechatronics               | 3   | -  | 3   |
| MTRN3202 | Microprocessor Control                       | -   | 3  | 3   |
| MTRN3212 | Principles of Control                        | -   | 3  | 3   |
| MTRN3530 | Computing Applications in Mechanical Systems | 3   | -  | 3   |
|          | General Education Elective                   | 2   | -  | 3   |
|          | General Education Elective                   | 2   | -  | 3   |
|          | General Education Elective                   | -   | 2  | 3   |

#### Year 4

|          |                                           |   |   |    |
|----------|-------------------------------------------|---|---|----|
| MANF4430 | Management for Engineers                  | 6 | - | 6  |
| MECH3601 | Thermofluid System Design                 | 3 | - | 3  |
| MECH4001 | Communications for Professional Engineers | - | 3 | 3  |
| MECH4003 | Thesis A                                  | 0 | - | 6  |
| MECH4004 | Thesis B                                  | - | 0 | 9  |
| MTRN4221 | Industrial Robotics                       | 3 | - | 3  |
|          | Technical Elective                        | x | - | 6  |
|          | Technical Electives                       | - | x | 12 |

### Mechatronic Engineering Technical Electives

18 units of credit of Technical Elective courses are required. It is recommended that they be primarily chosen from the Preferred Electives

List given below. Included must be at least one of COMP3111, COMP3331 or ELEC3041. However they may, with approval, be selected from the postgraduate list of courses of the School or from Years 3 and 4 courses from other undergraduate plans run by the School. Prerequisite and corequisite requirements must be satisfied.

Approval is required for the selection of any course from outside the School.

Due to staff availability and to demand, it is likely that not all of the Technical Electives listed will be always on offer. Students are advised in November which Technical Electives will be offered in the following year.

|                          |                                              | HPW    |    | UOC |
|--------------------------|----------------------------------------------|--------|----|-----|
| Preferred Electives List |                                              | S1     | S2 |     |
| COMP3111                 | Software Engineering                         | 5 or 5 |    | 6   |
| COMP3331                 | Computer Networks and Applications           | 5 or 5 |    | 6   |
| ELEC3041                 | Real Time Engineering                        | -      | 4  | 6   |
| MTRN9211                 | Modelling and Control of Mechatronic Systems | -      | 3  | 6   |
| MTRN9222                 | Intelligent Machines                         | 3      | -  | 6   |
| MTRN9223                 | Machine Condition Monitoring                 | 3      | -  | 6   |

### Naval Architecture (plan NAVLA13710)

#### Years 3 and 4

Naval Architecture is the branch of engineering which is concerned with the design, building and utilisation of all types of ships and marine vehicles.

Naval architects must be conversant with a wide variety of skills, including most forms of engineering and architecture. This is because a ship or a boat must be a completely self-sufficient vehicle containing a number of systems and able to withstand the loads from the sea. Yachts, fishing boats, frigates, ferries, catamarans and pleasure craft are just a few of the types of vessels that are studied during the program.

The Faculty has approved an arrangement whereby students who satisfy the requirements of the first two years of a Mechanical Engineering four year degree program at any Australasian tertiary institution may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Naval Architecture. The proviso is that the Head of the School is satisfied that the courses studied at the other institution are equivalent and gives their recommendation.

|          |                                   | HPW |    | UOC |
|----------|-----------------------------------|-----|----|-----|
| Year 3   |                                   | S1  | S2 |     |
| MECH3000 | Professional Responsibilities     | -   | 3  | 3   |
| MECH3211 | Linear Systems Analysis           | 3   | -  | 3   |
| MECH3330 | Vibration Analysis                | -   | 3  | 3   |
| MECH3400 | Mechanics of Solids 3             | 3   | -  | 3   |
| MECH3520 | Programming and Numerical Methods | 3   | -  | 3   |
| MTRN3212 | Principles of Control             | -   | 3  | 3   |
| NAVL3100 | Principles of Ship Design         | -   | 3  | 3   |
| NAVL3110 | Ship Practice                     | 3   | -  | 3   |
| NAVL3400 | Ship Structures 1                 | -   | 3  | 3   |
| NAVL3603 | Ship Hydromechanics A             | 6   | -  | 6   |
| NAVL3604 | Ship Hydromechanics B             | -   | 3  | 3   |
| NAVL3700 | Ship Propulsion                   | -   | 3  | 3   |
|          | General Education Elective        | 2   | -  | 3   |
|          | General Education Elective        | 2   | -  | 3   |
|          | General Education Elective        | -   | 2  | 3   |

#### Year 4

|          |                                           |   |   |   |
|----------|-------------------------------------------|---|---|---|
| MANF4430 | Management for Engineers                  | 6 | - | 6 |
| MECH4001 | Communications for Professional Engineers | - | 3 | 3 |
| MECH4003 | Thesis A                                  | 0 | - | 6 |
| MECH4004 | Thesis B                                  | - | 0 | 9 |
| NAVL4101 | Design of High-speed Craft                | 3 | - | 3 |
| NAVL4102 | Design of Yachts                          | - | 3 | 3 |
| NAVL4111 | Ship Design Project A                     | 3 | - | 3 |
| NAVL4112 | Ship Design Project B                     | - | 3 | 3 |
| NAVL4401 | Ship Structures 2A                        | 3 | - | 3 |
| NAVL4402 | Ship Structures 2B                        | - | 3 | 3 |
| NAVL4710 | Ship Standards                            | 3 | - | 3 |
| NAVL4720 | Marine Engineering                        | - | 3 | 3 |

### Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours

will be awarded for meritorious performance over the program: Special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

### Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

#### Program Progression Guidelines

The student's attention is directed to the 'Rules for Progression & the Award of Degrees' under 'Faculty Information and Assistance' in this Handbook. In addition, the following points should be noted:

A student who is faced with compiling a timetable comprising courses from two academic years must give preference to courses from the lower year.

#### Thesis Arrangements

- The course MECH4001 Communications for Professional Engineers must only be taken in conjunction with either MECH4003 Thesis A or MECH4004 Thesis B.
- MECH4003 and MECH4004 must be undertaken in two consecutive sessions which are the final two sessions of candidature.
- A student must not be enrolled in more than 24 units of credit in any session involving MECH4003 and MECH4004.
- A single thesis project is commenced in MECH4003 and completed in MECH4004. MECH4004 carries the mark for the thesis project.
- MECH4003 is graded satisfactory (SY)/ failure (FN). If a student receives a failure (FN) in MECH4003, a student cannot proceed with MECH4004.
- If the project is abandoned during MECH4004, or if MECH4004 is failed, then the satisfactory (SY) for MECH4003 is changed to failure (FN). To complete the degree, a completely new topic must be chosen and the student must enrol again in both MECH4003 and MECH4004. (For BE MBIomedE students, read BIOM5001 instead of MECH4003 and BIOM5002 instead of MECH4004)

### Industrial Experience Requirements

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete a total of sixty working days of industrial experience. A written report describing this experience is a requirement to passing the common, fourth year course MECH4001, Communications for Professional Engineers.

### Professional Recognition

The Institution of Engineers, Australia, recognises the degree of BE in any of the undergraduate programs offered by the School as meeting the examination requirements for admission to graduate and corporate membership. Substantial or complete recognition is accorded to the BE degree programs by overseas engineering institutions.

The award of the BE degree in Aerospace Engineering is recognised by the Royal Aeronautical Society as giving exemption from the formal examination requirements for corporate membership. Advancement from graduate membership to associate membership grade is awarded on a case by case basis after a further period of some years of professional experience.

The award of the BE degree in Naval Architecture is recognised by the Royal Institution of Naval Architects (RINA), London, as the academic qualification for corporate membership of that body.

### General Education

For students taking the Manufacturing Engineering and Management plan, the accounting courses GENC1001, GENC1002 or GENC1003 should not be chosen as they partially duplicate course ACCT9003.

## 3711 Bachelor of Engineering Bachelor of Science BE BSc

**Aerospace Engineering (plan AEROA13711 + Science plan)**

**Manufacturing Engineering and Management (plan MANFA13711 + Science plan)**

**Mechanical Engineering (plan MECHA13711 + Science plan)**

**Mechatronic Engineering (plan MTRNA13711 + Science plan)**

**Naval Architecture (plan NAVLA13711 + Science plan)**

**Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit with a minimum of 102 units of credit from Science Faculty

**Typical UOC per Session**

24 units of credit

### Program Description

The combined degree program of five years full-time study enables a student to qualify for the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). Every session of the program contains only the standard 24 Units of Credit of courses and hence workload should not be greater than in a single degree program. The combined degree program is administered by the School of Mechanical and Manufacturing Engineering.

For the Bachelor of Science the student selects a second plan based on an approved major sequence of courses. A major sequence is defined to comprise 42 Units of Credit of courses at Levels 2 and 3 with at least 18 Units of Credit being at Level 3. Overall, in the combined degree program, at least 84 units of credit must be taught by Science.

In some BSc majors, science courses specific to engineering degrees, e.g. PHYS1169 Physics 1CME, MATH2029 Engineering Mathematics 2A, will be exchanged for courses within that major.

The general layout for the combined degree is given below. Detailed outlines for each combination of engineering and science are available from the School.

Students who commence the program and do not complete the Engineering component may take out a BSc degree on completion of all Science requirements. Similarly, students not wishing to complete the BSc degree, may transfer to a plan under the single degree Engineering program and be given appropriate credit for courses satisfactorily completed.

Plans within this program:

**Aerospace Engineering (plan AEROA13711 + Science plan)**

**Manufacturing Engineering and Management (plan MANFA13711 + Science plan)**

**Mechanical Engineering (plan MECHA13711 + Science plan)**

**Mechatronic Engineering (plan MTRNA13711 + Science plan)**

**Naval Architecture (plan NAVLA13711 + Science plan)**

### Program Structure

#### Year 1

|                                             |                                       |         |
|---------------------------------------------|---------------------------------------|---------|
| CHEM1817                                    | Chemistry 1ME                         | (3 UOC) |
| MANF1130                                    | Introduction to Manufacturing         | (6 UOC) |
| MATH1131                                    | Mathematics 1A                        | (6 UOC) |
| MATH1231                                    | Mathematics 1B                        | (6 UOC) |
| MATS9520                                    | Engineering Materials                 | (3 UOC) |
| MECH1120                                    | Design and the Engineering Profession | (3 UOC) |
| MECH1500                                    | Computing 1M                          | (3 UOC) |
| PHYS1169                                    | Physics 1 (Chem, Mech, Min Eng)       | (6 UOC) |
| Plus 12 units of credits of Science courses |                                       |         |

#### Year 2

|          |                            |         |
|----------|----------------------------|---------|
| MATH2029 | Engineering Mathematics 2A | (6 UOC) |
| MATH2039 | Engineering Mathematics 2B | (3 UOC) |
| MATH2839 | Statistics SM              | (3 UOC) |
| MECH1300 | Engineering Mechanics 1    | (6 UOC) |
| MECH1400 | Mechanics of Solids 1      | (6 UOC) |
| MECH2611 | Fluid Mechanics A          | (3 UOC) |
| MECH2612 | Fluid Mechanics B          | (3 UOC) |

|          |                  |         |
|----------|------------------|---------|
| MECH2711 | Thermodynamics A | (3 UOC) |
| MECH2712 | Thermodynamics B | (3 UOC) |

Plus 12 units of credit of Science courses.

#### Year 3

|          |                               |         |
|----------|-------------------------------|---------|
| ELEC0807 | Electrical Engineering 1E     | (6 UOC) |
| MECH2101 | Machine Design A              | (3 UOC) |
| MECH2102 | Machine Design B              | (3 UOC) |
| MECH2300 | Engineering Mechanics 2       | (3 UOC) |
| MECH2411 | Mechanics of Solids 2A        | (3 UOC) |
| MECH2412 | Mechanics of Solids 2B        | (3 UOC) |
| MECH3000 | Professional Responsibilities | (3 UOC) |

Plus 24 units of credit of Science courses.

#### Year 4

|                                                                                                                   |          |
|-------------------------------------------------------------------------------------------------------------------|----------|
| S1 Year 3 engineering plan,<br>less 6 units of credit General Education<br>Plus 6 units of credit Science courses | (18 UOC) |
|-------------------------------------------------------------------------------------------------------------------|----------|

|                                                                                                                                            |          |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------|
| S2 Year 3 engineering plan,<br>less General Education &<br>MECH3000 Professional Responsibilities<br>Plus 6 units of credit Science course | (18 UOC) |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------|

#### Year 5

S1 Year 4 engineering plan 24 units of credit.

S2 Year 4 engineering plan 24 units of credit.

### Academic Rules

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## 3712 Bachelor of Engineering Bachelor of Arts BE BA

**Aerospace Engineering (plan AEROA13712 + Arts plan)**

**Manufacturing Engineering and Management (plan MANFA13712 + Arts plan)**

**Mechanical Engineering (plan MECHA13712 + Arts plan)**

**Mechatronic Engineering (plan MTRNA13712 + Arts plan)**

**Naval Architecture (plan NAVLA13712 + Arts plan)**

**Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

### Program Description

With this combined degree program students can add their choice of an Arts plan to a professionally accredited engineering plan in Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering or Naval Architecture. Thus every session of the combined degree program contains only the standard 24 Units of Credit of courses and hence the workload should not be greater than in a single degree program. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program later, although with late transfer it might not be possible to complete the course in minimum time. In this case the student will have to prescribe their own engineering plan following discussion with the School. The full range of Arts plans is available.

Because the Engineering and Arts plans have common content, such as mathematics and physics, only one more year of study is required to gain the additional qualification of Bachelor of Arts.

### Program Objectives and Learning Outcomes

Please contact the School of Mechanical & Manufacturing Engineering and the Faculty of Arts for information on the Program Objectives and Learning Outcomes.

### Program Structure

Plans within this program:

**Aerospace Engineering** (plan **AEORA13712** + Arts plan)  
**Manufacturing Engineering and Management** (plan **MANFA13712** + Arts plan)  
**Mechanical Engineering** (plan **MECHA13712** + Arts plan)  
**Mechatronic Engineering** (plan **MTRNA13712** + Arts plan)  
**Naval Architecture** (plan **NAVLA13712** + Arts plan)

## Academic Rules

### Eligibility

Anyone who meets the entry requirements for both Engineering and Arts is eligible for the combined program.

### Rules

1. In addition to their chosen engineering plan, students must complete a major sequence approved arts plan containing at least 60 units of credit of courses.

Mathematics majors are not usually permitted. BE BSc combined degrees are more appropriate for this.

2. There will be a testamur for each part of the combined degree program.

3. Students who complete the BE program first may proceed to graduation with the degree of Bachelor of Engineering in the usual way provided they have also completed 12 Units of Credit in General Education.

## Further Information

### Organisation

The BE BA program is administered by the School of Mechanical and Manufacturing Engineering.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as soon as possible - preferably well before enrolment. Enquiries should be directed to the Executive Assistant to the Dean of the Faculty of Arts and Social Sciences.

Students should work out for themselves the arts program they would like to add to their chosen engineering plan. The Arts and Social Sciences Faculty section in this Handbook describes the options, and the School of Mechanical and Manufacturing Engineering can supply sample plans showing what previous students have arranged. Although the Arts and Social Sciences Faculty section in this Handbook lists courses from the Faculties of Engineering and Science, it is not permissible for BE BA students to include these courses.

There are no special rules on what to include in each year. Students should schedule the arts and engineering components to suit their preferences while meeting the constraints of timetables and prerequisites. The sample plans can help here too.

The Arts component must be approved by the Faculty of Arts and Social Sciences.

The final program and schedule must be approved by the School.

## 3715 Mechanical, Manufacturing or Mechatronic Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 3683 Mechanical Engineering/ Master of Biomedical Engineering

### Bachelor of Engineering Master of Biomedical Engineering BE MBIomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

A Bachelor of Engineering degree in Mechanical Engineering and a Master of Biomedical Engineering degree (BE MBIomedE) can both be completed in five years of concurrent study.

## Program Structure

### Biomedical Engineering Electives

For a full list of Biomedical Engineering Electives, refer to the Graduate School of Biomedical Engineering in the Postgraduate Handbook.

#### Year 1

|          |                                       |         |
|----------|---------------------------------------|---------|
| BIOM1001 | Professional Biomedical Studies       | (3 UOC) |
| BIOM2010 | Biomedical Engineering Practice       | (3 UOC) |
| CHEM1817 | Chemistry 1ME                         | (3 UOC) |
| MANF1130 | Introduction to Manufacturing         | (6 UOC) |
| MATH1131 | Mathematics 1A                        | (6 UOC) |
| MATH1231 | Mathematics 1B                        | (6 UOC) |
| MECH1120 | Design and the Engineering Profession | (3 UOC) |
| MECH1300 | Engineering Mechanics 1               | (6 UOC) |
| MECH1400 | Mechanics of Solids 1                 | (6 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng)       | (6 UOC) |

#### Year 2

|          |                             |         |
|----------|-----------------------------|---------|
| BIOM9420 | Clinical Laboratory Science | (6 UOC) |
| ELEC0807 | Electrical Engineering 1E   | (6 UOC) |
| MATH2029 | Engineering Mathematics 2A  | (6 UOC) |
| MATH2039 | Engineering Mathematics 2B  | (3 UOC) |
| MATH2839 | Statistics SM               | (3 UOC) |
| MATS9520 | Engineering Materials       | (3 UOC) |
| MECH1500 | Computing 1M                | (3 UOC) |
| MECH2411 | Mechanics of Solids 2A      | (3 UOC) |
| MECH2412 | Mechanics of Solids 2B      | (3 UOC) |
| MECH2611 | Fluid Mechanics A           | (3 UOC) |
| MECH2612 | Fluid Mechanics B           | (3 UOC) |
| MECH2711 | Thermodynamics A            | (3 UOC) |
| MECH2712 | Thermodynamics B            | (3 UOC) |

#### Year 3

|                                   |                                 |         |
|-----------------------------------|---------------------------------|---------|
| ANAT2511                          | Fundamentals of Anatomy         | (6 UOC) |
| MECH2101                          | Machine Design A                | (3 UOC) |
| MECH2102                          | Machine Design B                | (3 UOC) |
| MECH2300                          | Engineering Mechanics 2         | (3 UOC) |
| MECH3203                          | Engineering Experimentation A   | (3 UOC) |
| MECH3204                          | Engineering Experimentation B   | (3 UOC) |
| MECH3211                          | Linear Systems Analysis         | (3 UOC) |
| MECH3300                          | Engineering Mechanics 3         | (3 UOC) |
| MECH3330                          | Vibration Analysis              | (3 UOC) |
| MECH3520                          | Programming & Numerical Methods | (3 UOC) |
| MECH3601                          | Thermofluid System Design       | (3 UOC) |
| MECH3602                          | Advanced Thermodynamics         | (3 UOC) |
| MTRN3212                          | Principles of Control           | (3 UOC) |
| 1 Biomedical Engineering Elective |                                 | (6 UOC) |

#### Year 4

|                                    |                                           |         |
|------------------------------------|-------------------------------------------|---------|
| BIOM5001                           | Thesis Part A                             | (6 UOC) |
| MANF4430                           | Management for Engineers                  | (6 UOC) |
| MECH3101                           | Machine Systems Design A                  | (3 UOC) |
| MECH3102                           | Machine Systems Design B                  | (3 UOC) |
| MECH3400                           | Mechanics of Solids 3                     | (3 UOC) |
| MECH4001                           | Communications for Professional Engineers | (3 UOC) |
| PHPH2121                           | Principles of Physiology A                | (6 UOC) |
| PHPH2221                           | Principles of Physiology B                | (6 UOC) |
| 1 Biomedical Engineering Elective  |                                           | (6 UOC) |
| 1 Mechanical Engineering Technical |                                           | (6UOC)  |

#### Year 5

|                                  |                               |          |
|----------------------------------|-------------------------------|----------|
| BIOM5002                         | Thesis Part B                 | (9 UOC)  |
| BIOM9410                         | Regulatory Req of Biomed Tech | (6 UOC)  |
| MECH3000                         | Professional Responsibilities | (3 UOC)  |
| Biomedical Engineering Electives |                               | (24 UOC) |
| General Education Electives      |                               | (6 UOC)  |

### Masters Thesis

Masters Thesis BIOM9913 Project Report can be taken instead of 12 UOC of Biomedical Engineering Electives.

## General Education Requirements

Students in this program must also satisfy the General Education requirements. This is usually 6 UOC taken in the final year of studies.

Each Faculty has responsibility for deciding what courses are able to be counted towards the General Education requirement for their students. The Faculty of Engineering is committed to providing the widest range of choice of general education electives for its students. It strongly encourages students to make the best use of this flexibility. Please contact

your School Office for further information on General Education electives available to you.

For further information, please refer to the General Education section in this Handbook.

### Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Mechanical and Manufacturing Engineering for more information.

## 3688 Mechatronic Engineering/Master of Biomedical Engineering

### Bachelor of Engineering Master of Master of Biomedical Engineering BE MBIomedE

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

A Bachelor of Engineering degree in Mechatronic Engineering and a Master of Biomedical Engineering degree (BE MBIomedE) can both be completed in five years of concurrent study.

### Program Structure

#### Year 1

|          |                                       |         |
|----------|---------------------------------------|---------|
| BIOM1001 | Professional Biomedical Studies       | (3 UOC) |
| BIOM2010 | Biomedical Engineering Practice       | (3 UOC) |
| CHEM1817 | Chemistry 1ME                         | (3 UOC) |
| MANF1130 | Introduction to Manufacturing         | (6 UOC) |
| MATH1131 | Mathematics 1A                        | (6 UOC) |
| MATH1231 | Mathematics 1B                        | (6 UOC) |
| MECH1120 | Design and the Engineering Profession | (3 UOC) |
| MECH1300 | Engineering Mechanics 1               | (6 UOC) |
| MECH1400 | Mechanics of Solids 1                 | (6 UOC) |
| PHYS1169 | Physics 1 (Chem,Mech,Min Eng)         | (6 UOC) |

#### Year 2

|          |                             |         |
|----------|-----------------------------|---------|
| BIOM9420 | Clinical Laboratory Science | (6 UOC) |
| ELEC0807 | Electrical Engineering 1E   | (6 UOC) |
| MATH2029 | Engineering Mathematics 2A  | (6 UOC) |
| MATH2039 | Engineering Mathematics 2B  | (3 UOC) |
| MATH2839 | Statistics SM               | (3 UOC) |
| MATS9520 | Engineering Materials       | (3 UOC) |
| MECH1500 | Computing 1M                | (3 UOC) |
| MECH2411 | Mechanics of Solids 2A      | (3 UOC) |
| MECH2412 | Mechanics of Solids 2B      | (3 UOC) |
| MECH2611 | Fluid Mechanics A           | (3 UOC) |
| MECH2612 | Fluid Mechanics B           | (3 UOC) |
| MECH2711 | Thermodynamics A            | (3 UOC) |
| MECH2712 | Thermodynamics B            | (3 UOC) |

#### Year 3

|          |                                 |         |
|----------|---------------------------------|---------|
| ANAT2511 | Fundamentals of Anatomy         | (6 UOC) |
| MECH2101 | Machine Design A                | (3 UOC) |
| MECH2102 | Machine Design B                | (3 UOC) |
| MECH2300 | Engineering Mechanics 2         | (3 UOC) |
| MECH3203 | Engineering Experimentation A   | (3 UOC) |
| MECH3204 | Engineering Experimentation B   | (3 UOC) |
| MECH3211 | Linear Systems Analysis         | (3 UOC) |
| MECH3300 | Engineering Mechanics 3         | (3 UOC) |
| MECH3330 | Vibration Analysis              | (3 UOC) |
| MTRN3201 | Digital Logic for Mechatronics  | (3 UOC) |
| MTRN3202 | Microprocessor Control          | (3 UOC) |
| MTRN3212 | Principles of Control           | (3 UOC) |
| MTRN3530 | Computing Applcts in Mech.Sys.  | (3 UOC) |
|          | Biomedical Engineering Elective | (6 UOC) |

#### Year 4

|          |                           |         |
|----------|---------------------------|---------|
| BIOM5001 | Thesis Part A             | (6 UOC) |
| ELEC2042 | Real Time Instrumentation | (3 UOC) |
| MANF4430 | Management for Engineers  | (6 UOC) |
| MECH3101 | Machine Systems Design A  | (3 UOC) |

|          |                                           |         |
|----------|-------------------------------------------|---------|
| MECH3400 | Mechanics of Solids 3                     | (3 UOC) |
| MECH3601 | Thermofluid System Design                 | (3 UOC) |
| MECH4001 | Communications for Professional Engineers | (3 UOC) |
| MTRN4221 | Industrial Robotics                       | (3 UOC) |
| PHPH2121 | Principles of Physiology A                | (6 UOC) |
| PHPH2221 | Principles of Physiology B                | (6 UOC) |
|          | Biomedical Engineering Elective           | (6 UOC) |

#### Year 5

|          |                                  |          |
|----------|----------------------------------|----------|
| BIOM5002 | Thesis Part B                    | (9 UOC)  |
| BIOM9410 | Regulatory Req of Biomed Tech    | (6 UOC)  |
| BIOM9613 | Medical Instrumentation          | (6 UOC)  |
| MECH3000 | Professional Responsibilities    | (3 UOC)  |
|          | Biomedical Engineering Electives | (12 UOC) |
|          | Mtrn Technical Elective          | (6 UOC)  |
|          | General Education Electives      | (6 UOC)  |

### Masters Thesis

Masters Thesis BIOM9913 Project Report can be taken instead of 12 UOC of Biomedical Engineering electives.

### Biomedical Engineering Electives

For a full list of Biomedical Engineering Electives, refer to the Graduate School of Biomedical Engineering in the Postgraduate Handbook.

### General Education Requirements

Students in this program need to satisfy the General Education requirements of 6 units of credit which is taken in the final of the studies. For further information, please refer to the General Education section in this Handbook.

Each Faculty has responsibility for deciding what courses are able to be counted towards the General Education requirement for their students.

The Faculty of Engineering is committed to providing the widest range of choice of general education electives for its students. It strongly encourages students to make the best use of this flexibility. Please contact your School Office for further information on General Education electives available to you.

### Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Mechanical and Manufacturing Engineering for more information.

## Fast-Track Program with Master of Engineering Science

### 3710 Bachelor of Engineering/8710 Master of Engineering Science

#### BE MEngSc

A Bachelor of Engineering degree in Manufacturing Engineering and Management, in Mechanical Engineering, or in Mechatronic Engineering, and a Master of Engineering Science degree (BE MEngSc) can both be completed in four and a half years of study.

Students undertake the first three years (6 sessions) of the standard BE plan in Manufacturing Engineering and Management, in Mechanical Engineering, or in Mechatronic Engineering. Subject to satisfying a minimum performance requirement over these three years (see below), they (a) substitute 12 units of credit of the standard Year 4 BE degree plan with 12 units of credit of approved postgraduate coursework in their fourth year, (b) they undertake 12 units of credit of project/thesis work over the Summer (9th) Session, and (c) they undertake 24 units of credit of postgraduate coursework in the 10th session (first half of their fifth year).

There will be a testamur for each degree. The degree of Bachelor of Engineering will be awarded on the satisfactory completion of the first eight sessions.

### Admission Requirements

Admission to the BE MEngSc will require a credit grade average by the end of Year 3.

### 3710 Manufacturing Engineering and Management

#### Years 1, 2 and 3 (plan MANFA13710)

Students in Years 1 and 2 are enrolled in the standard single degree Manufacturing Engineering and Management plan MANFA13710 within program 3710.

**Year 4 (plan MANFL13710)**

In Year 4, students transfer to the special plan MANFL13710 within program 3710. Compared to the standard plan for Session 1 of Year 4, the postgraduate course MANF9471 Manufacturing Strategy is substituted for MANF4440 Strategic Manufacturing Management and for MANF4500 Computers in Manufacturing 2. In Session 2, the postgraduate course MANF9340 Factory Automation is substituted for MANF4300 Design of Manufacturing Facilities 2.

|          |                                           | HPW |    | UOC |
|----------|-------------------------------------------|-----|----|-----|
|          |                                           | S1  | S2 |     |
| MANF4011 | Analysis of Manufacturing Systems A       | 2   | -  | 3   |
| MANF4012 | Analysis of Manufacturing Systems B       | -   | 2  | 3   |
| MANF4430 | Management for Engineers                  | 6   | -  | 6   |
| MANF4601 | Computer Aided Production Management A    | 3   | -  | 3   |
| MANF4602 | Computer Aided Production Management B    | -   | 3  | 3   |
| MECH4001 | Communications for Professional Engineers | -   | 3  | 3   |
| MECH4003 | Thesis A                                  | 0   | -  | 6   |
| MECH4004 | Thesis B                                  | -   | 0  | 9   |
| MANF9340 | Factory Automation                        | -   | 3  | 6   |
| MANF9471 | Manufacturing Strategy                    | 3   | -  | 6   |

**8710 Manufacturing Engineering and Management**

After Year 4, students, having completed their engineering program, change to MEngSc program 8710.

**Summer Session between Year 4 and Year 5**

Students undertake a 12 UOC project, MANF9010.

**Year 5**

24 UOC of courses are selected from the School's postgraduate courses. It is suggested that consideration be given to the courses making up the Manufacturing Engineering and Management specialisation plans outlined in the Postgraduate Handbook. Attribution of a specialisation on the Master of Engineering Science testamur may not be possible if project MANF9010 has been taken instead of certain courses. Consult the School for direction on this matter.

**3710 Mechanical Engineering**

Years 1, 2 and 3 (plan MECHA13710)

Students in Years 1 and 2 are enrolled in the standard single degree Mechanical Engineering plan MECHA13710 within program 3710.

**Year 4 (plan MECHL13710)**

In Year 4, students transfer to the special plan MECHL13710 within program 3710. This plan requires that a minimum of 12 units of credit of postgraduate courses must be selected as part of the 24 units of credit Technical Electives requirement. Typically this means that a minimum of 12 units of credit of MECH9\*\*\* courses are selected.

**8710 Mechanical Engineering**

After Year 4, students, having completed their engineering program, change to MEngSc program 8710.

**Summer Session between Year 4 and Year 5**

Students undertake a 12 UOC project, MECH9010.

**Year 5**

24 UOC of courses are selected from the School's postgraduate courses. It is suggested that consideration be given to the courses making up the Mechanical specialisation plans outlined in the Postgraduate Handbook.

**3710 Mechatronic Engineering**

Years 1, 2 and 3 (plan MTRNA13710)

Students in Years 1 and 2 are enrolled in the standard single degree Mechatronic Engineering plan MTRNA13710 within program 3710.

**Year 4 (plan MTRNL13710)**

In Year 4, students transfer to the special plan MTRNL13710 within program 3710. This plan requires that a minimum of 12 units of credit of postgraduate courses must be selected as part of the 18 units of credit Technical Electives requirement. Typically this means that a minimum of 12 units of credit of MTRN9\*\*\* courses are selected.

**8710 Mechatronic Engineering**

After Year 4, students, having completed their engineering program, change to MEngSc program 8710.

**Summer Session between Year 4 and Year 5**

Students undertake a 12 UOC project, MTRN9010.

**Year 5**

24 UOC of courses are selected from the School's postgraduate courses. It is suggested that consideration be given to the courses making up the Mechatronic specialisation plans outlined in the Postgraduate Handbook.

**School of Mining Engineering**

**Head of School:** Professor BK Hebblewhite

**Director - Undergraduate Studies:** Dr Paul Hagan

**Administrative Assistants:** Mrs Carol Bell, Mrs Kim Russell

Mining Engineering offers a diverse range of career path options, high salary levels and excellent opportunities for career progression. This is because it is a global profession that encompasses a wide range of activities involving people, technology, equipment, financial resources, community and government.

Mining Engineering is concerned with the safe, economic and environmentally sustainable recovery, processing and marketing of mineral resources from the earth. The Mining Engineering degree program includes elements from other disciplines including geology, metallurgy, commerce, economics and management. This means that graduates possessing knowledge of mining processes within this framework are very versatile and can progress rapidly both within the mining industry and in those sectors affiliated to the industry.

Career opportunities exist in areas such as operations and project management, and technical design at mine sites; corporate management within mining organisations; engineering design, geotechnical engineering, environmental engineering, risk management and technology developments with consultants, research organisations and equipment manufacturers; specialist mining software design and development with IT organisations; mine planning and design, financial evaluation and feasibility studies with merchant banks, stock brokers, mining organisations and consultants; policy formulation, administration and regulation with government; as well as opportunities in quarrying, tunnelling for infrastructure development in urban areas, education and training.

Mining engineering is an international profession with the major mining companies operating in many parts of South East Asia, Africa, South and North America and Europe. Our graduates have the flexibility and opportunity to travel in their work if they so desire. Mining Engineering graduates are trained to be versatile, adaptable and responsive to change in a physically and mentally challenging career.

Further details can be found at our website at [www.mining.unsw.edu.au](http://www.mining.unsw.edu.au)

The School offers a four year full-time program in Mining Engineering leading to the award of the degree of Bachelor of Engineering at Pass or Honours level. A five year combined degree program is also available with Civil Engineering, Science or Arts.

After graduation, mining engineers who choose to develop careers in operations management gain further practical experience to obtain a Mine Manager's Certificate of Competency, in either Coal or Metalliferous Mining.

Formal arrangements are in place with the University of Newcastle and the University of Tasmania for students who have completed a specified program to be admitted with advanced standing to Year 3 of the program at UNSW. Recognition of students from other institutions or graduates of other disciplines may also be considered for advanced standing to the program.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

**3140 Mining Engineering****Bachelor of Engineering BE****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

Year 1 of the program includes courses that cover the sciences to provide the foundation for many of the engineering courses offered in Year 2. Year 3 is largely devoted to fundamental courses in mining engineering while Year 4 provides advanced instruction in aspects essential for all mining engineers. In addition, the fourth year offers a range of electives that allow students to supplement their studies with a minor specialisation. A number of General Education courses are also prescribed in the program. In keeping with the international career opportunities, students are encouraged to undertake a foreign culture/language course as a General Education elective.

An important requirement in the fourth year is for students to undertake personal research or a study project in mining or minerals engineering for which they are required to submit a dissertation for examination. High achieving students who have maintained a Distinction average grade can also choose to undertake a research project in Years 2 and 3 of the program.

For the award of Honours at the conclusion of the program, students will need to have distinguished themselves in the formal course work, in other assignments as directed by the Head of School and in the final year research project.

Some courses in the program require students to attend field trips as part of the learning process. This provides an opportunity for students to gain immediate practical insight into the application of the theoretical concepts presented in courses.

In the undergraduate program, it is compulsory for students to gain practical experience in the mining industry during successive long recesses. A minimum of 80 days needs to be completed on which a student must submit a report and give a presentation on the experience before graduation. The School assists students as much as possible in securing suitable vacation employment.

**Program Objectives and Learning Outcomes**

The School offers a four year full-time program in Mining Engineering leading to the award of the degree of Bachelor of Engineering at Pass or Honours level. A five year combined degree program is also available in Civil Engineering, in Science, and in Arts.

After graduation, mining engineers who choose to develop careers in operations management gain further practical experience to obtain a Mine Manager's Certificate of Competency, in either Coal or Metalliferous Mining.

Formal arrangements are in place with the University of Newcastle and the University of Tasmania for students who have satisfactorily completed a specified program to be admitted with advanced standing to Year 3 of the program at UNSW. Recognition of students from other institutions or graduates of other disciplines may also be considered for advanced standing to the program.

**Program Structure****Year 1**

|          |                                    |         |
|----------|------------------------------------|---------|
| CHEM1817 | Chemistry 1ME                      | (3 UOC) |
| GEOS1111 | Fundamentals of Geology            | (6 UOC) |
| MATH1131 | Mathematics 1A                     | (6 UOC) |
| MATH1231 | Mathematics 1B                     | (6 UOC) |
| MATS9410 | Materials for Mining Engineers     | (3 UOC) |
| MINE1010 | Introduction to Mining Engineering | (6 UOC) |
| MINE1020 | Mining Industry Practice           | (6 UOC) |
| MINE1300 | Applied Mechanics                  | (6 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng)    | (6 UOC) |

**Year 2**

|          |                                |         |
|----------|--------------------------------|---------|
| ELEC0809 | Electrical Engineering 1C      | (3 UOC) |
| GMAT0443 | Surveying for Mining Engineers | (3 UOC) |
| MATH2029 | Engineering Mathematics 2A     | (6 UOC) |
| MATH2039 | Engineering Mathematics 2B     | (3 UOC) |
| MINE2010 | Mining Project Development     | (6 UOC) |
| MINE2310 | Structural Mechanics           | (6 UOC) |
| MINE2320 | Mining Stress Analysis         | (3 UOC) |
| MINE2500 | Fluids & Thermodynamics        | (6 UOC) |
| MINE2700 | Mining Data Analysis           | (3 UOC) |

Plus 3 x General Education Electives totalling 9 units of credit

**Year 3**

|          |                                     |         |
|----------|-------------------------------------|---------|
| GEOS3300 | Mine Geology                        | (3 UOC) |
| MINE3210 | Resource Mining Control System      | (3 UOC) |
| MINE3300 | Mining Geomechanics                 | (6 UOC) |
| MINE3410 | Coal Mining Systems                 | (6 UOC) |
| MINE3420 | Metal Mining Systems                | (6 UOC) |
| MINE3500 | Mine Workplace Environment          | (6 UOC) |
| MINE3610 | Excavation Engineering              | (6 UOC) |
| MINE3620 | Mine Infrastructure & Services      | (3 UOC) |
| MINE3710 | Mine Economics and Business Systems | (6 UOC) |
| MINE3800 | Mineral Processing                  | (3 UOC) |

**Year 4**

|          |                                          |         |
|----------|------------------------------------------|---------|
| MINE4210 | Mine Planning                            | (6 UOC) |
| MINE4220 | Coal Mine Design and Evaluation Project  | (9 UOC) |
| MINE4230 | Metal Mine Design and Evaluation Project | (9 UOC) |
| MINE4240 | Mine Design and Evaluation               | (9 UOC) |
| MINE4300 | Geotechnical Engineering                 | (6 UOC) |
| MINE4410 | Industry Applications                    | (6 UOC) |
| MINE4420 | Thesis A                                 | (6 UOC) |
| MINE4500 | Sustainable Mining Practices             | (3 UOC) |
| MINE4700 | Mining Law                               | (6 UOC) |

Plus Elective totalling 3 units of credit (see below)

Plus General Education totalling 3 units of credit

**Mining Electives** (select one)

|          |                               |         |
|----------|-------------------------------|---------|
| MINE4800 | Mine Simulation and Modelling | (3 UOC) |
| MINE4805 | Mineral Process Technology    | (3 UOC) |
| MINE4810 | Comp Methods in Geomechanics  | (3 UOC) |

OR students may select the following:

Students may enrol in one 6 UOC course from the following graduate courses offered by the Institute of Environmental Studies (IES), subject to approval of the Head of School and availability and approval of the IES in lieu of one Mining elective (3 UOC) and MINE4500 (3 UOC).

|          |                                                              |         |
|----------|--------------------------------------------------------------|---------|
| BIOS9001 | Fundamental Knowledge in Environmental Management: Ecology   | (6 UOC) |
| ECON5125 | Fundamental Knowledge in Environmental Management: Economics | (6 UOC) |
| IENT5001 | Frameworks for Environmental Management                      | (6 UOC) |
| IENT5002 | Tools for Environmental Management                           | (6 UOC) |
| LAWS3439 | Fundamental Knowledge in Environmental Management: Law       | (6 UOC) |

**General Education Requirements**

Please refer to the General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Honours**

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience Requirements**

All students must complete at least 80 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## Professional Recognition

The award of the BE degree in Mining Engineering from UNSW is a recognised tertiary qualification required for corporate membership of the Australasian Institution of Mining and Metallurgy (AusIMM). On completion of the degree, a Mining Engineer may apply for Graduate Membership of the AusIMM. Following three years relevant experience after graduation, graduates may apply for Corporate Membership of the Institute. The BE degree in Mining Engineering is also required in some jurisdictions to obtain the statutory qualification of Mine Manager.

## 3142 Mining Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

This option is available to students wishing to supplement their Mining Engineering degree with courses from the Faculty of Science. The minimum time to complete this combined program is five years.

The selection of specialisations in the Science component is quite flexible. It is important, however, that students discuss their interests with the relevant program authorities as programs may need to be individually tailored to suit each student. Also, students must undertake the BSc in accordance with the requirements for the award of a BSc degree. There may be restrictions on course availability due to timetabling constraints.

A more structured program is available in the BE(Mining)/BSc(Computer Science) program. This combination is an excellent choice for students who have a strong computing interest. Details of this program are available from the School of Mining Engineering.

Please note that there may be a minimum UAI requirement for entry to the combined BE BSc degree. Please contact the School of Mining Engineering for information regarding this combined degree.

### Program Structure

Please contact the School of Mining Engineering for information regarding the Program Structure.

### Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## 3144 Mining Engineering/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BA

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

A wide range of options are available in this 5 year combined degree. The Bachelor of Arts degree must be completed in accordance with the requirements for the award of a BA. Students interested in this combined degree must discuss their planned program with the individual program Authorities. There may be restrictions on course availability due to timetabling constraints.

Please note that there may be a minimum UAI requirement for entry to the combined BE/BA degree. Please contact the School of Mining Engineering for more information.

### Program Structure

Please contact the School of Mining Engineering and the Faculty of Arts for information on the Program Structure.

## Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

## Academic Rules

These combined programs of five years full-time study enable students in the School to qualify for the award of the degrees of Bachelor of Engineering and Bachelor of Arts. With these programs students can add their choice of an Arts major to the standard professionally accredited Mining Engineering program. It provides flexibility in course choice within the full Arts program and enables students to obtain the broader education offered by the Arts and Social Sciences. Since Engineering and Arts programs can have a common content, such as mathematics and physics, approximately two additional sessions of study are required to gain the additional qualifications of Bachelor of Arts. In general, this additional study is taken concurrently with the BE program and both can be completed within 10 sessions.

The programs are open to all students who satisfy both the Mining Engineering and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program after completion of at least one year if they have a credit or higher average or permission from the Head of School.

The BE BA programs are administered by the School of Mining Engineering. The School requires the student to obtain the approval of the Faculty of Arts and Social Sciences for the BA components of their program. The School of Mining Engineering must approve the final program timetable.

1. Students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. subjects designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one school of department.
2. Students must complete a major sequence (42 units of credit) in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
Environmental Studies\*  
European Studies  
Film  
French  
German Studies  
Greek  
History  
History and Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music  
Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology & Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

\*Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 level 1 units of credit in an approved course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.

3. Except for courses completed as part of the Environmental Studies major sequences, no more than 12 units of credit may be obtained from courses in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE programs can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students must complete the full requirements of the program 3140 BE in Mining Engineering except that they are exempt from the General Education requirement of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE BA program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of an Honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is  $5 \times 48 = 240$ .

### Industrial Experience Requirements

All students must complete at least 80 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## 3715 Mining Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 3146 Civil Engineering/Mining Engineering

### Bachelor of Engineering Bachelor of Engineering BE BE

Students initially enrol in courses in the Bachelor of Engineering (Civil Engineering) program 3620 which is administered by the School of Civil Engineering. The first three and one half years of the combined degree program are therefore identical to the 3620 program. After completing six sessions in the 3620 program, students may apply to enter the Bachelor of Engineering in Mining Engineering program 3146 which is administered by the School of Mining Engineering and aim to complete the mining requirements in four additional sessions. Students considering this option should discuss the above arrangements with the relevant program authorities.

For more information, please refer to the entry under the School of Civil and Environmental Engineering in this Handbook

## Fast Track Program with Master of Engineering Science

### 3140 Mining Engineering/Master of Engineering Science – Plan MINEP13140

#### Bachelor of Engineering Master of Engineering Science BE MEngSc

Students may undertake a four and one half years (10 semesters) full-time combined program leading to the awards of a Bachelor of Engineering and a Master of Engineering in Mining Engineering.

Students undertake the first three years (six semesters) of the BE program in Mining Engineering. Subject to satisfying a minimum performance over these three years (see "Rules for Progression and the Award of Degrees"), they must (a) substitute 12 UOC in the standard Yr4 BE degree program with a School approved 12 UOC of graduate coursework in their 4th year; (b) undertake a 12 UOC project/thesis work over the Summer (9th

Semester; and (c) undertake 24 UOC of graduate coursework in the tenth semester (first half of their 5th year).

### Year 1 to Year 3

Same as program 3140

|                                         |                                           | HPW |    | UOC |
|-----------------------------------------|-------------------------------------------|-----|----|-----|
| Year 4                                  |                                           | S1  | S2 |     |
| Mining Management Specialisation Option |                                           |     |    |     |
| MINE4210                                | Mine Planning                             | 5   | -  | 6   |
| MINE4300                                | Geotechnical Engineering                  | 5   | -  | 6   |
| MINE8210                                | Management Systems                        | B*  | -  | 6   |
| MINE4410                                | Industry Applications                     | 4   | -  | 6   |
| MINE4220                                | Coal Mine Design & Evaluation Project or  | -   | 7  | 9   |
| MINE4230                                | Metal Mine Design & Evaluation Project or | -   | 7  | 9   |
| MINE4240                                | Mine Design & Evaluation Project          | -   | 7  | 9   |
| MINE4420                                | Thesis A                                  | -   | 4  | 6   |
| MINE8220                                | Mine Feasibility, Planning and            |     |    |     |
|                                         | Project Evaluation                        | -   | B* | 6   |
|                                         | General Education                         | -   | 2  | 3   |

### OR

#### Mining Geomechanics Specialisation Option

|          |                                                   |    |    |   |
|----------|---------------------------------------------------|----|----|---|
| MINE4210 | Mine Planning                                     | 5  | -  | 6 |
| MINE8140 | Mining Geomechanics                               | B* | -  | 6 |
| MINE4700 | Mining Management 2                               | 4  | -  | 6 |
| MINE4410 | Industry Applications                             | 4  | -  | 6 |
| MINE4220 | Coal Mine Design & Evaluation Project or          | -  | 7  | 9 |
| MINE4230 | Metal Mine Design & Evaluation Project or         | -  | 7  | 9 |
| MINE4240 | Mine Design & Evaluation Project                  | -  | 7  | 9 |
| MINE4420 | Thesis A                                          | -  | 4  | 6 |
| MINE8760 | Mine Geology and Geophysics for Mining Operations | -  | B* | 6 |
|          | General Education                                 | -  | 2  | 3 |

B\* indicates course is presented in block format – contact School for further details.

### Year 5 (Summer Session)

|          |                  |   |   |    |
|----------|------------------|---|---|----|
| MINE8000 | Graduate Project | 6 | - | 12 |
|----------|------------------|---|---|----|

### Year 5 Session 1

During Session 1, students undertake four 6 UOC Mining MEngSc courses according to their specialisation and subject to timetabling constraints.

## School of Petroleum Engineering

**Director:** Professor WV Pinczewski

Petroleum Engineering is a specialised engineering discipline which prepares graduates for careers in the oil and gas industries. Its related operations apply physical, mathematical and engineering principles to identify and solve problems associated with exploration, exploitation, drilling, production and all the related economic and management problems associated with the recovery of hydrocarbons and alternative sources of energy from deep beneath the earth's surface.

The School of Petroleum Engineering offers both undergraduate and postgraduate programs as well as open learning programs on the Internet leading to the award of Graduate Diploma, Graduate Certificate and Master of Engineering Science degrees in Petroleum Engineering.

The undergraduate program for the award of a Bachelor of Engineering in Petroleum Engineering requires four years of full-time study. This degree is fully accredited and recognised internationally.

Entry is normally into Year 1 of the program. Students who satisfy the requirements of other full-time engineering degree programs at UNSW or any other Australian tertiary institution may be admitted into Year 2 or Year 3 of the undergraduate Petroleum Engineering program. These students will need to complete an appropriately modified Year 2 or Year 3 of the program as the case demands. The same requirements apply to students from accredited tertiary institutions in other countries. The award of Honours in the Petroleum Engineering program requires students to have distinguished themselves in the formal work, as well as in related assignments and industrial training periods as advised by the Director of Undergraduate Studies of the School.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3045 Petroleum Engineering

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The undergraduate program for the award of a Bachelor of Engineering in Petroleum Engineering requires four years of full-time study. This degree is fully accredited and recognised internationally.

Entry is normally into Year 1 of the program. Students who satisfy the requirements of other full-time engineering degree programs at UNSW or any other Australian tertiary institution may be admitted into Year 2 or Year 3 of the undergraduate Petroleum Engineering program. These students will need to complete an appropriately modified Year 2 or Year 3 of the program as the case demands. The same requirements apply to students from accredited tertiary institutions in other countries. The award of Honours in the Petroleum Engineering program requires students to have distinguished themselves in the formal work, as well as in related assignments and industrial training periods as advised by the Director of Undergraduate Studies of the School.

This program extends over four years and students study full-time during the day for 28 weeks of each year (excluding examinations and recess periods).

Successful completion of the BE degree program is accepted by the Institution of Engineers Australia, and the Institution of Chemical Engineers as sufficient academic qualification for corporate membership.

The Director of Undergraduate Studies may approve various program patterns involving full-time or part-time studies.

### Program Objectives and Learning Outcomes

Petroleum Engineering is a specialised engineering discipline which prepares graduates for careers in the oil and gas industries. Its related operations apply physical, mathematical and engineering principles to identify and solve problems associated with exploration, exploitation, drilling, production and all the related economic and management problems associated with the recovery of hydrocarbons and alternative sources of energy from deep beneath the earth's surface.

### Program Structure

#### Year 1

|          |                                         |         |
|----------|-----------------------------------------|---------|
| CEIC1020 | Introduction to Chemical Engineering    | (6 UOC) |
| CHEM1011 | Fundamentals of Chemistry 1A            | (6 UOC) |
| MECH0130 | Engineering Drawing and Solid Modelling | (3 UOC) |
| PHYS1169 | Physics 1 (Chem, Mech, Min Eng)         | (6 UOC) |
| PTL1010  | Introduction to the Petroleum Industry  | (3 UOC) |
| PTL1013  | Computing - Petroleum Engineers         | (6 UOC) |
| PTL1016  | Reservoir Rock & Fluid Properties       | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

#### Year 2

|          |                                           |         |
|----------|-------------------------------------------|---------|
| CEIC2110 | Material & Energy Balances                | (3 UOC) |
| CEIC2120 | Fluid Flow                                | (3 UOC) |
| CEIC2130 | Heat Transfer                             | (3 UOC) |
| GEOS3321 | Fundamentals of Petroleum Geology         | (6 UOC) |
| MATH2020 | Mathematics 2A                            | (3 UOC) |
| MATH2030 | Mathematics 2B                            | (3 UOC) |
| MATH2899 | Applied Statistics for Chemical Engineers | (3 UOC) |
| PTL2010  | Business Communication Skills             | (6 UOC) |

|                   |                                      |         |
|-------------------|--------------------------------------|---------|
| PTL2014           | Fluid Dynamics in Porous Media       | (3 UOC) |
| PTL2015           | Well Drilling Equipment & Operations | (3 UOC) |
| PTL2016           | Introduction to Petrophysics         | (3 UOC) |
| General Education |                                      | (6 UOC) |

#### Electives

Students must take 3 units of credit of electives in Year 2

|          |                                      |         |
|----------|--------------------------------------|---------|
| SESC1580 | Risk Management 1                    | (3 UOC) |
| SESC3020 | Occupational Health and Safety Law 1 | (3 UOC) |

#### Year 3

|                   |                                                   |         |
|-------------------|---------------------------------------------------|---------|
| PTL3008           | Reservoir Engineering A                           | (6 UOC) |
| PTL3009           | Reservoir Engineering B                           | (6 UOC) |
| PTL3013           | Reservoir Characterisation and Modelling          | (3 UOC) |
| PTL3016           | Field Development Geology for Petroleum Engineers | (3 UOC) |
| PTL3023           | Formation Evaluation                              | (6 UOC) |
| PTL3024           | Drilling Fluids & Cementing Techniques            | (6 UOC) |
| PTL3025           | Petroleum Economics                               | (6 UOC) |
| General Education |                                                   | (6 UOC) |

#### Electives

Students must take 6 units of credit of electives in Year 3

|          |                                        |         |
|----------|----------------------------------------|---------|
| COMP4920 | Professional Issues and Ethics         | (3 UOC) |
| GEOS3341 | Special Topics in Petroleum Geoscience | (3 UOC) |
| PTL3021  | Design Project for Petroleum Engineers | (6 UOC) |
| SESC3101 | Risk Assessment and Safety Engineering | (6 UOC) |

#### Year 4

|          |                                     |         |
|----------|-------------------------------------|---------|
| GEOS3331 | Petroleum Reservoir Geophysics      | (6 UOC) |
| MARK1012 | Marketing Fundamentals              | (6 UOC) |
| PTL4001  | Integrated Oil/Gas Field Evaluation | (9 UOC) |
| PTL4015  | Numerical Reservoir Simulation      | (3 UOC) |
| PTL4016  | Natural Gas Engineering             | (3 UOC) |
| PTL4017  | Well Technology                     | (6 UOC) |
| PTL4018  | Petroleum Production Engineering    | (3 UOC) |
| SESC9221 | Major Hazards Management            | (6 UOC) |

#### Electives

Students must take 6 UOC of electives in Year 4

|          |                                         |         |
|----------|-----------------------------------------|---------|
| INFS1603 | Business Data Management                | (6 UOC) |
| SESC3310 | Social Issues in Science and Technology | (3 UOC) |
| SESC4310 | Industrial Safety Management            | (3 UOC) |

### General Education Requirements

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

### Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

### Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

### Industrial Experience Requirements

All students must complete at least 60 working days of approved industrial experience (or professional practice in the case of Surveying and Spatial Information Systems students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## 3047 Petroleum Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Students may seek to undertake a five-year full-time combined program leading to the award of the degree of Bachelor of Engineering in Petroleum Engineering and Bachelor of Science (BE BSc).

The School of Petroleum Engineering is the academic unit responsible for the program. All programs must be approved by both the Faculty of Engineering and the Faculty of Science. The School will consult with the Faculty of Science in approving the BSc component of the program.

Students must satisfy admission requirements for both the BE in Petroleum Engineering and BSc programs.

### Program Structure

With the combined degree program, students complete a full, professionally accredited 4-year Engineering program (which includes Science courses) and add an additional 5th year to augment the Science component of the combined degree program. In all, a minimum of 102 units of credit of science courses must be taken with the combined program, which must include a Science major defined in Table A in the Science Handbook, or an approved major in Computer Science where this is permitted.

### Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## 3715 Petroleum Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## School of Photovoltaic and Renewable Energy Engineering

**Head of School:** Dr R.P. Corkish

**Director of Academic Studies:** Scientia Professor S.R. Wenham

**Director of Research:** Scientia Professor M.A. Green

**Undergraduate Coordinator:** Dr J.E. Cotter

**Postgraduate Coordinator:** Dr A.B. Sproul

**Research Coordinator:** A/Prof A. G. Aberle

**Student Administration Manager:** Ms. T. Burns

The need for the School of Photovoltaic and Renewable Energy Engineering has arisen due to rapid growth and evolution in the photovoltaic industry in recent years, with considerable demand by industry for UNSW developed technologies and appropriately trained engineers across the entire photovoltaic and renewable energy sectors. It originally comprised three centres established by the Australian Research Council: the Photovoltaics Special Research Centre, the Key Centre for Teaching and Research in Photovoltaic Engineering, and the Special Research Centre for Third Generation Photovoltaics. However, in 2003, the UNSW Centre of Excellence for Advanced Silicon Photovoltaics and Photonics was established merging the three centres into one.

The School offers undergraduate and postgraduate training encompassing all aspects of the photovoltaic and renewable energy sectors. Innovative teaching techniques have been developed to enhance the learning environment. UNSW academics in the photovoltaic field have been consistently ranked amongst the leaders worldwide through international peer review. This team has held the world record for silicon solar cell efficiencies for almost two decades and has been responsible for

developing the most successfully commercialised new photovoltaic technology internationally throughout the same period.

### Summary of Undergraduate Programs

#### Normal Full-time

#### Single Degree Programs Duration

|      |                                      |         |
|------|--------------------------------------|---------|
| 3642 | BE in Photovoltaics and Solar Energy | 4 years |
| 3657 | BE in Renewable Energy Engineering   | 4 years |

#### Combined Degree Programs \* Duration

|      |                                                                                                      |           |
|------|------------------------------------------------------------------------------------------------------|-----------|
| 3655 | BE in Photovoltaics and Solar Energy/<br>Bachelor of Science                                         | 5 years   |
| 3656 | BE in Photovoltaics and Solar Energy/<br>Bachelor of Arts                                            | 5 years   |
| 3658 | BE in Renewable Energy Engineering/<br>Bachelor of Science                                           | 5 years   |
| 3715 | BE in Photovoltaics & Solar Energy or BE in<br>Renewable Energy Engineering/<br>Bachelor of Commerce | 5.5 years |

*\*Please note: The School is in the process of obtaining approval for a BE in Renewable Energy Engineering / Bachelor of Arts. Please see the School Office if you would like to know more about this proposed program.*

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3642 Photovoltaics and Solar Energy

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The undergraduate engineering degree in Photovoltaics (PV) and Solar Energy was established in 2000 and is a four-year full-time program. It is the first of its kind internationally and won the Education and Awareness Award at the 2004 Energy and Water Green Globe Awards held by the Department of Energy, Utilities and Sustainability. The program has been established in response to rapid growth in the industry in recent years in both manufacturing capacity and job creation. In 2004 global manufacturing of solar cells expanded by 67% - growth reminiscent of the electronics industry in the booming 1980s.

The program includes training in technology development, manufacturing, quality control, reliability and lifecycle analysis, cell interconnection and encapsulation, a range of solar cell applications, system design, maintenance and fault diagnosis, marketing, policy development and the use of other renewable energy technologies. Considerable emphasis is placed on gaining hands-on experience of working with PV devices, modules and systems.

#### Second Area of Specialisation

The cross-disciplinary nature of photovoltaics and renewable energy applications necessitates many PV engineers possessing broad engineering backgrounds or else working in teams with other engineers. A good example is the UNSW Solar Car Project involving PV engineers, electronics engineers, control engineers, mechanical engineers, chemical engineers, power engineers, biomedical engineers, computer engineers, and communications engineers, etc. Therefore it is important for photovoltaic engineers to have a broader understanding of other engineering disciplines.

A unique feature of this program is that in Year 2, students have the opportunity to select one of ten possible strands to complement their education in Photovoltaics and Solar Energy. Each strand comprises 18 units of credit with the opportunity to subsequently select additional electives in the corresponding area in the final two years, subject to the approval of the Undergraduate Coordinator. The strands available are

listed below and cover areas such as computing, electronics, mathematics, mechanical engineering, civil engineering, physics, chemical engineering, and architecture. Students may also formulate their own strands subject to approval of the Undergraduate Coordinator.

### Program Objectives and Learning Outcomes

The broad objective of the program is to produce well educated graduates with the basic skills, attributes and knowledge required to practice as professional engineers. The program aims to produce graduates that are self-motivated; lifelong learners; critical thinkers; problem solvers; independent investigators; team players; good communicators; effective managers; and are environmentally, socially and ethically responsible. More specifically, the School hopes to train and educate engineers to cater for the needs of the rapidly growing and evolving photovoltaics industry.

Students in each course are assessed by way of assignments, tutorials, laboratory/project work and formal examinations. In a small number of courses/projects students are also assessed on their communication, leadership skills and project management through seminar presentations, reports and their demonstrated ability to manage a group/project.

### Program Structure

#### Plan SOLAA13642

##### Year 1

|          |                                                             |         |
|----------|-------------------------------------------------------------|---------|
| ELEC1011 | Electrical Engineering 1                                    | (6 UOC) |
| ELEC1041 | Digital Circuits                                            | (6 UOC) |
| MATH1141 | Higher Mathematics 1A                                       | (6 UOC) |
| MATH1241 | Higher Mathematics 1B                                       | (6 UOC) |
| PHYS1131 | Higher Physics 1A                                           | (6 UOC) |
| PHYS1231 | Higher Physics 1B                                           | (6 UOC) |
| SOLA1050 | Introduction to Photovoltaics, Solar Energy and Computing 1 | (6 UOC) |
| SOLA1051 | Introduction to Photovoltaics, Solar Energy and Computing 2 | (3 UOC) |
| SOLA1060 | Chemical Processes for Renewable Energy Systems             | (3 UOC) |

**Note:** MATH1141 and MATH1241 may be taken at the lower level (MATH1131 and MATH1231)

##### Year 2

|                            |                                                 |          |
|----------------------------|-------------------------------------------------|----------|
| MATH2120                   | Mathematical Methods for Differential Equations | (3 UOC)  |
| MATH2859                   | Probability, Statistics and Information         | (3 UOC)  |
| SOLA2020                   | Photovoltaic Technology and Manufacturing       | (6 UOC)  |
| SOLA2051                   | Project in Photovoltaics and Solar Energy 1     | (6 UOC)  |
| SOLA2052                   | Project in Photovoltaics and Solar Energy 2     | (6 UOC)  |
| SOLA2053                   | Sustainable & Renewable Energy Technologies     | (6 UOC)  |
| SOLA2060                   | Introduction to Electronic Devices              | (3 UOC)  |
| Selected Strand            |                                                 | (12 UOC) |
| General Education Elective |                                                 | (3 UOC)  |

**Note:** SOLA2060 is offered every second year and will not be offered in 2006.

##### Year 3

|                             |                                        |          |
|-----------------------------|----------------------------------------|----------|
| ELEC2031                    | Circuits and Systems                   | (3 UOC)  |
| SOLA3010                    | Photovoltaics in the Built Environment | (6 UOC)  |
| SOLA3507                    | Solar Cells                            | (6 UOC)  |
| SOLA3540                    | Applied Photovoltaics                  | (6 UOC)  |
| Professional Electives      |                                        | (18 UOC) |
| Selected Strand (continued) |                                        | (6 UOC)  |
| General Education           |                                        | (3 UOC)  |

**Note:** SOLA3507 is offered every second year and will not be offered in 2006.

##### Year 4

|                            |                                              |          |
|----------------------------|----------------------------------------------|----------|
| ELEC4010                   | Project Management for Professional Services | (3 UOC)  |
| ELEC4011                   | Ethics and Electrical Engineering Practice   | (3 UOC)  |
| SOLA4910                   | Thesis Part A                                | (6 UOC)  |
| SOLA4911                   | Thesis Part B                                | (12 UOC) |
| SOLA4012                   | Grid-Connected Photovoltaic Systems          | (6 UOC)  |
| Professional Electives     |                                              | (12 UOC) |
| General Education elective |                                              | (6 UOC)  |

**Notes:** Where students have a weighted average mark (WAM) less than 65, they should enrol in the group thesis SOLA4914 and SOLA4915.

SOLA4012 is offered every second year and will not be offered in 2006.

### Years 2 & 3 Strand Options

Please note that the strands listed below are subject to change and may not be available every year.

### Strand 1 Computing

Choose one of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1011 | Computing 1A        | (6 UOC) |
| COMP1711 | Higher Computing 1A | (6 UOC) |

And choose one of the following courses:

|          |                     |         |
|----------|---------------------|---------|
| COMP1021 | Computing 1B        | (6 UOC) |
| COMP1721 | Higher Computing 1B | (6 UOC) |

And choose from the following to complete the strand:

|          |                               |         |
|----------|-------------------------------|---------|
| COMP3111 | Software Engineering          | (6 UOC) |
| ELEC2041 | Microprocessors & Interfacing | (6 UOC) |

Or ONE of the following courses:

|          |                          |         |
|----------|--------------------------|---------|
| COMP2011 | Data Organisation        | (6 UOC) |
| COMP2711 | Higher Data Organisation | (6 UOC) |

**Note:** Students must choose whether to take Computing 1A, Computing 1B and Data Organisation at the ordinary or higher level

### Strand 2 Electronics

|          |                           |         |
|----------|---------------------------|---------|
| ELEC2032 | Electronics and Systems   | (3 UOC) |
| ELEC2042 | Real Time Instrumentation | (3 UOC) |
| ELEC3006 | Electronics A             | (6 UOC) |

And choose from the following to complete the strand:

|          |                                        |         |
|----------|----------------------------------------|---------|
| ELEC3017 | Electrical Engineering Design          | (6 UOC) |
| ELEC4240 | Power Electronics                      | (6 UOC) |
| ELEC4503 | Electronics C                          | (6 UOC) |
| ELEC4522 | Microelectronics Design and Technology | (6 UOC) |

### Strand 3 Electric Energy

|          |                                    |         |
|----------|------------------------------------|---------|
| ELEC2015 | Electromagnetic Applications       | (3 UOC) |
| ELEC3005 | Electric Energy 1                  | (6 UOC) |
| MATH2011 | Several Variable Calculus          | (6 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering) | (3 UOC) |

### Strand 4 Communications and Control

|          |                           |         |
|----------|---------------------------|---------|
| ELEC2032 | Electronics and Systems   | (3 UOC) |
| ELEC2042 | Real Time Instrumentation | (3 UOC) |
| MATH2011 | Several Variable Calculus | (6 UOC) |

And choose from the following to complete the strand:

|          |                                         |         |
|----------|-----------------------------------------|---------|
| ELEC3004 | Signal Processing and Transform Methods | (6 UOC) |
| ELEC3014 | Systems and Control 1                   | (6 UOC) |
| TELE3013 | Telecommunication Systems 1             | (6 UOC) |

### Strand 5 Mathematics

|          |                              |         |
|----------|------------------------------|---------|
| MATH2011 | Several Variable Calculus    | (6 UOC) |
| MATH2509 | Linear Algebra for Engineers | (3 UOC) |
| MATH2520 | Complex Analysis             | (3 UOC) |

And choose one from the following to complete the strand:

|          |                           |         |
|----------|---------------------------|---------|
| MATH3041 | Mathematical Modelling    | (6 UOC) |
| MATH3121 | Mathematical Methods      | (6 UOC) |
| MATH3241 | Fluid Dynamics            | (6 UOC) |
| MATH3261 | Atmosphere-Ocean Dynamics | (6 UOC) |

### Strand 6 Mechanical Engineering

|          |                   |         |
|----------|-------------------|---------|
| MECH2611 | Fluid Mechanics A | (3 UOC) |
| MECH2612 | Fluid Mechanics B | (3 UOC) |
| MECH2711 | Thermodynamics A  | (3 UOC) |
| MECH2712 | Thermodynamics B  | (3 UOC) |

And choose from the following to complete the strand:

|          |                             |         |
|----------|-----------------------------|---------|
| MECH3601 | Thermofluid System Design   | (3 UOC) |
| MECH3602 | Advanced Thermodynamics     | (3 UOC) |
| MECH9720 | Solar Thermal Energy Design | (6 UOC) |
| MECH9740 | Power Plant Engineering     | (6 UOC) |

### Strand 7 Civil Engineering

|          |                               |         |
|----------|-------------------------------|---------|
| CVEN1021 | Civil Engineering Practice 1A | (4 UOC) |
| CVEN1023 | Statics                       | (4 UOC) |
| CVEN1026 | Engineering Materials 1       | (4 UOC) |
| CVEN2023 | Mechanics of Solids           | (3 UOC) |
| CVEN2026 | Engineering Materials 2       | (3 UOC) |

### Strand 8 Chemical Engineering

|          |                                      |         |
|----------|--------------------------------------|---------|
| CEIC1020 | Introduction to Chemical Engineering | (6 UOC) |
| CEIC2110 | Material & Energy Balances           | (3 UOC) |
| CEIC2120 | Fluid Flow                           | (3 UOC) |
| CEIC2130 | Heat Transfer                        | (3 UOC) |
| CEIC3110 | Thermodynamics                       | (3 UOC) |

**Strand 9 Physics**

|          |                           |         |
|----------|---------------------------|---------|
| MATH2011 | Several Variable Calculus | (6 UOC) |
| PHYS2040 | Quantum Physics           | (3 UOC) |
| PHYS2060 | Thermal Physics           | (3 UOC) |

And choose from the following to complete the strand:

|          |                                |         |
|----------|--------------------------------|---------|
| PHYS3010 | Quantum Mechanics (Advanced)   | (3 UOC) |
| PHYS3020 | Statistical Physics            | (3 UOC) |
| PHYS3080 | Solid State Physics            | (3 UOC) |
| PHYS3210 | Quantum Mechanics              | (3 UOC) |
| PHYS3310 | Physics of Solid State Devices | (3 UOC) |
| PHYS3770 | Laser and Spectroscopy Lab     | (3 UOC) |

PHYS3080 has PHYS3010 or PHYS3210 and PHYS3020 as co-requisites  
PHYS3310 has PHYS3080 as a pre-requisite

**Strand 10 Faculty of the Built Environment**

|          |                              |         |
|----------|------------------------------|---------|
| BENV1072 | Design for Energy Efficiency | (6 UOC) |
|----------|------------------------------|---------|

And choose from the following to complete the strand:

|          |                                        |         |
|----------|----------------------------------------|---------|
| BENV1242 | Computer-Aided Design                  | (3 UOC) |
| BENV1341 | Design Modelling & Visualisation       | (3 UOC) |
| BENV2103 | Environmental Planning                 | (3 UOC) |
| BENV2720 | Introduction to Lighting and Acoustics | (4 UOC) |
| BENV2901 | City Planning Today                    | (3 UOC) |
| BLDG1050 | Structures 1                           | (6 UOC) |
| BLDG1211 | Construction Technology 1A             | (6 UOC) |
| BLDG1212 | Construction Technology 1B             | (6 UOC) |

BLDG1212 requires completion of BLDG1211 - Construction Technology 1A

**Professional Electives for Years 3 & 4**

Because of timetable clashes not all combinations or courses are possible

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| MECH9720 | Solar Thermal Energy Design                        | (6 UOC) |
| MECH9740 | Power Plant Engineering                            | (6 UOC) |
| SOLA5050 | Renewable Energy Policy and International Programs | (6 UOC) |
| SOLA5051 | Life Cycle Assessment                              | (6 UOC) |
| SOLA5052 | Biomass                                            | (6 UOC) |
| SOLA5053 | Wind Energy Converters                             | (6 UOC) |
| SOLA5054 | PV Stand-Alone System Design & Installation        | (6 UOC) |
| SOLA5055 | Semiconductor Devices                              | (6 UOC) |
| SOLA5056 | Sust. Energy Developing Country                    | (6 UOC) |
| SOLA5058 | Special Topic in Photovoltaics                     | (6 UOC) |
| SOLA5059 | Industrial Elective                                | (6 UOC) |
| SOLA5060 | Industrial Elective                                | (3 UOC) |
| SOLA5061 | Industrial Elective                                | (3 UOC) |
| SOLA5508 | High Efficiency Silicon Solar Cells                | (6 UOC) |

**Note:** The following courses are offered every second year and will not be offered in 2006: SOLA5051, SOLA5053, SOLA5054, SOLA5055, SOLA5508.

Electives can also be chosen from the courses listed as electives for Electrical Engineering, Mechanical Engineering, Civil Engineering, Environmental Engineering, Computer Science and Engineering and Chemical Engineering for which appropriate prerequisite requirements have been satisfied and which conform to the credit point requirements. Approval to substitute these electives for SOLA professional electives must be sought from the Undergraduate Coordinator. Substitutions will be restricted to a maximum of two.

The program selected by each student must be approved by the Head of School. Not all electives are available each session or each year, nor is the full range available to part-time students. Students are advised each year of the timetable of available electives. Substitution is not permitted if it unduly restricts the range of subjects studied to only one area of Photovoltaic Engineering.

**General Education**

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

**Honours**

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

**Academic Rules**

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

**Industrial Experience Requirements**

All students must complete at least 60 working days of approved industrial experience prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

**3657 Renewable Energy Engineering****Bachelor of Engineering BE****Typical Duration**

4 years

**Minimum UOC for Award**

192 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

This program commenced in 2003 and is a four year full-time program. Discussions on course content have been held with Australian manufacturers, major end-users, the former NSW Sustainable Energy Development Authority, the Australian CRC for Renewable Energy and the industry representative association, Solar Energy Industries Association of Australia. All these organisations have representatives on the Advisory Committee established for the School of Photovoltaic and Renewable Energy Engineering.

Consultation has also taken place as necessary with other schools within UNSW. In particular, the plans for this program have been developed in collaboration with the School of Mechanical Engineering, the School of Electrical Engineering and Telecommunications and the Faculty of the Built Environment. All of these schools will be offering courses within the new program.

Approximately half the material for this new program is in common with the program in Photovoltaics and Solar Energy. However, this new program in Renewable Energy Engineering encompasses a wider range of renewable energy technologies and their use. These include electricity generation from solar thermal systems, photovoltaics, wind turbines, biomass, tidal energy, geothermal systems, and also includes the important areas of solar architecture and the design of energy efficient housing.

**Program Objectives and Learning Outcomes**

The broad objective of the program is to produce well educated graduates with the basic skills, attributes and knowledge required to practice as professional engineers. The program aims to produce graduates that are self-motivated; lifelong learners; critical thinkers; problem solvers; independent investigators; team players; good communicators; effective managers; and are environmentally, socially and ethically responsible. More specifically, the School hopes to train and educate engineers to cater for the needs of the rapidly growing and evolving renewable energy industry.

Students in each course are assessed by way of assignments, tutorials, laboratory/project work and formal examinations. In a small number of courses/projects students are also assessed on their communication, leadership skills and project management through seminar presentations, reports and their demonstrated ability to manage a group/project.

**Program Structure****Plan SOLAA13657****Year 1**

|          |                                                 |         |
|----------|-------------------------------------------------|---------|
| ELEC1011 | Electrical Engineering 1                        | (6 UOC) |
| ELEC1041 | Digital Circuits                                | (6 UOC) |
| MATH1141 | Higher Mathematics 1A                           | (6 UOC) |
| MATH1241 | Higher Mathematics 1B                           | (6 UOC) |
| PHYS1131 | Higher Physics 1A                               | (6 UOC) |
| PHYS1231 | Higher Physics 1B                               | (6 UOC) |
| SOLA1055 | Introduction to Renewable Energy Technologies 1 | (6 UOC) |
| SOLA1056 | Introduction to Renewable Energy Technologies2  | (3 UOC) |
| SOLA1060 | Chemical Processes for Renewable Energy Systems | (3 UOC) |

**Note:** MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).

### Year 2

|                             |                                                    |         |
|-----------------------------|----------------------------------------------------|---------|
| MATH2509                    | Linear Algebra for Engineers                       | (3 UOC) |
| MATH2859                    | Probability, Statistics and Information            | (3 UOC) |
| MECH2611                    | Fluid Mechanics A                                  | (3 UOC) |
| MECH2612                    | Fluid Mechanics B                                  | (3 UOC) |
| MECH2711                    | Thermodynamics A                                   | (3 UOC) |
| MECH2712                    | Thermodynamics B                                   | (3 UOC) |
| SOLA1172                    | Solar Architectural Technologies                   | (9 UOC) |
| SOLA2060                    | Introduction to Electronic Devices                 | (3 UOC) |
| SOLA5050                    | Renewable Energy Policy and International Programs | (6 UOC) |
| SOLA5051                    | Life Cycle Assessment                              | (6 UOC) |
| General Education Electives |                                                    | (6 UOC) |

**Note:** SOLA2060 and SOLA5051 are offered every second year and will not be offered in 2006.

### Year 3

|                             |                                             |          |
|-----------------------------|---------------------------------------------|----------|
| MECH9720                    | Solar Thermal Energy Design                 | (6 UOC)  |
| SOLA2053                    | Sustainable & Renewable Energy Technologies | (6 UOC)  |
| SOLA3010                    | Photovoltaics in the Built Environment      | (6 UOC)  |
| SOLA3540                    | Applied Photovoltaics                       | (6 UOC)  |
| SOLA5053                    | Wind Energy Converters                      | (6 UOC)  |
| Professional Electives      |                                             | (12 UOC) |
| General Education Electives |                                             | (6 UOC)  |

**Note:** SOLA5053 is offered every second year and will not be offered in 2006.

### Year 4

|                        |                                                |          |
|------------------------|------------------------------------------------|----------|
| ELEC4010               | Project Management for Professional Services   | (3 UOC)  |
| ELEC4011               | Ethics and Electrical Engineering Practice     | (3 UOC)  |
| SOLA4912               | Thesis in Renewable Energy Engineering. Part A | (9 UOC)  |
| SOLA4913               | Thesis in Renewable Energy Engineering Part B  | (9 UOC)  |
| SOLA5052               | Biomass                                        | (6 UOC)  |
| Professional Electives |                                                | (18 UOC) |

### Professional Electives

|          |                                             |         |
|----------|---------------------------------------------|---------|
| ARCH1271 | Architectural Technologies 3                | (6 UOC) |
| BENV1072 | Design for Energy Efficiency                | (6 UOC) |
| ELEC2015 | Electromagnetic Applications                | (3 UOC) |
| ELEC3005 | Electric Energy 1                           | (6 UOC) |
| ELEC3015 | Electric Energy 2                           | (6 UOC) |
| MATH2011 | Several Variable Calculus                   | (6 UOC) |
| MECH3602 | Advanced Thermodynamics                     | (3 UOC) |
| PHYS2939 | Physics 2 (Electrical Engineering)          | (3 UOC) |
| SOLA2020 | Photovoltaic Technology and Manufacturing   | (6 UOC) |
| SOLA3507 | Solar Cells                                 | (6 UOC) |
| SOLA4012 | Grid-Connected Photovoltaic Systems         | (6 UOC) |
| SOLA5054 | PV Stand-Alone System Design & Installation | (6 UOC) |
| SOLA5055 | Semiconductor Devices                       | (6 UOC) |
| SOLA5056 | Sust. Energy Developing Country             | (6 UOC) |
| SOLA5508 | High Efficiency Silicon Solar Cells         | (6 UOC) |

### Notes:

ELEC2015, PHYS2939 and MATH2011 cannot be taken without course authority permission.

The following courses are offered every second year and will not be offered in 2006: SOLA3507, SOLA4012, SOLA5054, SOLA5055, SOLA5508.

With the program authority's permission, courses can also be chosen from amongst the electives offered by other Schools, provided that appropriate pre-requisites have been satisfied and they conform to the units of credit requirements.

## General Education

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

## Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

## Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under Faculty Information and Assistance in this Handbook.

## Industrial Experience Requirements

All students must complete at least 60 working days of approved industrial experience prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## 3655 Photovoltaics and Solar Energy/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

Students may seek to undertake a five-year full-time combined program leading to the award of the degrees of Bachelor of Engineering in Photovoltaics and Solar Energy and a Bachelor of Science (BE BSc). Students complete a full professionally accredited 4-year Engineering program (which includes Science courses) and add an additional 5th year to augment the Science component of the combined degree program.

## Program Objectives and Learning Outcomes

The broad objective of the program is to produce well educated graduates with the basic skills, attributes and knowledge required to practice as professional engineers.

The program aims to produce graduates that are self-motivated; lifelong learners; critical thinkers; problem solvers; independent investigators; team players; good communicators; effective managers; and are environmentally, socially and ethically responsible. More specifically, the School hopes to train and educate engineers to cater for the needs of the rapidly growing and evolving photovoltaics industry.

Students in each course are assessed by way of assignments, tutorials, laboratory/project work and formal examinations. In a small number of courses/projects students are also assessed on their communication, leadership skills and project management through seminar presentations, reports and their demonstrated ability to manage a group/project.

Offering the Photovoltaics and Solar Energy Engineering program in combination with a Bachelor of Science, enables students with broader interests to simultaneously pursue a second degree which will extend their skill set and knowledge beyond the professionally oriented engineering program.

## Program Structure

### Plan SOLAA13655

Students should start discussing their program with representatives of the Faculty of Science as soon as possible, preferably well before enrolment in Year 2. Enquiries should be directed to the Executive Officer in the Science Student Centre, or the Associate Dean for Student Affairs in the Faculty of Science.

Students should work out for themselves the Science program they would like to add to the Photovoltaics and Solar Energy Engineering program. The Faculty of Science section in this Handbook describes the options. There are no special rules on what to include in each year. Students should schedule the Science and Engineering components to suit their preferences while meeting the constraints of timetables and prerequisites.

The Science component must be approved by the Faculty of Science.

The final program and schedule must be approved by the School of Photovoltaic and Renewable Energy Engineering.

## Honours

### (a) BE with Honours

On completion of the requirements for the combined degree a student may qualify for the award of the BE degree with Honours in accordance with the rules for the BE in Photovoltaics and Solar Energy Engineering and the Faculty of Engineering rules for calculation of the grade of Honours (1st Class Honours: a weighted average of 75% or greater; 2nd Class Honours Division 1: a weighted average of 70% or greater; 2nd Class Honours Division 2: a weighted average of 65% or greater, a student being awarded the highest grade of Honours for which they qualify).

**(b) BSc with Honours**

On completion of the requirements of the combined degree a student may be qualified to enrol in an Honours program in the Bachelor of Science and to qualify for the award of the BSc with Honours after successfully completing an additional year of study (48 Units of Credit) as specified in the rules of the Faculty of Science.

**Academic Rules**

To qualify for the Bachelor of Engineering and Bachelor of Science a student must complete successfully courses that total at least 240 units of credit and include:

(a) In the Faculty of Engineering:

- Courses making up a full 4-year engineering program described in the degree requirements for the Photovoltaics and Solar Energy Engineering program; and

(b) In the Faculty of Science:

- At least 102 units of credit comprising a major in an approved disciplinary stream described in the Science section of this Handbook, or a major in Computer Science; and

(c) At least 60 days of approved industrial training (required for the award of the BE degree)

To meet these requirements, as part of their BE in Photovoltaics and Solar Energy program, students need to complete a strand offered within the Faculty of Science. Please see a list of strands in the program entry for 3642 BE in Photovoltaics and Solar Energy in this Handbook.

## 3656 Photovoltaics and Solar Energy/Bachelor of Arts

**Bachelor of Engineering Bachelor of Arts BE BA****Typical Duration**

5 years

**Minimum UOC for Award**

240 units of credit

**Typical UOC per Session**

24 units of credit

**Program Description**

With this combined degree program, students can add their choice of Arts program to the standard Engineering program offered by the School of Photovoltaic and Renewable Energy Engineering. The full range of Arts courses is available.

Because the Engineering and Arts programs have many common objectives and content, such as mathematics and physics, only one more year of study is normally required to gain the additional qualification of Bachelor of Arts.

Students should start discussing their program with the Faculty of Arts and Social Sciences office as soon as possible, preferably well before enrolment in Year 2.

Students should work out for themselves the Arts program they would like to add to their chosen Engineering program. The Faculty of Arts and Social Sciences section in this Handbook describes the options.

The Arts component must be approved by the Faculty of Arts and Social Sciences.

The final program and schedule must be approved by the School of Photovoltaic and Renewable Energy Engineering.

**Program Objectives and Learning Outcomes**

The broad objective of the program is to produce well educated graduates with the basic skills, attributes and knowledge required to practice as professional engineers. The program aims to produce graduates that are self-motivated; lifelong learners; critical thinkers; problem solvers; independent investigators; team players; good communicators; effective managers; and are environmentally, socially and ethically responsible. More specifically, the School hopes to train and educate engineers to cater for the needs of the rapidly growing and evolving photovoltaics industry.

Students in each course are assessed by way of assignments, tutorials, laboratory/project work and formal examinations. In a small number of courses/projects students are also assessed on their communication, leadership skills and project management through seminar presentations, reports and their demonstrated ability to manage a group/project.

Offering the Photovoltaics and Solar Energy Engineering program in combination with a Bachelor of Arts, enables students with broader interests to simultaneously pursue a second degree which will extend their skill set and knowledge beyond the professionally oriented engineering program.

**Program Structure**

This program comprises five years of full-time study where, in addition to the BE program, students must complete 60 units of credit comprising a major sequence offered by the Faculty of Arts and Social Sciences. Students must apply through UAC for admission into or transfer to this combined program.

There are no special rules on what to include in each year. Students should schedule the Arts and Engineering components to suit their preferences while meeting the constraints of timetables and prerequisites.

Students who commence this program but subsequently do not wish to proceed with both areas of study, should apply in writing to the Program Authority for permission to revert to the single degree program.

Please contact the School of Photovoltaic and Renewable Energy Engineering and the Faculty of Arts and Social Sciences for more information.

**Honours**

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA, the award of the BA degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate School in the Faculty of Arts and Social Sciences.

AUSTUDY support is available for the combined degree program including the Honours level.

**Academic Rules**

1. In addition to the BE program, students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. in courses designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one school of department.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
Environmental Studies\*  
European Studies  
Film  
French  
German Studies  
Greek  
History  
History and Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music  
Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology & Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

*\*Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 level 1 units of credit in an approved course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.*

3. Except for courses completed as part of the Environmental Studies major sequences, no more than 12 units of credit may be obtained from subjects in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students are exempt from the General Education requirement of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE BA program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of an Honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is  $5 \times 48 = 240$ .

There will be a separate testamur for each part of the combined degree program.

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under Faculty Information and Assistance in this Handbook.

### Industrial Experience Requirements

All students must complete at least 60 working days of approved industrial experience prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

## 3715 Photovoltaics & Solar Energy/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## 3658 Renewable Energy Engineering/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

Students may seek to undertake a five-year full-time combined program leading to the award of two degrees, a Bachelor of Engineering in Renewable Energy Engineering, and a Bachelor of Science (BE BSc). The program is administered by the School of Photovoltaic and Renewable Energy Engineering, however students should seek advice from the Faculty of Science regarding the science component of their program. All programs must be approved by both the School of Photovoltaic and Renewable Energy Engineering and the Faculty of Science.

### Program Objectives and Learning Outcomes

The broad objective of the program is to produce well educated graduates with the basic skills, attributes and knowledge required to practice as professional engineers. The program aims to produce graduates that are self-motivated; lifelong learners; critical thinkers; problem solvers; independent investigators; team players; good communicators; effective managers; and are environmentally, socially and ethically responsible. More specifically, the School hopes to train and educate engineers to cater for the needs of the rapidly growing and evolving photovoltaics industry.

Students in each course are assessed by way of assignments, tutorials, laboratory/project work and formal examinations. In a small number of courses/projects students are also assessed on their communication, leadership skills and project management through seminar presentations, reports and their demonstrated ability to manage a group/project.

Offering the Renewable Energy Engineering program in combination with a Bachelor of Science, enables students with broader interests to simultaneously pursue a second degree which will extend their skill set and knowledge beyond the professionally oriented engineering program.

### Program Structure

With the combined degree program, students complete a full, professionally accredited 4-year Engineering program (which includes Science courses) and add an additional 5th year to augment the Science component of the combined degree program. In all, a minimum of 102 Units of Credit of Science courses must be taken within the combined program, which must include a Science Major defined in Table A in the Science Handbook, or an approved Major in Computer Science where this is permitted (Computer Science may not be combined with any other computing degree).

For Renewable Energy Engineering students to meet this criteria, they are required to substitute 12 units of credit of approved Science courses for SOLA5050 and SOLA5051 which form part of the standard Renewable Energy Engineering (3657) program.

Approved science courses include any course that forms part of the Maths or Physics strand in the Photovoltaics and Solar Energy (3642) program. Students will then have the opportunity to take SOLA5050 and SOLA5051 in their 3rd or 4th year as a professional elective. Students will need to complete Course Substitution Forms for these substitutions which are available from the School Office.

### Award of the Degrees

(i) A student who completes the requirements for both the BE and BSc degrees shall receive at graduation a separate testamur for each of the degrees.

(ii) Both testamurs will be awarded at the same graduation ceremony.

(iii) A student may apply to discontinue the combined BE BSc programs and elect to complete either the BE or the BSc degree in accordance with the rules governing award of that degree. Following the discontinuation of one of the programs (BE or BSc), courses which count toward that program will not in general count toward the remaining single degree unless they meet the single degree requirements in their own right.

### Enrolment

(i) An application to enrol as a candidate for the combined program shall be made through UAC, or on the prescribed form for international students which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(ii) The candidate shall be enrolled as either a full-time or part-time student.

### Honours

#### BE with Honours:

On completion of the requirements for the combined degree a student may qualify for the award of the BE degree with Honours in accordance with the rules for the BE program of specialisation and the Faculty of Engineering rules for calculation of the grade of Honours (1st Class Honours: a weighted average of 75% or greater; 2nd Class Honours Division i: a weighted average of 70% or greater; 2nd Class Honours Division ii: a weighted average of 65% or greater, a student being awarded the highest grade of Honours for which they qualify).

#### BSc with Honours:

On completion of the requirements for the combined degree a student may be qualified to enrol in an Honours program in the Bachelor of Science and to qualify for the award of the BSc with Honours after successfully completing an additional year of study (48 UOC) as specified in the rules of the Faculty of Science.

### Academic Rules

For academic requirements relating to this program, please refer to Program Structure and contact the School of Photovoltaic and Renewable Energy Engineering for more information.

## 3715 Renewable Energy Engineering/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## School of Surveying and Spatial Information Systems

**Head of School:** Professor C. Rizos

**Administrative Officer:** Mr L Daras

The School's undergraduate programs involve an integrated approach to the measurement, analysis, storage, management, distribution and application of spatially-referenced data. Spatial data underpins many applications in modern society, and the range of spatial technologies and applications is expanding rapidly. A graduate from the School may choose to enter the profession of surveying or an associated spatial information discipline. For further information on the School's programs and research visit [www.gmat.unsw.edu.au](http://www.gmat.unsw.edu.au)

An education in surveying deals with topics such as satellite positioning, geodesy, mapping, survey measurement technologies and computations, as applied to applications such as engineering and cadastral surveying, and land management and development in general. With the selection of the appropriate elective courses, a graduate may choose instead to specialise in Spatial Information Systems (SIS), a fast moving IT area. Topics include computing, databases, geographic information systems, GPS technologies, digital mapping, remote sensing and image analysis. SIS applications include land information and resource management, navigation, and telematics.

### 3741 Bachelor of Engineering in Surveying & SIS

The BE in Surveying and SIS is a four year full-time degree program. This program aims to prepare a graduate for a broad range of career opportunities in the various branches of surveying and the numerous SIS disciplines. To this end, the program covers general scientific and IT principles, as well as specialised surveying and SIS topics. This specialisation is provided for through the provision of a wide range of elective courses offered in the third and fourth year of the program.

The degree of BE in Surveying and SIS is recognised by the Board of Surveyors of NSW as meeting the requirements for entry as a candidate to become a Registered Surveyor. The degree is also recognised by the Institution of Surveyors, Australia, and the Institution of Engineers Australia, for admission as corporate members.

### 3746 Bachelor of Engineering in Surveying & SIS / Bachelor of Science

This combined degree program of five years full-time study enables a student to qualify for the award of the two degrees of Bachelor of Science and Bachelor of Engineering in Surveying & SIS. This program is open to all students who satisfy both the Surveying & SIS and Science entry conditions.

The program is designed for those wishing to broaden their career options.

### 3747 Bachelor of Engineering in Surveying & SIS / Bachelor of Arts

With this combined five year degree program, students can add their choice of an Arts major to the standard, professionally accredited engineering program offered by the School of Surveying and Spatial Information Systems. The program is open to all students who satisfy both the Engineering and Arts entry conditions. The program provides flexibility in the choice of courses within the full Arts program, and enables students to gain a broad education in Arts and Social Sciences, as well as undertake specialised studies in Surveying and SIS.

### 3715 Bachelor of Engineering in Surveying & SIS/Bachelor of Commerce

This combined degree of five ½ years full-time study enables a student to qualify for the award of the two degrees Bachelor of Engineering and Bachelor of Commerce. Please refer to full details under Program Rules and Information in this Handbook.

### 3741 Bachelor of Engineering in Surveying & SIS / Master of Engineering Science

Students may undertake a five year full-time fast-track program leading to the award of the degrees of BE in Surveying & SIS and a Masters of

Engineering Science. The aim of the program is to offer an accelerated postgraduate coursework program to high achieving students. In addition to the undergraduate BE degree, graduates receive in-depth specialist training to facilitate employment in discipline specific consulting practices and other specialised disciplines.

There is a testamur awarded for each degree. The BE degree will be awarded on the satisfactory completion of the first four years of the program.

### Professional Practice / Industrial Experience

Students are required to complete at least 60 days of Professional Practice experience in each of the above programs.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## 3741 Surveying and Spatial Information Systems

### Bachelor of Engineering BE

#### Typical Duration

4 years

#### Minimum UOC for Award

192 units of credit

#### Typical UOC per Session

24 units of credit

### Program Description

The BE in Surveying and SIS is a four year, full time degree program. This program aims to prepare a graduate for a broad range of career opportunities in the various branches of Surveying and the numerous SIS disciplines. To this end the program covers general scientific and IT principles, as well as specialised Surveying and Spatial Information topics.

Specialisation is provided for through the provision of elective courses offered in the third and fourth year of the program.

The degree of BE in Surveying and SIS is recognised by the Board of Surveying and Spatial Information of New South Wales as meeting the requirements for entry as a candidate to become a Registered Surveyor. The degree is also recognised by the Institution of Surveyors, New South Wales, the Spatial Sciences Institute and the Institution of Engineers Australia, for admission as corporate members.

### Program Objectives and Learning Outcomes

Please contact the School of Surveying & Spatial Information Systems for information on the Program Objectives and Learning Outcomes.

### Program Structure

#### Year 1

|          |                                     |         |
|----------|-------------------------------------|---------|
| GMAT1100 | Principles of Surveying             | (6 UOC) |
| GMAT1150 | Survey Methods & Computations       | (6 UOC) |
| GMAT1200 | Visualisation of Spatial Data       | (6 UOC) |
| GMAT1300 | Computing Applications in Geomatics | (6 UOC) |
| GMAT1400 | Land Studies in Geomatics           | (6 UOC) |
| PHYS1189 | Physics 1 (Geomatic Engineering)    | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

#### Year 2

|          |                                                             |         |
|----------|-------------------------------------------------------------|---------|
| GMAT2100 | Electronic Surveying Instrumentation: Principles & Practice | (6 UOC) |
| GMAT2110 | Electronic & GPS Positioning Technologies                   | (6 UOC) |
| GMAT2200 | Geographic Information Systems & CAD                        | (6 UOC) |
| GMAT2300 | Analysis of Observations                                    | (3 UOC) |
| GMAT2350 | Computing for Spatial Information Sciences                  | (3 UOC) |
| GMAT2700 | Geometry of Coordinate Reference Systems                    | (6 UOC) |

|          |                                               |         |
|----------|-----------------------------------------------|---------|
| MATH2019 | Engineering Mathematics 2CE                   | (6 UOC) |
| MATH2829 | Statistics SU                                 | (3 UOC) |
| PHYS2969 | Physics of Measurement (Geomatic Engineering) | (3 UOC) |

**Note:** PHYS2969 may not be offered every year. It can be done in Year 2 or 3.

### Year 3

The program structure for Years 3 and 4 of the program depends on the electives chosen by students.

|                           |                                                    |          |
|---------------------------|----------------------------------------------------|----------|
| GMAT3200                  | Geospatial Information Techniques and Applications | (6 UOC)  |
| GMAT3400                  | Cadastral Surveying 1                              | (3 UOC)  |
| GMAT3410                  | Land Economics & Valuation                         | (3 UOC)  |
| GMAT3500                  | Photogrammetry and Remote Sensing                  | (6 UOC)  |
| GMAT3150                  | Field Projects                                     | (6 UOC)  |
| General Education courses |                                                    | (6 UOC)  |
| Session 1 Electives       |                                                    | (12 UOC) |
| Session 2 Electives       |                                                    | (6 UOC)  |

### Electives: Session One

|          |                                  |         |
|----------|----------------------------------|---------|
| BENV2901 | City Planning Today              | (3 UOC) |
| COMP1011 | Computing 1A                     | (6 UOC) |
| CVEN0646 | Water and Wastewater Engineering | (3 UOC) |
| GMAT3100 | Surveying Applications           | (6 UOC) |
| MATH1081 | Discrete Mathematics             | (6 UOC) |

### Electives: Session Two

|          |                             |         |
|----------|-----------------------------|---------|
| COMP1011 | Computing 1A                | (6 UOC) |
| COMP1021 | Computing 1B                | (6 UOC) |
| COMP2011 | Data Organisation           | (6 UOC) |
| CVEN0656 | Soil & Pavement Engineering | (3 UOC) |
| GMAT3450 | Cadastral Surveying 2       | (3 UOC) |
| MATH1081 | Discrete Mathematics        | (6 UOC) |

### Year 4

|                     |                                                              |          |
|---------------------|--------------------------------------------------------------|----------|
| GMAT4000            | Thesis Part A                                                | (3 UOC)  |
| GMAT4001            | Thesis Part B                                                | (9 UOC)  |
| GMAT4700            | Project Management 1                                         | (3 UOC)  |
| GMAT4750            | Project Management 2                                         | (3 UOC)  |
| GMAT4850            | Surveying and Spatial Information Systems for Sustainability | (3 UOC)  |
| Session 1 Electives |                                                              | (15 UOC) |
| Session 2 Electives |                                                              | (12 UOC) |

### Electives

Any remaining Year 3 electives and

|          |                                                                     |         |
|----------|---------------------------------------------------------------------|---------|
| GEOH3911 | Environmental Impact Assessment                                     | (6 UOC) |
| GMAT4020 | Project in Surveying and SIS                                        | (6 UOC) |
| GMAT4400 | Land Management & Development Project 1                             | (6 UOC) |
| GMAT4410 | Land Subdivision & Development                                      | (3 UOC) |
| GMAT4450 | Land Management & Development Project 2                             | (6 UOC) |
| GMAT4900 | Principles of Global Navigation Satellite System (GNSS) Positioning | (6 UOC) |
| GMAT4910 | Modern Navigation & Positioning Technologies                        | (6 UOC) |
| GMAT9211 | Introduction to Geodesy                                             | (6 UOC) |
| MINE3410 | Coal Mining Systems                                                 | (6 UOC) |
| PLAN1122 | Development Processes                                               | (6 UOC) |
| PLAN2111 | Economics of Planning and Development                               | (6 UOC) |

The following electives 5 HPW, 6UOC courses may be chosen once COMP1011, COMP1021 and MATH1081 have been completed:

|          |                                             |         |
|----------|---------------------------------------------|---------|
| COMP2021 | Digital System Structures                   | (6 UOC) |
| COMP2041 | Software Construction: Techniques and Tools | (6 UOC) |
| COMP2411 | Logic and Logic Programming                 | (6 UOC) |
| COMP3111 | Software Engineering                        | (6 UOC) |
| COMP3121 | Algorithms and Programming Techniques       | (6 UOC) |
| COMP3131 | Programming Languages and Compilers         | (6 UOC) |
| COMP3211 | Computer Architecture                       | (6 UOC) |
| COMP3221 | Microprocessors and Embedded Systems        | (6 UOC) |
| COMP3231 | Operating Systems                           | (6 UOC) |
| COMP3311 | Database Systems                            | (6 UOC) |
| COMP3331 | Computer Networks and Applications          | (6 UOC) |
| COMP3411 | Artificial Intelligence                     | (6 UOC) |
| COMP3511 | Human Computer Interaction                  | (6 UOC) |

and other electives with the approval of the Head of School.

The School has available a list of suggested subject selections for course streams in Cadastral Surveying and Land Development as well as GPS and Geographic Information Systems. Please contact the School Office.

Total HPW Session 1 & 2 depends on electives chosen

Total units of credit: 48

## General Education

Please refer to General Education Requirements under 'Faculty Information and Assistance' in this Handbook.

## Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

## Academic Rules

For program rules relating to the Bachelor of Engineering, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Experience Requirements

All students must complete at least 60 working days of approved professional practice prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of professional practice at a standard approved by the University.

## Field Excursions

Students may have to complete a number of field projects as part of their program and are expected to complete all necessary fieldwork for any course. They must be prepared to pay all the appropriate costs associated with these field projects, and must be in attendance at all scheduled examinations, except in exceptional circumstances.

## Professional Recognition

The degree of BE in Surveying and Spatial Information Systems is recognised by the Board of Surveying and Spatial Information of New South Wales as meeting requirements for entry as a candidate to become a Registered Surveyor in New South Wales. The degree is recognised by the Institution of Surveyors, New South Wales, the Spatial Sciences Institute, and the Institution of Engineers Australia (IEAust.) for admission as corporate members.

Students wishing to become Registered Surveyors after graduation are advised to gain practical experience under a Registered Surveyor during their program. Details are obtainable from the Registrar, Board of Surveying and Spatial Information of NSW, P.O. Box 143, Bathurst NSW 2795.

## 3746 Surveying and Spatial Information Systems/Bachelor of Science

### Bachelor of Engineering Bachelor of Science BE BSc

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

This combined degree program of five years full-time study enables a student to qualify for the award of the two degrees of Bachelor of Engineering in Surveying & SIS and Bachelor of Science. This program is open to all students who satisfy both the Surveying & SIS and Science entry conditions.

The program is designed for those wishing to broaden their career options.

## Program Structure

### Year 1

#### Session One

|          |                                  |         |
|----------|----------------------------------|---------|
| COMP1011 | Computing 1A                     | (6 UOC) |
| GMAT1100 | Principles of Surveying          | (6 UOC) |
| PHYS1189 | Physics 1 (Geomatic Engineering) | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1131 | Mathematics 1A        | (6 UOC) |
| MATH1141 | Higher Mathematics 1A | (6 UOC) |

#### Session Two

|          |                               |         |
|----------|-------------------------------|---------|
| COMP1021 | Computing 1B                  | (6 UOC) |
| GMAT1150 | Survey Methods & Computations | (6 UOC) |

And ONE of the following courses:

|          |                       |         |
|----------|-----------------------|---------|
| MATH1231 | Mathematics 1B        | (6 UOC) |
| MATH1241 | Higher Mathematics 1B | (6 UOC) |

and Year 1 GMAT elective either

|          |                           |         |
|----------|---------------------------|---------|
| GMAT1400 | Land Studies in Geomatics | (6 UOC) |
|----------|---------------------------|---------|

or

|          |                               |         |
|----------|-------------------------------|---------|
| GMAT1200 | Visualisation of Spatial Data | (6 UOC) |
|----------|-------------------------------|---------|

#### Year 2

##### Session One

|          |                                                             |         |
|----------|-------------------------------------------------------------|---------|
| GMAT2100 | Electronic Surveying Instrumentation: Principles & Practice | (6 UOC) |
| GMAT2700 | Geometry of Coordinate Reference Systems                    | (6 UOC) |
| MATH1081 | Discrete Mathematics                                        | (6 UOC) |
| MATH2829 | Statistics SU                                               | (3 UOC) |
| PHYS2969 | Physics of Measurement (Geomatic Engineering)               | (3 UOC) |

##### Session Two

|          |                                           |         |
|----------|-------------------------------------------|---------|
| COMP2011 | Data Organisation                         | (6 UOC) |
| GMAT2110 | Electronic & GPS Positioning Technologies | (6 UOC) |
| GMAT2200 | Geographic Information Systems & CAD      | (6 UOC) |
| GMAT2300 | Analysis of Observations                  | (3 UOC) |

and Year 2 free elective

#### Year 3

##### Session One

|          |                                                    |         |
|----------|----------------------------------------------------|---------|
| GMAT3200 | Geospatial Information Techniques and Applications | (6 UOC) |
| GMAT3400 | Cadastral Surveying 1                              | (3 UOC) |
| COMP2xxx | (a level 2 computing elective)                     |         |

##### Year 3 electives

|          |                                  |         |
|----------|----------------------------------|---------|
| CVEN0646 | Water and Wastewater Engineering | (3 UOC) |
| GMAT3100 | Surveying Applications           | (6 UOC) |

General Education course/s

#### Year 4

##### Session One

|          |                                                              |         |
|----------|--------------------------------------------------------------|---------|
| GMAT4700 | Project Management 1                                         | (3 UOC) |
| GMAT4850 | Surveying and Spatial Information Systems for Sustainability | (3 UOC) |

COMP3 (a level 3 computing elective)

Year 4 GMAT electives from:

|          |                                                                     |         |
|----------|---------------------------------------------------------------------|---------|
| GMAT4400 | Land Management & Development Project 1                             | (6 UOC) |
| GMAT4410 | Land Subdivision & Development                                      | (3 UOC) |
| GMAT4900 | Principles of Global Navigation Satellite System (GNSS) Positioning | (6 UOC) |

##### Session Two

|          |                      |         |
|----------|----------------------|---------|
| GMAT4750 | Project Management 2 | (3 UOC) |
|----------|----------------------|---------|

COMP3XXX (a level 3 computing elective) and Year 4 GMAT electives from:

|          |                                              |         |
|----------|----------------------------------------------|---------|
| GMAT4020 | Project in Surveying and SIS                 | (6 UOC) |
| GMAT4450 | Land Management & Development Project 2      | (6 UOC) |
| GMAT4910 | Modern Navigation & Positioning Technologies | (6 UOC) |
| GMAT9211 | Introduction to Geodesy                      | (6 UOC) |

#### Year 5

##### Session One

|          |               |         |
|----------|---------------|---------|
| GMAT4000 | Thesis Part A | (3 UOC) |
|----------|---------------|---------|

COMP3 (2 level 3 Comp Science & Engineering electives totalling 12 units of credit)

Year 5 electives (totalling 9 units of credit)

##### Session Two

|          |               |         |
|----------|---------------|---------|
| GMAT4001 | Thesis Part B | (9 UOC) |
|----------|---------------|---------|

COMP3xxx (a level 3 Comp Scie & Eng. elective), and Year 5 electives (9 units of credit).

Year 5 electives may be chosen from any of the remaining GMAT Year 4 electives or COMP level 3 or 4 courses.

Other arrangements of electives are possible with the approval of the Head of School.

The School of Surveying and Spatial Information Systems is the program authority.

Students may choose to do 3 units of General Education in Year 2, and another 3 units in Year 3. It is possible to revert to the single BE (Surveying and Spatial Information Systems) degree; progress and conversion will be determined on an individual student basis by the program authority.

## Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

## Academic Rules

For academic rules relating to the combined degree Bachelor of Engineering Bachelor of Science, please refer to the 'Rules for Progression and Award of Degrees' under 'Faculty Information and Assistance' in this Handbook.

## Industrial Experience Requirements

All students must complete at least 60 working days of approved professional practice prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of profession practice at a standard approved by the University.

## Field Excursions

Students may have to complete a number of field projects as part of their program and are expected to complete all necessary fieldwork for any course. They must be prepared to pay all the appropriate costs associated with these field projects, and must be in attendance at all scheduled examinations, except in exceptional circumstances.

## Professional Recognition

The degree of BE in Surveying and Spatial Information Systems is recognised by the Board of Surveying and Spatial Information of New South Wales as meeting requirements for entry as a candidate to become a Registered Surveyor in New South Wales. The degree is recognised by the Institution of Surveyors, New South Wales, the Spatial Sciences Institute, and the Institution of Engineers Australia (IEAust.) for admission as corporate members.

Students wishing to become Registered Surveyors after graduation are advised to gain practical experience under a Registered Surveyor during their program. Details are obtainable from the Registrar, Board of Surveying and Spatial Information of NSW, P.O. Box 143, Bathurst NSW 2795.

## 3747 Surveying and Spatial Information Systems/Bachelor of Arts

### Bachelor of Engineering Bachelor of Arts BE BA

#### Typical Duration

5 years

#### Minimum UOC for Award

240 units of credit

#### Typical UOC per Session

24 units of credit

## Program Description

With this combined five year degree program, students can add their choice of an Arts major to the standard, professionally accredited

engineering program offered by the School of Surveying and Spatial Information Systems. The program is open to all students who satisfy both the Engineering and Arts entry conditions.

The program provides flexibility in the choice of courses within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as to engage in specialised studies in Surveying and Spatial Information Systems.

### Program Structure

The program is administered by the School of Surveying and Spatial Information Systems.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as soon as possible, preferably well before enrolment. Students should work out for themselves the BA program they would like to add to their Surveying and Spatial Information Systems program. The Faculty of Arts and Social Sciences section in this Handbook describes the options, and the School of Surveying and Spatial Information Systems can supply sample programs.

There are no special rules on what to include in each, year. Students should schedule the Arts and Surveying and Spatial Information Systems components to suit their preferences whilst meeting the constraints of timetables and prerequisites.

The Arts component must be approved by the Faculty of Arts and Social Sciences.

The final program and schedule must be approved by the School of Surveying and Spatial Information Systems.

### Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both Pass students and to those aiming at Honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.

Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Faculty of Science and of the appropriate school concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Science Cross Faculty Standing Committee or its delegated authorities. AUSTUDY support is available for the combined degree program including the Honours level.

### Academic Rules

1. In addition to the BE program, students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. in courses designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one school of department.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

Australian Studies  
Chinese Studies  
Development Studies  
Education  
English  
Environmental Studies\*  
European Studies  
Film  
French  
German Studies  
Greek  
History  
History and Philosophy of Science  
Indonesian Studies  
Japanese Studies  
Korean Studies  
Linguistics  
Media, Culture & Technology  
Music

Philosophy  
Policy Studies  
Political Economy  
Politics and International Relations  
Russian Studies  
Sociology & Anthropology  
Spanish & Latin American Studies  
Theatre & Performance Studies  
Women's and Gender Studies

*\*Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 level 1 units of credit in an approved course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.*

3. Except for courses completed as part of the Environmental Studies major sequences, no more than 12 units of credit may be obtained from subjects in the BA program which are offered by schools outside the Faculty of Arts and Social Sciences.

4. No course included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students are exempt from the General Education requirement of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE BA program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of an Honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is  $5 \times 48 = 240$ .

There will be a separate testamur for each part of the combined degree program.

For academic rules relating to the Bachelor of Engineering component of this combined program, please refer to the 'Rules for Progression and Award of Degrees' under Faculty Information and Assistance in this Handbook.

### Industrial Experience Requirements

All students must complete at least 60 working days of approved professional practice prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of professional practice at a standard approved by the University.

### Field Excursions

Students may have to complete a number of field projects as part of their program and are expected to complete all necessary fieldwork for any course. They must be prepared to pay all the appropriate costs associated with these field projects, and must be in attendance at all scheduled examinations, except in exceptional circumstances.

### Professional Recognition

The degree of BE in Surveying and Spatial Information Systems is recognised by the Board of Surveying and Spatial Information of New South Wales as meeting requirements for entry as a candidate to become a Registered Surveyor in New South Wales. The degree is recognised by the Institution of Surveyors New South Wales, the Spatial Sciences Institute, and the Institution of Engineers Australia (IEAust.) for admission as corporate members.

Students wishing to become Registered Surveyors after graduation are advised to gain practical experience under a Registered Surveyor during their program. Details are obtainable from the Registrar, Board of Surveying and Spatial Information of NSW, P.O. Box 143, Bathurst NSW 2795.

## 3715 Surveying & Spatial Information Systems/Bachelor of Commerce

### BE BCom

Please refer to the program entry for 3715 Bachelor of Engineering Bachelor of Commerce under 'Program Rules and Information' in this Handbook.

## Fast Track program with Master of Engineering Science

### 3741 Surveying and Spatial Information Systems/Master of Engineering – Plan GMATL13741

#### Bachelor of Engineering Master of Engineering Science BE MEngSc

Students may undertake a 4.5 years (10 semesters) full-time fast-track program leading to the awards of a Bachelor of Engineering and a Master of Engineering in Surveying and Spatial Information Systems.

Students undertake the first three years (6 semesters) of the BE program in Surveying and Spatial Information Systems. Subject to satisfying a minimum performance over these three years (see “Rules for Progression and the Award of Degrees”, they (a) substitute 12 units of credit of the standard 4th year BE degree program with a School approved 12 units of credit of graduate coursework in their 4th year; (b) undertake a 12 units of credit of project/thesis work over the Summer (9th) Semester; and (c) undertake 24 units of credit of graduate coursework in the 10th semester (first half of their 5th year).

## Graduate School of Biomedical Engineering

**Head of School:** Professor BK Milthorpe

The Graduate School of Biomedical Engineering is an interdisciplinary unit which promotes and coordinates biomedical engineering studies and research being conducted by various schools and departments within the University and its teaching hospitals. Biomedical Engineering is the application of engineering techniques and analysis to problem solving in medicine and the biological sciences. The engineering disciplines embraced within the scope of Biomedical Engineering include: Electrical Engineering, Mechanical Engineering, Computer Engineering, Materials Science, Chemical Engineering, and Bioinformatics. Biomedical Engineering provides a direct input to enhancing the quality and scope of health care through the application of engineering analysis to biological systems and introducing engineering principles to medical and surgical interventions.

The Graduate School of Biomedical Engineering, in conjunction with the Schools of Mechanical and Manufacturing Engineering, Electrical Engineering and Telecommunications, Computer Science and Engineering, Material Science and Engineering, and Chemical Engineering and Industrial Chemistry, offers concurrent degree programs which allow the completion of a Bachelor of Engineering and a Master of Biomedical Engineering within a 5 year period.

Formal graduate courses in Biomedical Engineering are offered. These are: the Master of Biomedical Engineering, the Master of Engineering Science in Biomedical Engineering, and the Graduate Diploma in Biomedical Engineering. Opportunities are provided for graduate research leading to the award of the degrees of Master of Science, Master of Engineering and Doctor of Philosophy.

#### Concurrent Degree Programs

The concurrent degree programs are specifically designed for undergraduate students wishing to pursue a career in Biomedical Engineering. These programs allow students to enter an integrated course which provides both the prerequisite engineering education and the specialist Biomedical Engineering training.

Biomedical Engineering is available in concurrent degrees with Mechanical Engineering, Mechatronic Engineering, Electrical Engineering, Computer Engineering, Software Engineering, Chemical Engineering, Materials Science, Telecommunications Engineering, and Bioinformatics

Students are expected to perform at a Credit average (65%) or better in their first three years to be permitted to progress to the Masters component of a concurrent degree program. Students who at the end of Year 3, do not satisfy the requirements for progression to the Masters component may complete the Bachelor of Engineering. At the completion of the Bachelor of Engineering, students may enrol in the Graduate Diploma in

Biomedical Engineering with advanced standing for biomedical subjects previously completed.

Students may elect at any time to revert to the BE program. If, once entering a concurrent degree program, students wish to revert to the normal BE programs they will need to satisfy the requirements for the BE as set out in the relevant sections of this Handbook. Since the concurrent degree programs introduce subjects additional to those in the BE, the student reverting to the normal BE program may require up to an additional year to achieve a BE after completing years 3 or 4 of the concurrent degree program.

#### Professional Recognition

The Institution of Engineers, Australia, recognises the Bachelor of Engineering components of the BE/MBiomedE courses as meeting the examination requirements for admission to graduate and corporate membership. In addition, examination requirements are met for membership of the Institution's College of Biomedical Engineering. The degrees are accorded substantial or complete recognition by overseas engineering institutions.

**Please note:** Most undergraduate programs in the Faculty of Engineering are currently under revision, subject to approval by the University Council. Students commencing in 2006 should refer to the Online Handbook ([www.handbook.unsw.edu.au](http://www.handbook.unsw.edu.au)) for up-to-date information about program structures.

## Bachelor of Engineering Master of Biomedical Engineering

### BE MBiomedE

Please contact Biomedical Engineering or go to the Biomedical Engineering website ([www.gsbme.unsw.edu.au](http://www.gsbme.unsw.edu.au)) for specific information on the concurrent degrees:

**3757 Bachelor of Engineering (Bioinformatics)/Master of Biomedical Engineering**

**3048 Bachelor of Engineering (Chemical Engineering)/Master of Biomedical Engineering**

**3728 Bachelor of Engineering (Computer Engineering)/Master of Biomedical Engineering**

**3727 Bachelor of Engineering (Electrical Engineering)/Master of Biomedical Engineering**

**3138 Bachelor of Engineering (Materials Science)/Master of Biomedical Engineering**

**3683 Bachelor of Engineering (Mechanical Engineering)/Master of Biomedical Engineering**

**3688 Bachelor of Engineering (Mechatronic Engineering)/Master of Biomedical Engineering**

**3749 Bachelor of Engineering (Software Engineering)/Master of Biomedical Engineering**

**3723 Bachelor of Engineering (Telecommunications Engineering)/Master of Biomedical Engineering**

Courses offered in each program can be found listed under the relevant undergraduate teaching school.

#### Further Study

Postgraduate coursework programs in Biomedical Engineering are also offered. These are the Master of Biomedical Engineering, the Master of Engineering Science in Biomedical Engineering, and the Graduate Diploma in Biomedical Engineering.

Biomedical Engineering research programs offerings are the Master of Science, Master of Engineering and PhD. Research areas can be found listed in the Postgraduate Handbook or on the school website: [www.gsbme.unsw.edu.au](http://www.gsbme.unsw.edu.au)