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Science
Faculty Handbook
1995



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Science Faculty Handbook **1995**

The University attempts to ensure that the information contained in the handbook is correct as at 4 November 1994. The University reserves the right to vary any matter described in the handbook at any time without notice.



Equal opportunity

It is University policy to provide equal opportunity for all, regardless of race, sex, marital status, physical ability, sexual preference, age, political conviction or religious belief. The University also has an ethnic affairs policy to ensure that the University community is sensitive to the multicultural nature of Australian society and the cultural diversity within the University.

Free speech

The University supports the right to freedom of speech and the rights of its members to contribute to the diversity of views presented in our society.

Non-discriminatory language

UTS has adopted the use of non-discriminatory language as a key strategy in providing equal opportunity for all staff and students. Guidelines for the use of non-discriminatory language have been developed and all members of the University community are encouraged to use them.

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Corporate Responsibilities Unit
University Secretary's Division

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UTS News and Design Services

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- Haymarket
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Road, Haymarket, Sydney
- Blackfriars
Blackfriars Street, Chippendale
- Smail Street
3 Smail Street, Ultimo
- Wembley House
839–847 George Street, Sydney
- 645 Harris Street, Ultimo
- Bulga Ngurra, 23–27 Mountain Street
Ultimo
- 82–84 Ivy Street, Chippendale

Kuring-gai campus

Eton Road
Lindfield
(PO Box 222, Lindfield, NSW 2070)

St Leonards campus

- Dunbar Building
Corner Pacific Highway and
Westbourne Street, Gore Hill
- Clinical Studies, Centenary Lecture
Theatre and West Wing
Reserve Road, Royal North Shore
Hospital
- Gore Hill Research Laboratories
Royal North Shore Hospital
- School of Legal Practice (College of Law)
Corner Chandos and Christie Streets
St Leonards
Telephone: (02) 965 7000

Yarrawood Conference and Research Centre

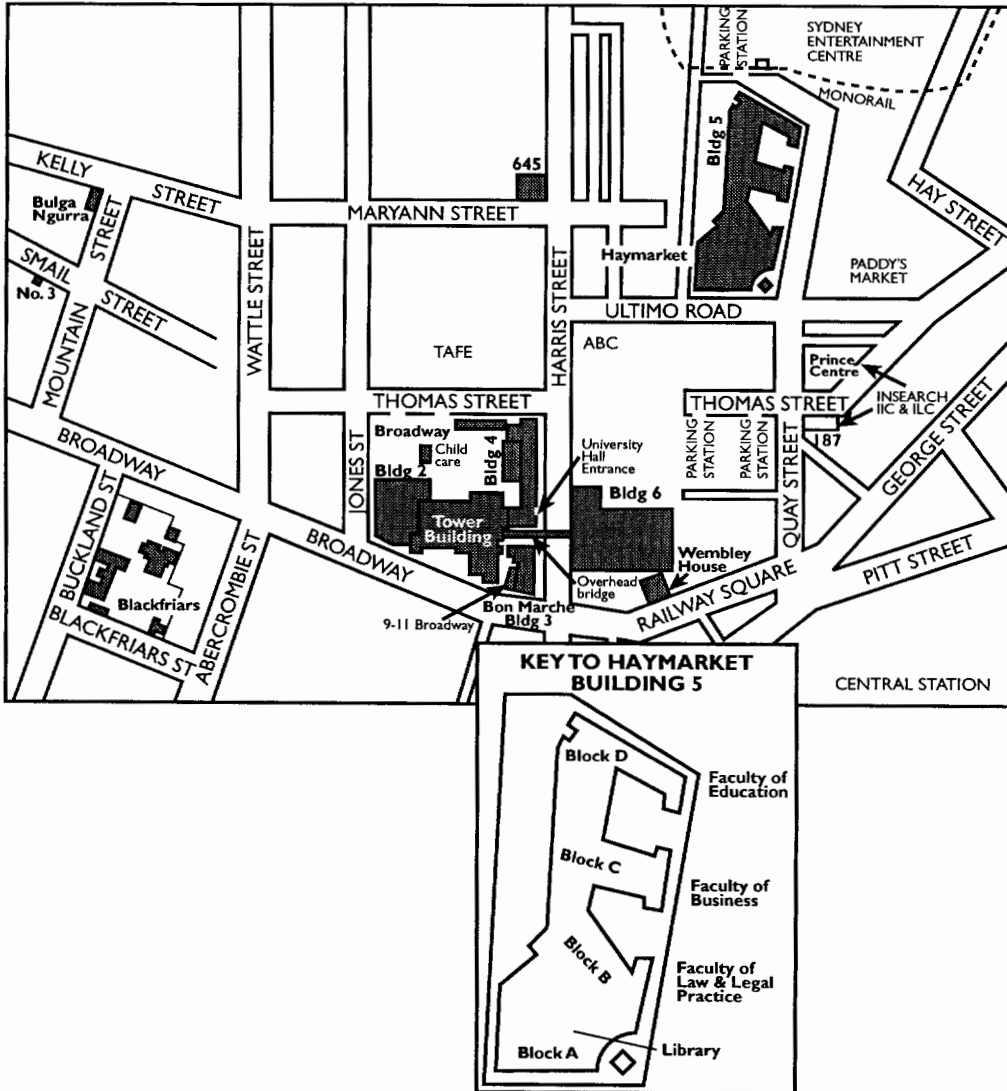
Hawkesbury Road
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Stroud

Lot AFP 161894
The Bucketts Way
Booral 2425

CAMPUS MAPS

CITY CAMPUS



City campus

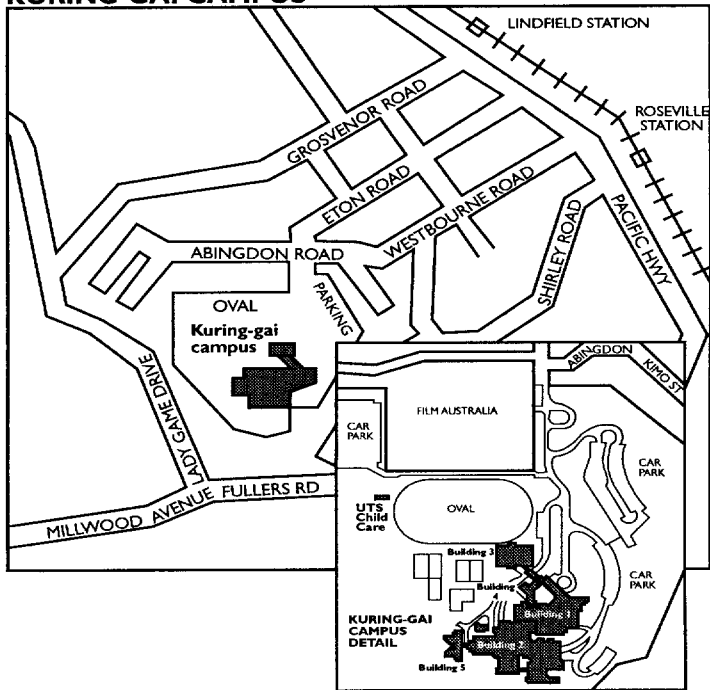
- Broadway
No.1 Broadway, Ultimo
702-730 Harris Street, Ultimo
- Haymarket
Corner Quay Street and Ultimo Road
Haymarket, Sydney
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3 Smail Street, Ultimo
- Wembley House
839-847 George Street
Sydney
- 645 Harris Street, Ultimo
- Bulga Ngurra, 23-27 Mountain Street
Ultimo
- 82-84 Ivy Street, Chippendale

CAMPUS MAPS

Kuring-gai campus

Eton Road
Lindfield

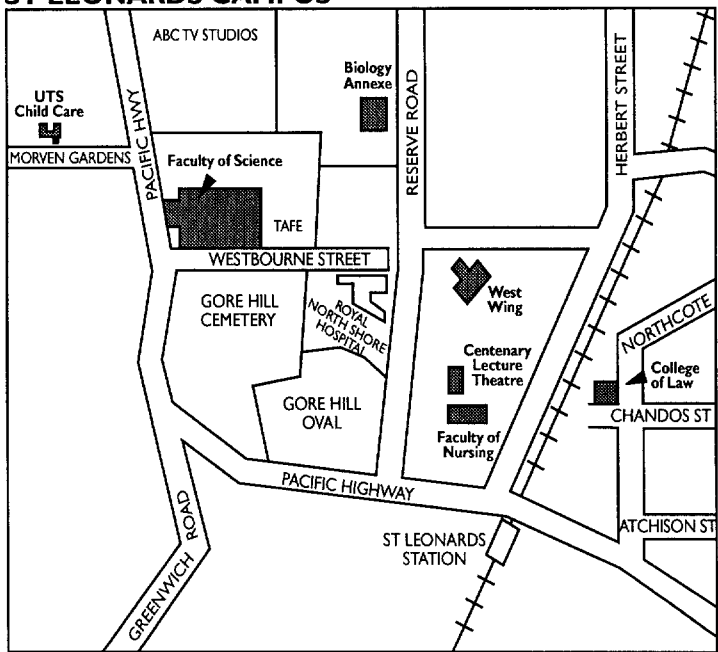
KURING-GAI CAMPUS



St Leonards campus

- School of Biological and Biomedical Sciences
Dunbar Building
Corner Pacific Highway and Westbourne Street
Gore Hill
- Clinical Studies, Centenary Lecture Theatre and West Wing
Reserve Road, Royal North Shore Hospital
- Gore Hill Research Laboratories
Royal North Shore Hospital
- School of Legal Practice (College of Law)
Corner Chandos and Christie Streets
St Leonards

ST LEONARDS CAMPUS



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PREFACE

This handbook is one of a suite of twelve publications comprising the *University Calendar*, the *Student Information Guide* and ten handbooks: Business; Design, Architecture and Building; Education; Engineering; Humanities and Social Sciences; International Studies; Law and Legal Practice; Mathematical and Computing Sciences; Nursing; and Science. Each handbook provides general information about the faculty as well as detailed information on the courses and subjects offered.

The *Calendar* contains the University By-law, which all students should read. It also contains a list of the University's courses, giving the name, abbreviation and title as indicated on the testamur. Copies of the *Calendar* are held in the University Library and in faculty offices, and may be purchased at the Co-op Bookshop.

Copies of the *Student Information Guide* are provided free to students at enrolment. You should make sure that you

read the student rules published in the guide. Information on the rights and responsibilities of students and on the services and facilities available is also given. The guide will assist you in your dealings with the University's administration and tell you whom to contact if you have a problem or need advice. Other publications providing information of a general nature are the *UAC Guide*, and the *UTS Undergraduate and Postgraduate Studies Guides*, all of which are available from the UTS Information Service.

For further information not provided in any of the publications mentioned e.g. additional information on courses, methods of assessment and book lists, you should contact the UTS Information Service or your Faculty office. If in doubt, don't hesitate to ask.

We hope you will enjoy your time as a student at UTS and wish you well in your studies.

MESSAGE FROM THE DEAN

The Faculty of Science comprises several departments in the biological and biomedical sciences and in the physical sciences. It is housed on two campuses, City and St Leonards.

The Faculty offers 17 undergraduate degree programs, Master's and PhD programs by research, and several graduate coursework programs including eight Master's degrees by coursework. The Faculty also provides teaching for several other faculties of the University. The Faculty further ensures that its educational services are available to students from a diversity of backgrounds and offers study patterns that facilitate progress through its courses.

Major course developments in the Faculty are in the areas of environmental management and forensic science. Teaching innovations include an enquiry/discovery approach to the teaching in several areas including biochemistry and physics.

The Faculty is proud of its strength in research. It wins over half of the competitive grants awarded to the University and is a major partner in two Cooperative Research Centres. Much of the Faculty's research is focused on the activities of its research centres and units. This concentration of research has enabled the Faculty to significantly improve the quality of its laboratories and its major equipment in recent years, to the obvious benefit of our students.

If you are a new student I welcome you to the Faculty, and wish you a challenging, inspiring and rewarding stay with us as you undertake your studies. The graduates you will join in a few short years have a very high reputation with Australian industry and the professions.

Professor Tony Moon

FACULTY MISSION STATEMENT

The purpose of the Faculty is to provide the highest quality professional education and training of graduates and postgraduates in science to meet the needs of Australian industry and science; and to engage in research and other professional activities in science to bring economic and social benefits to the Australian and international community.

Its vision is to become a leading science faculty, recognised nationally and internationally for the quality of its teaching, research and community service programs. The Faculty has developed its reputation by producing graduates and postgraduates who meet the needs of Australian industry and the professions and by establishing strong links with Australian industry through cooperative research and development.

PRINCIPAL DATES FOR 1995 ¹

AUTUMN SEMESTER

January

- 3 Enrolment day for Summer schools
- 4 School of Legal Practice enrolment day at St Leonards campus
- 9 Release of HSC results
- 13 Formal supplementary examinations for 1994 Spring semester students
- 17 Closing date for changes of preference to the Universities Admissions Centre (UAC) from 1994 NSW HSC applicants (by 4.30 p.m.)
- 19–31 Enrolment of postgraduate students, continuing undergraduate students and new direct entry students at City campus
- 26 Australia Day – public holiday
- 27 Public school holidays end

February

- 1–6 Enrolment of new undergraduate (UAC) students at City campus
- 7–17 Enrolment of postgraduate students, continuing undergraduate students and new direct entry students at City campus
- 27 Classes begin

March

- 10 Last day to enrol in a course or add subjects
Last day to change to 'pay now / up-front' HECS payment

- 24 Last day to apply for leave of absence without incurring student fees/charges
- 31 HECS Census Date
Last day to withdraw from a subject without financial penalty

April

- 7 Last day to withdraw from a course or subject without academic penalty ²
- 14 Public school holidays begin
Good Friday
- 17 Easter Monday
- 18–21 Vice-Chancellors' Week (non-teaching)
- 19 Graduation period begins
- 21 Public school holidays end
Provisional examination timetable available
- 25 Anzac Day
- 28 Last day to apply to graduate in Spring semester 1995

May

- 5 Graduation period ends
- 12 Examination Masters due
- 26 Final examination timetable available
- 31 Closing date for undergraduate and postgraduate applications for Spring semester

June

- 12 Queen's Birthday – public holiday
- 13–29 Formal examination period
- 30 Autumn semester ends

¹ Information is correct as at 15 November 1994. The University reserves the right to vary any information described in Principal Dates for 1995 without notice.

² HECS/Postgraduate course fees will apply after the HECS Census Date.

SPRING SEMESTER

July

- 3 Public school holidays begin
- 3–7 Vice-Chancellors' Week (non-teaching)
- 10–14 Formal alternative examination period for Autumn semester students
- 14 Public school holidays end
- 21 Release of Autumn semester examination results
- 24 Formal supplementary examinations for Autumn semester students
- 24–28 Confirmation of Spring semester programs
- 25–26 Enrolment of new and readmitted students and students returning from leave/concurrent study
- 31 Classes begin

August

- 1 Applications available for undergraduate and postgraduate courses
- 4 Last day to withdraw from full year subjects without academic penalty ²
- 11 Last day to enrol in a course or add subjects
Last day to change to 'pay now/up-front' HECS payment
- 25 Last day to apply for leave of absence without incurring student fees/charges (Spring enrolments only)
- 31 HECS Census Date
Last day to withdraw from a subject without financial penalty
Last day to apply to graduate in Autumn semester 1996

September

- 8 Last day to withdraw from a course or subject without academic penalty ²

- 22 Provisional timetable available
- 25 Public school holidays begin
Graduation period begins
- 25–29 Vice-Chancellors' Week (non-teaching)
- 29 Closing date for undergraduate applications via UAC (without late fee)
Closing date for inpUTS Special Admission Scheme applications
Graduation period ends
Closing date for postgraduate applications (*to be confirmed*)

October

- 2 Labour Day – public holiday
- 6 Public school holidays end
- 13 Examination Masters due
- 27 Final examination timetable available
- 31 Closing date for postgraduate research and course award applications
Closing date for undergraduate applications via UAC (with late fee)
Closing date for undergraduate applications direct to UTS (without late fee)

November

- 13–30 Formal examination period

December

- 1 Spring semester ends
- 11–15 Formal alternative examination period for Spring semester students
- 18 Public school holidays begin
- 22 Release of Spring semester examination results

² HECS/Postgraduate course fees will apply after the HECS Census Date.

THE FACULTY OF SCIENCE

The Faculty of Science has established a sound tradition of providing quality teaching, research and consultancy. The Faculty consists of several departments in biological and biomedical sciences as well as in physical sciences.

The departments in physical sciences and the main faculty office are located at the City campus. While the majority of departments in biological and biomedical sciences and a Dean's office are located at the St Leonards campus, the Bioscience Unit is located in Building 1 of the City campus.

The Faculty is concerned with providing high quality professional education in physical, biological and biomedical sciences, and with engaging in high level research, scholarship and other community service activities in support of the UTS mission, with a view to bringing social and economic benefit to the Australian community.

The Faculty offers a number of graduate and Honours degree programs developed to produce graduates for professional and vocational practice with an ability to continue their studies by research and to contribute to the knowledge base of their scientific discipline. Bachelor of Applied Science and Honours programs are offered in chemistry, chemistry/forensic science, physics, geology, and materials science. Bachelor of Science and Honours programs are offered in biomedical science (majoring in microbiology, biochemistry or cellular pathology), biotechnology, environmental biology and urban horticulture. Many of the degrees offered by the Faculty are cooperative in nature, which means that there is a mandatory period of industrial training for all students.

The Faculty is involved in the teaching of science to other faculties, in particular Engineering and Nursing. The Faculty is also involved in the offering of two joint undergraduate degree programs:

- The combined Science/Education program was first introduced at UTS in 1991 and is offered jointly with the Faculty of Education. The course is unique in that it combines three-and-a-half years of full-time academic studies in science and education together with one-and-a-half years of industrial training in a scientific discipline. The combination of academic subjects together with the industrial training means that secondary school teachers will be far better equipped to advise students on career options in industry.
- The BSc LLB joint degree is offered in conjunction with the Faculty of Law and Legal Practice and is aimed primarily at producing law graduates with a strong background in science who wish to work in areas such as environmental law, patent law and mining law.

In the postgraduate area, the Faculty offers PhD and Master's degrees (by thesis), Master of Science programs (by coursework), Graduate Diplomas, and Graduate Certificates. Prospective students should discuss possible topics of research with the head of the appropriate department in the first instance. The research programs may be carried out on either a full-time or part-time basis and it is permissible for part-time students to undertake a portion of their research at a site external to UTS, provided an appropriate external supervisor can be appointed. Details of current research projects can be obtained from the Science Faculty office.

The Faculty has a strong record of research and development, essential to the strength of both undergraduate and postgraduate programs. The Faculty is therefore justifiably proud of its strength in research. Competitive research funding is obtained across a wide range of areas of expertise. The Faculty wins over half of the competitive grants awarded to the University and is a major partner in two Cooperative Research Centres, namely Cardiac Technology and Aquaculture. Much of

the Faculty's research is focused in the activities of its research centres and units including the Centre for Ecotoxicology (run jointly with the EPA), the Institute for Coastal Resource Management, the Centre for Materials Technology, the National Centre for Groundwater Management and the Centre for Biomedical Technology. This concentration of research has enabled the Faculty to improve significantly the quality of its major equipment in recent years, to the obvious benefit of its students. In research, the areas targeted for future development include forensic science and environmental management.

In the development of all of the above programs the Faculty is assisted by appropriate advisory committees having members drawn from the wider community. The courses are constantly kept under review to ensure currency and relevance to industrial and commercial practice.

The Faculty has always maintained strong links with industry. Staff maintain contact with industry by undertaking appropriate consulting activities, and in some of the above courses students spend six to 12 months working in a relevant industry. In cases where industrial training is a requirement of the course, the Faculty provides some assistance to students in finding these paid industrial training positions, but students are expected to source positions for themselves.

Most programs referred to above are available on either a full-time or part-time basis or a combination of both these attendance patterns.

Students in the Faculty of Science are strongly encouraged to read their copies of the 1995 *Student Information Guide*. The *Student Information Guide* contains valuable information about admission requirements, enrolment, examinations, exclusion, progression and a variety of other important information.

The 'Statement of good practice and ethics in informal assessments' can be found below and is especially included

here for two reasons: firstly, because it is not included in the *Student Information Guide* and secondly, and most importantly, because the statement is taken very seriously by the Faculty and we encourage you, the student, to take it seriously too.

STATEMENT OF GOOD PRACTICE AND ETHICS IN INFORMAL ASSESSMENTS

I. Aims of informal assessments

The term 'informal assessment' at UTS is defined as any assessment task other than a final examination that is administered by the Academic Registrar and held in the official UTS Examination Weeks. Such assessment is in no other sense 'informal', if it contributes to the final assessment of the student in the subject.

Common forms of such assessment in the Faculty of Science include:

- practical reports
- computer programs
- essays and assignments (including reports of field work)
- tests and quizzes

The setting and assessing of these tasks is aimed at promoting the following educational aims:

- furthering each student's learning of the subject
- the acquisition of practical skills of laboratory and field work, and its documentation
- providing a means for staff to assess each student's learning
- providing feedback to the student on progress in learning
- providing feedback to staff on the effectiveness of their teaching

These aims will be subverted if students deceive staff about either the authenticity of results, or the authorship of their written work. Such behaviour is unethical, unprofessional and completely unacceptable. Within the Western tradition of scholarship it is regarded as a serious academic offence.

It is recognised that students may sometimes find themselves in positions of extreme stress, for reasons of illness or misadventure, when malpractice may seem tempting. In such circumstances, however, other solutions are available, for example, seeking extra time for the submission of an assignment, accompanied by medical certificate and/or other compelling explanation.

2. Unacceptable behaviour

Cheating in all its forms is unacceptable behaviour, **and cannot be condoned**. Cheating is a breach of the University Rules. Examples of cheating include:

2.1 Outright lying

This is never acceptable under any circumstances. Remember that lying, in science, includes inventing or falsifying results.

2.2 Plagiarism (copying)

The Oxford Dictionary defines plagiarism as the taking and using of another person's thoughts, writings, inventions as one's own. It includes unacknowledged quotations from other authors (books, journals, fellow students), or the copying out, perhaps with changes intended to disguise, of slabs of other people's work. Don't copy!

2.3 Collusion

Collusion is a fraudulent, secret understanding to deceive, for example, in 'fixing' results, or doing one essay together and rewording it slightly to pass it off as two independent efforts.

2.4 Use of unauthorised material or equipment

Only equipment or material specified by the coordinating examiner may be used by a student during examinations, class tests and quizzes. Don't write on rulers, calculator cases etc.!

Don't cheat! Don't even think of cheating!

3. Acceptable practices

3.1 Acknowledging sources – referencing

Whenever any other person's work is used in the formulation of a written piece of work, it must be clearly indicated where the source of the information lies. The 'other person' could be a published or unpublished author, your lecturer, or one of your fellow students. Consult the various guides to writing assignments that are held in the library (and any that your lecturers may provide). As you prepare the assignment, keep a detailed running record of your references in a notebook, and use a standard referencing system e.g. the Harvard system. Often references cannot be found again later.

3.2 Collaboration

In many cases, experiments and other means of data collection require students to cooperate. Some assignments may involve an ideas-gathering stage followed by the writing-up phase.

While collaboration is normally encouraged in the developmental and experimental stages, **final data analysis and interpretation and writing-up** must be strictly your own effort (except in any exceptional circumstances that would have to be spelt out in detail by your lecturer).

4. Guide for good practice in written work

(Adapted from the statement prepared by the Faculty of Humanities and Social Sciences.)

4.1 Writing essays or assignments

Developing the ability to express yourself and argue clearly and in your own words is an important part of your university studies. Students are often confused, however, about just what is expected of them in written work: on the one hand, they are asked to present their own original ideas and arguments yet, on the other, they are told to use and take account of ideas, concepts and theories etc., in the material they read.

In fact, an important element of a well-written piece of work is the way that a student meets these two, apparently conflicting, demands.

4.2 Originality

'Being original', in an essay, for instance, **does not** mean that you have to think up your own theories and concepts etc. Rather, it refers, in part, to the way you make use of – by critiquing, analysing, evaluating, synthesising, exemplifying, instancing – the ideas, theories, evidence etc. of other writers or of experimental or secondary data (e.g. census statistics) in constructing a coherent and plausible argument.

4.3 Arguing a case

Strictly speaking, an 'argument' refers to the reasoned advancement of a number of propositions leading to a particular conclusion. In an essay, it means that having read and considered the relevant literature, and on the basis of this and any other appropriate evidence, you come to a conclusion about the question. In writing the essay, you set out the argument, or a series of arguments, to support that conclusion. In doing so, you draw on relevant ideas etc. from your reading, using them to support your argument. In cases where experimental data form the basis of the written work, your task may be to argue the case of how the data support or falsify a hypothesis.

Whether you are asked to argue, discuss, evaluate, compare and contrast, analyse, critique, consider etc. **you are still being asked to mount a reasoned argument**, in one form or another, leading to a conclusion based on an evaluation of all the evidence presented in your reading or provided by the data. For example, some essay questions may ask you to discuss or evaluate two conflicting arguments; in this case you have to decide – on the basis of the arguments themselves, any other evidence, and perhaps with the help of what some other writers say – which is the stronger or more adequate of the

two and then argue that, giving evidence in support.

In a sense, you could think of writing an essay, assignment or report (some of which might require different formats) rather like designing and erecting a building. All the possible and available building materials (bricks, timber, concrete, steel, roofing etc.) would be equivalent to all the reading you have done or experimental data acquired. You certainly cannot just throw a stack of materials on to a block of land and expect them to form the building. Rather, you would need to, firstly, get a general idea of the sort of building that is appropriate by considering all the relevant factors (such as size and lie of the land, accommodation required and building restrictions); secondly, design a structure which takes all of these factors into account, selecting materials to hold up the structure and rejecting those which would not. In a similar way you need to think carefully about all the information you have and decide what is relevant and what you can generally conclude from it; then design or plan it into a coherent and cogent argument supporting that position.

The actual argument (the design) is your original contribution; the support for that argument comes from all the data, ideas and theories etc. you considered and the evidence used (the materials). Hence, **it is the way you critically analyse, evaluate, select and synthesise information and use it in your argument** which is important in the work. You do not create something totally new, nor do you merely throw together other people's ideas. Do not make the mistake of thinking that it is sufficient for you to merely compile into some coherent order other people's referenced ideas etc. – the bulk of the essay has to be your own work.

PRIZES AND SCHOLARSHIPS

Prizes and scholarships are awarded each year to students in the Faculty for meritorious work. These are made available through the generosity of private individuals and public organisations. They are offered either each semester, annually or biennially. In rare instances, a prize or scholarship will be offered only when funds permit. Most prizes and scholarships are offered subject to the provision that they will be awarded only when a student has attained a mark or level of achievement considered by the Faculty Board to be sufficiently high. In addition to these official University prizes and scholarships it should be noted that there are available a number of scholarships and prizes from external sources for which University students can compete. Information about these scholarships and prizes appears from time to time on official noticeboards.

Faculty of Science Postgraduate Research Scholarship

A number of Postgraduate Research Scholarships are offered by the Faculty for full-time study towards a PhD. The awards which may be up to the value of \$18,500 per annum over three years are available for study in the following areas:

- Materials technology
- Image processing and analysis
- Regional and resource geology
- Science education
- Cell and molecular biology
- Biomedical science and engineering
- Environmental biology and toxicology
- Groundwater management
- Biomedical technology
- Forensic and analytical chemistry
- Coastal resource management

Dean's Merit List for Academic Excellence

The Faculty wishes to formally recognise outstanding performance by its students through the awarding of prizes, medals and the grading of degrees. The Dean's Merit List endeavours to formally acknowledge academic achievement throughout a student's course of study. From the end of 1993 and thereafter, the Faculty will each year publish a list of students who have been placed on the Dean's Merit List. Each student will also receive a certificate to this effect. To be listed a student would usually need to undertake a normal load; achieve an average mark for the year of 85 or above; and be recommended by the relevant Examination Review Committee in December each year.

AC Hatrick Chemicals Prize

This prize was established in 1990. It is awarded to the full-time student enrolled in the Applied Chemistry course who obtains the highest aggregate mark in Chemical Process Control. The prize has a cash value of \$250.

The Australian Ceramic Society Prize in Ceramics

This is a cash prize of \$100, intended for the purchase of books, and is awarded annually to the final stage student in the Materials Science degree course who achieves the highest aggregate mark in the subjects Ceramics 1, 2 and 3 in the year for which the award is made. The prize, established in 1979 through the generosity of the NSW Branch of the Australian Ceramic Society, is intended as an encouragement to students studying in the field of ceramics.

The Australian Ceramic Society Scholarship

The Australian Ceramic Society Scholarship was established in 1986 and is awarded annually to the student enrolled in the Materials Science degree course who, when undertaking a research project in the area of ceramics, obtains the highest average mark in Stages 1, 2, 3 and 4. The cash value of the scholarship is \$400.

Australian Institute of Medical Laboratory Scientists' Prize in Clinical Bacteriology and Parasitology

This prize was established in 1983 by the New South Wales Branch of the Australian Institute of Medical Laboratory Scientists. It is offered annually to students enrolled in the Biological and Biomedical Sciences courses and is awarded to the student who obtains the highest mark in the subject Clinical Bacteriology and Parasitology. The prize consists of a cash award of \$200 and a suitably inscribed bronze medallion.

Australian Institute of Medical Laboratory Scientists' Prize in Haematology

This prize was established in 1983 by the New South Wales Branch of the Australian Institute of Medical Laboratory Scientists. It is offered annually to students enrolled in the Biological and Biomedical Sciences courses and is awarded to the student who obtains the highest mark in the subject Haematology 2. The prize consists of a cash award of \$200 and a suitably inscribed bronze medallion.

Australian Institute of Physics Prize

The NSW Branch of the Australian Institute of Physics has made available an annual award to a student in the fourth year of the Physics degree, who obtains the best results in completing the final stage of the course. The prize is a cash award of \$200 plus one year's free membership of the Australian Institute of Physics.

Boehringer Mannheim Prize for Biomedical Sciences

This prize was established in 1990. It is awarded annually to the student enrolled in the Biomedical Science degree course who achieves the highest average mark in Stage 3, obtaining at least a distinction average mark. The prize consists of a medal and a cash award of \$250.

Chemistry Department Prize

This prize was established in 1986. It is awarded annually to the student enrolled in the Applied Chemistry degree course who, having completed Stage 2 of the course, obtains the best performance in the Stage 2 chemistry subjects Chemistry 2M or Chemistry 2 and Organic Chemistry 1. The prize is valued at \$100.

Colin Field Prize

This prize was established in 1989 by Emeritus Professor Colin Field, former Dean of the Faculty of Life Sciences and Head of the School of Biological and Biomedical Sciences. The prize is awarded annually to the Biomedical Science, Environmental Biology or Biotechnology student who obtains the highest overall average mark from all subjects undertaken in Stages 1 and 2, with at least a credit average for the biology subjects offered in those stages. The prize has a cash value of \$200.

CSL (Commonwealth Serum Laboratories) Prize

This prize was established in 1990. It is awarded to the graduating student from the Biological and Biomedical Sciences degrees who attains the highest aggregate mark in the subject Blood Bank, with a mark at distinction level or higher. The prize has a cash value of \$200.

Department of Water Resources Prize

This prize was established in 1990. It is awarded annually to a student enrolled in the Biological and Biomedical Sciences courses, who obtains the highest average mark in the two subjects Aquatic Ecology and Terrestrial Ecology, provided that the average mark is of distinction grade. The prize has a cash value of \$250.

Dr David Sugerman Prize in Pathology

This prize was established in 1982 by Dr David Sugerman. The prize is awarded annually to the student who obtains the highest aggregate in the subjects Anatomical Pathology, Immunology and Haematology, provided that the student reaching the highest aggregate has an average mark of not less than the standard of credit. The prize has a cash value of \$500.

The Environmental Biology Prize

This prize was established anonymously in 1984. The prize has a cash value of \$250 and is awarded to the student enrolled in the BSc Environmental Biology degree course who obtains the highest average mark in Stages 3 to 6 of the degree course.

Foseco Prize in Materials Science

This prize was established in 1982 by Foseco Pty Ltd as an incentive to students engaged in studies in the field of Materials Science. The prize is offered annually to students enrolled in the Materials Science degree course and is awarded to the student who achieves the highest aggregate mark in the subjects Materials Science 1 and Materials Science 2. The prize consists of a cash award of \$200.

Francis E Feledy Memorial Prize

For information on the Francis E Feledy Memorial Prize, refer to the section on General Prizes and Scholarships.

Hatrick-Jotun Prize in Design and Materials Selection

This prize (formerly the Hatrick Fiberfil Prize in Design and Materials Selection) was re-established in 1986. It is awarded to the student in the Materials Science degree course who achieves the best performance in the subject Design and Materials Selection. The prize has a cash value of \$250.

Hatrick Reichhold Prize in Polymer Technology

This prize was established in 1984 by A C Hatrick Chemicals Pty Ltd as an incentive to students studying in the field of polymers and resin technology. The prize is awarded to the student who achieves the best performance in the subject Polymers 3. The cash value of the prize is \$250.

The Institute of Metals and Materials Australasia Prize

This prize, established in 1983, is offered annually to students in the Materials Science degree course, and will be awarded to the student who achieves the highest mark in the subject Physical Metallurgy 1. The prize consists of a cash award of \$200 and one year's membership of the Institute of Metals and Materials Australasia.

JOEL Prize for Electron Microscopy

This prize was established in 1991. It is awarded to the student who achieves the highest mark in the subject Electron Microscopy Techniques. The prize has a cash value of \$250.

KK & S Prize in Metallurgy

This prize was established in 1982 by KK & S Instruments Pty Ltd as an incentive to students engaged in studies in the field of Metallurgy. The prize is offered annually to students enrolled in the Materials Science degree course, and is awarded to the student who achieves the best performance in the subject Physical Metallurgy 3. The prize has a cash value of \$150.

Leonard J Lawler Prize

This prize is presented by the Australian Institute of Medical Laboratory Scientists in dedication to the past services of Mr L J Lawler to the New South Wales Branch of the AIMLS. Over a long period Mr Lawler has shown great interest in the education of clinical chemists. The prize has been awarded annually since 1976. It is awarded to the student enrolled in the Biological and Biomedical Sciences courses who attains

the best aggregate in the subjects Clinical Biochemistry 1 and Clinical Biochemistry 2. The prize consists of a cash award of \$200 and a suitably inscribed bronze medallion.

Loctite Australia Prize in Adhesion Science

This prize was established in 1983. It is awarded annually to the student enrolled in the Materials Science degree course who achieves the best performance in the subject Surface Properties of Materials. The prize has a cash value of \$150.

Macquarie Pathology Services Prize in Biomedical Science

This prize was established in 1984 by Macquarie Pathology Services Pty Ltd. The prize is awarded annually to the student who obtains the highest average mark in Stages 3 to 6 of the degree course leading to the award of BSc in Biomedical Science. The prize includes a cash award of \$500 and a medal.

M Y Ali Prize in Diagnostic Cytology

This prize was established in 1978 by Dr M Y Ali, former Head of the Department of Pathology and Immunology. The prize of approximately \$100 is awarded annually to the student who achieves the highest aggregate in the Diagnostic Cytology subjects, provided that the student has an average mark in these subjects of not less than credit level.

National Safety Council of Australia Prize

The National Safety Council of Australia Prize was established in 1986 and is awarded to the student enrolled in the Applied Chemistry degree course who obtains the highest aggregate mark in the subject Chemical Safety. The prize is in the form of a book token to the value of \$100.

Pasminco Prize in Extractive Metallurgy

This prize was established in 1990. It is awarded to the student enrolled in the Physical Sciences courses who obtains the highest aggregate mark in the subject Extractive Metallurgy. The prize has a cash value of \$250.

Physics Staff Prize

This prize was established in 1985. It is awarded each year to the student in the Applied Physics degree course who obtains the highest average mark in the first three stages of the course. The prize has a cash value of \$200.

Ratcliffe Prize

Awarded for the best aggregate result of the Graduate Diploma in Occupational Health and Safety course.

R F G MacMillan Award

This prize was established in 1991. It is awarded to a Materials Science degree student for participation and involvement in Materials Science activities beyond the normal academic requirements. The prize has a cash value of \$500.

Robert K Murphy Research Fund

To perpetuate the name of Dr R K Murphy, who was for 25 years Lecturer-in-Charge of the Chemistry Department and subsequently Principal of Sydney Technical College, the Sydney Technical College Science Association sponsored a fund to be known as the Robert K Murphy Research Fund, to which a number of chemical industries also subscribed. The income from the fund has been applied to set up the following prizes and scholarship:

(i) Robert K Murphy Research Prize

This prize is awarded annually to the student in the Applied Chemistry degree course who submits the best original Chemistry project. The prize has a cash value of \$250.

(ii) Robert K Murphy Prize

This prize is awarded annually to the student in the Applied Chemistry degree course who entered the course on completion of Chemistry Certificate of the TAFE Commission and who achieves the best overall performance in the Applied Chemistry degree. The prize has a cash value of \$250.

(iii) Robert K Murphy Research Scholarship

This scholarship is awarded annually to the student in the Applied Chemistry degree course who satisfies the Trustees that such a scholarship is warranted to assist the student in research in investigation or advanced study. The prize has a cash value of \$250.

Schering Plough Prize

This prize was established in 1990. It is awarded to the student enrolled in an Advanced Chemistry project in the Applied Chemistry course who presents the best project seminar (in terms of both technical merit and presentation). The prize has a cash value of \$250.

SICPA Australia Award

This is a cash prize of \$40, intended for the purchase of books, and is to be awarded annually to the student in the Materials Science degree course who achieves the highest aggregate mark in the subject Polymers 1 in the year for which the award is made. The prize, established in 1979 through the generosity of Collie Cooke Consolidated, is intended as an encouragement to students studying in the field of Organic Materials.

St Joe Mineral Deposits Prize

St Joe Australia Pty Ltd established this prize in 1984. The prize is awarded to the student who obtains the highest credit point average in the subject Mineral Deposits. The prize has a cash value of \$50.

TICS Prize

This prize was established in 1983 by The Institute Chemistry Society (TICS). It is offered annually to students completing Stage 3 of the Applied Chemistry degree course and is awarded to the student who obtains the highest average mark in Stage 3. The prize consists of a cash award of \$50.

Western Mining Corporation Prize

This prize was established in 1986. It is awarded annually to the student enrolled in the Applied Geology course who obtains the highest average mark of all students undertaking the Field Project in the year for which the award is made. The successful student will preferably demonstrate an interest in metalliferous exploration Geology. The prize has a cash value of \$200.

Western Mining Corporation Junior Studies Prize

This is a cash prize of \$150 awarded annually to the student who has shown the most significant improvement in the quality of academic work at the completion of Stage 4 in the Materials Science degree course. The prize was awarded for the first time in 1979.

Western Mining Corporation Senior Studies Prize

This is a cash prize of \$150 awarded annually subject to a suitable recipient being nominated by the Head of the Department of Materials Science, for distinguished performance in the final year (Stages 5 and 6) of the Materials Science degree course. The prize was awarded for the first time in 1979.

Workcover Authority Prize

Awarded for the highest aggregate mark in the first year of study in the Graduate Diploma in Occupational Health and Safety or Master of Occupational Health and Safety course.

COURSES OFFERED BY THE FACULTY

The Faculty offers the following undergraduate degrees:

- KB02 Bachelor of Science in Biomedical Science
- KB03 Bachelor of Science in Urban Horticulture
- KB04 Bachelor of Science (Honours) ¹
- KB05 Bachelor of Science in Environmental Biology
- KB06 Bachelor of Science in Biotechnology
- LL04 Bachelor of Science/Bachelor of Laws
- NC01 Bachelor of Applied Science (Chemistry)
- NC02 Bachelor of Applied Science (Honours) (Chemistry)
- NC04 Bachelor of Science (Honours) in Applied Chemistry – Forensic Science
- NG01 Bachelor of Applied Science (Geology)
- NG02 Bachelor of Applied Science (Honours) (Geology)
- NM02 Bachelor of Applied Science (Materials Science)
- NM03 Bachelor of Applied Science (Honours) (Materials Science)
- N003 Bachelor of Applied Science in Science Education
- NP01 Bachelor of Applied Science (Physics)
- NP02 Bachelor of Applied Science (Honours) (Physics)
- P005 Bachelor of Health Science in Acupuncture

Thirteen Graduate Certificates:

- EC58 Environmental Engineering and Management²
- KB70 Coastal Resource Management²
- KB71 Computer Data Acquisition in the Life Sciences
- KB72 Data Processing and Management in the Life Sciences
- KB73 Electronics and Computing in the Life Sciences
- KB74 Human Biology

- KB75 Medical Instrumentation and Measurement
- KB76 Physics in Medicine
- KB77 Principles of Environmental Toxicology³
- KB78 Ecotoxicology³
- KB80 Coastal Zone Law and Economics²
- P053 Occupational Health and Safety
- P054 Occupational Health and Safety Management

Eight Graduate Diplomas:

- KB62 Environmental Toxicology³
- KB65 Clinical Biochemistry
- KB67 Medical Microbiology
- KB69 Coastal Resource Management²
- N061 Hydrogeology and Groundwater Management
- P052 Occupational Health and Safety
- P056 Clinical Acupuncture
- P057 Musculo-skeletal Acupuncture

Eight Master's degrees (by coursework):

- KB52 Master of Science in Environmental Toxicology³
- KB53 Master of Science in Clinical Measurement
- KB55 Master of Science in Clinical Biochemistry
- KB57 Master of Science in Medical Microbiology
- KB58 Master of Science in Medical Physics
- KB59 Master of Science in Coastal Resource Management²
- N057 Master of Science in Hydrogeology and Groundwater Management
- P055 Master of Occupational Health and Safety

Master's degrees (by thesis):

- KB51 Master of Science (Biological and Biomedical Sciences)
- N053 Master of Science (Physical Sciences)
- N056 Master of Applied Science (Groundwater Management)

Doctor of Philosophy:

KB56 PhD (Biological and Biomedical Sciences)

N054 PhD (Physical Sciences)

N055 PhD (Groundwater Management)

¹ Offered to students who possess, or have fulfilled, all the requirements for a three-year Bachelor's degree in Biomedical Science, Biotechnology, Environmental Biology or Urban Horticulture from UTS, or equivalent, with at least an average credit grade in the final two stages of the undergraduate program.

² Interdisciplinary course run by the Faculty of Science in collaboration with the Faculties of Engineering, Business, Law and Legal Practice, and Design, Architecture and Building.

³ In collaboration with the NSW Environment Protection Authority.

Most programs are available on a full-time and part-time basis or a combination of both these attendance patterns.

In 1995, the newly established Institute for International Studies will offer the first stages of its International Studies Program which will be open to all UTS students. The program will include language programs; the study of history, politics, economics and society; and opportunities for in-country study. Activities will start with a focus on China, Indonesia and Japan, and later expand to other parts of East and South-East Asia, South America and Western Europe. Subjects within the International Studies Program can be taken as electives within current degrees, or as part of the new combined degrees, integrating International Studies with a discipline.

While the University of Technology, Sydney maintains traditional university standards of scholarly excellence in the granting of its awards, it is continually seeking to instruct students in new and innovative areas in keeping with the needs of our highly technological society.

UNDERGRADUATE COURSES

ADMISSION REQUIREMENTS

Applicants are considered for admission in accordance with the Rules and By-Law of UTS as set out in the UTS *Calendar*, and on the basis of meeting the general requirements in one of the following categories:

- the NSW Higher School Certificate
- an appropriate TAFE award – diploma, Associate Diploma or completion of a Tertiary Preparation Course (TPC)
- equivalent qualifications
- Mature age (see UTS *Calendar* for details)
- Accumulated Matriculation (see UTS *Calendar* for special circumstances)

ASSUMED KNOWLEDGE/COURSE PREREQUISITES

There are no mandatory prerequisite subjects from the Higher School Certificate; all science subjects taught in the first semester assume no HSC knowledge of the subject. However, it is assumed that all students entering the biological and biomedical sciences courses will have studied **at least two-unit mathematics plus one two-unit science course**. It is strongly recommended that they complete studies in two science subjects. Common combinations include chemistry/physics, chemistry/biology, or multistrand with biology. For students entering the physical sciences courses, it is assumed that they have studied two-unit mathematics plus two-unit physics, or two-unit chemistry or three/four-unit science. The minimum Tertiary Entrance Rank (TER) varies from year to year dependent upon the number of applications for entry and the number of places available.

REQUIREMENTS FOR AWARD OF BACHELOR'S DEGREE

A degree will be awarded to students satisfactorily completing the following requirements:

1. Credit points

A minimum of 144 credit points, accumulated by:
full-time attendance in Bachelor's degree courses involving satisfactory completion of the prescribed core subjects and approved elective subjects to the value of 48 credit points for each of three years;

or

part-time attendance in Bachelor's degree courses involving satisfactory completion of the prescribed core subjects and approved elective subjects to the value of 24 credit points for each of six years;

or

any other approved combination of full-time and part-time attendance.

Students who have failed subjects cannot be guaranteed a complete program or normal progression. However, a subject failed with a mark of 40 per cent or more may allow progression into subjects for which the failed subject is a prerequisite. All failed subjects must be successfully completed for award of a degree.

Students having difficulty devising a program should consult the Student Administrative Officer or an academic adviser. Where a student experiences legitimate difficulty enrolling in sufficient credit points to make up a full-time load, a minimum of 75 per cent of a normal full-time program is deemed adequate to maintain designation as a full-time student provided the whole degree is completed within 150 per cent of the normal progression period i.e. a three-year full-time degree should be completed in or under four-and-a-half years. Similarly, there is no minimum number of credit points for a part-time program for any one semester, but the whole degree should be completed within 150 per cent of the normal

progression period i.e. a six-year part-time degree should be completed in or under nine years.

2. Professional/work experience

Students who are enrolled in the physical sciences courses have industrial training as an integral part of the course. In most of these courses, students spend six to 12 months working in a relevant industry. This experience is to be gained prior to or concurrently with the final stage of the course depending on whether attendance is full-time (sandwich) or part-time.

For full-time students enrolled in the biological and biomedical sciences courses who desire to complete a period of work/industrial experience during their degree program, they may either insert a sandwich year of full-time employment between Stages 4 and 5 or may complete Stages 5 and 6 on a part-time basis. Students are required to inform the University officially if they intend not to appear for formal courses during a sandwich year, by enrolling for the subject 91997 Professional Experience (Biol/Biom) F/T.

Part-time students enrolled in the biological and biomedical sciences courses who are employed on a full-time basis in an area relevant to their course should enrol in the subject 91999 Professional Experience (Biol/Biom) P/T in every semester for which they are employed so that the experience gained is reflected on their academic record.

Bachelor of Applied Science in Chemistry

The purpose of this course is to provide a program of instruction, which, together with concurrent work experience, will prepare a student for entry to professional work in the field of applied chemistry. The course includes a firm foundation of study in the basic sciences, with in-depth development in the particular discipline of chemistry, emphasising its industrial applications.

By taking an appropriate selection from a range of subjects a student can prepare for laboratory, plant or sales work in industries concerned with plastics, paints, foods, metals and alloys, solvents or industrial chemicals.

The course consists of six stages and may be completed by a number of different patterns of attendance: two years of full-time attendance followed by one year in industry and one year of full-time attendance; or two years of full-time attendance followed by two years of part-time attendance; or six years of part-time attendance. Other patterns of attendance may also be permitted.

Full-time attendance involves approximately 24 hours each week at the University; this enables a full stage of the course to be completed in one semester.

Part-time attendance involves approximately 12 hours each week at the University; with this form of attendance a full stage may be completed in one year. It is normal practice for employers to release part-time students for at least one half-day per week for attendance at classes. Students commonly attend the University for one half-day and three evenings each week, or for two half-days and two evenings per week.

The award for successful completion of the course is Bachelor of Applied Science. The course has been designed to meet the academic requirements for entry to corporate membership of the Royal Australian Chemical Institute.

A new Honours program has been designed to introduce students to more advanced coursework and to research work in chemistry. It will allow selected students to continue on with postgraduate studies if desired and will generally enhance their employment prospects.

Industrial training is regarded as an integral part of the course. The minimum period of relevant employment is one year full-time, or its part-time equivalent. This experience is to be gained prior to or concurrently with the final stage of the course depending on whether attendance is full-time (sandwich) or part-time.

An Industrial Training Committee has been established within the Chemistry Department to provide guidance in the matter of appropriate vocational training. Students will be interviewed by this Committee after completing Stage 3 of the course. Each student will then be assigned to a member of staff who will maintain regular contact during subsequent periods of study and employment.

SANDWICH PROGRAM – PASS DEGREE

Each stage corresponds to one semester of full-time attendance. Credit point values are shown in brackets.

Stage 1

Autumn semester

- 31870 Introduction to Microcomputers (2cp)
- 33171 Science Mathematics 1 (4cp)
- 65101 Chemistry 1M (6cp)
- 68101 Physics 1 (6cp)
- 91388 Concepts in Biology (6cp)

or

- 66011 Geology 1 (6cp)

Stage 2

Spring semester

- 33172 Science Mathematics 2 (3cp)
- 31871 Computing for Science (3cp)
- 65201 Chemistry 2M (6cp)
- 65202 Organic Chemistry 1 (6cp)
- 68201 Physics 2 (6cp)

Stage 3*Autumn semester*

- 60301 Treatment of Scientific Data (3cp)
 65301 Spectroscopy and Structure (7cp)
 65302 Inorganic Chemistry (7cp)
 65504 Chemical Safety (4cp)
 66031 Technical Communication (4cp)

Stage 4*Spring semester*

- 65401 Analytical Chemistry 1 (8cp)
 65402 Organic Chemistry 2 (8cp)
 65403 Electrochemistry (4cp)
 65404 Chemical Thermodynamics (4cp)

Autumn semester

- 65996 Industrial Training 1¹

Spring semester

- 65997 Industrial Training 2¹

Stage 5*Autumn semester*

- 33173 Science Mathematics 3 (3cp)
 65501 Analytical Chemistry 2 (8cp)
 65602 Reaction Kinetics (4cp)
 Chemistry Elective(s)² (8cp)

Stage 6*Spring semester*

- Chemistry Elective(s)² (16cp)
 Elective (8cp)

PART-TIME PROGRAM – PASS DEGREE

Each stage corresponds to two semesters of part-time attendance.

Stage 1*Autumn semester*

- 31870 Introduction to Microcomputers (2cp)
 33171 Science Mathematics 1 (4cp)
 91388 Concepts in Biology (6cp)

or

- 66011 Geology 1 (6cp)

Spring semester

- 65011 Chemistry 1 F/T (6cp)
 68101 Physics 1 (6cp)

Stage 2*Autumn semester*

- 65021 Chemistry 2 F/T (6cp)
 68201 Physics 2 (6cp)

Spring semester

- 31871 Computing for Science (3cp)
 33172 Science Mathematics 2 (3cp)
 65202 Organic Chemistry 1 (6cp)

Stage 3

Academic requirements

Autumn semester

- 65301 Spectroscopy and Structure (7cp)
 65504 Chemical Safety (4cp)
 66030 Technical Communication (2 sem) (2cp)

Spring semester

- 60301 Treatment of Scientific Data (3cp)
 65302 Inorganic Chemistry (7cp)
 66030 Technical Communication (2 sem) (2cp)

Industrial requirements

- 65998 Industrial Training P/T¹

Stage 4

Academic requirements

Autumn semester

- 65402 Organic Chemistry 2 (8cp)
 65404 Chemical Thermodynamics (4cp)

Spring semester

- 65401 Analytical Chemistry 1 (8cp)
 65403 Electrochemistry (4cp)

Industrial requirements

- 65998 Industrial Training P/T¹

Stage 5

Academic requirements

Autumn semester

- 33173 Sciences Mathematics 3 (3cp)
 65501 Analytical Chemistry 2 (8cp)

Spring semester

- 65602 Reaction Kinetics (4cp)
 Chemistry Elective(s)² (8cp)

Industrial requirements

- 65998 Industrial Training P/T¹

Stage 6**Academic requirements***Autumn semester*Chemistry Elective(s)² (12cp)*Spring semester*Chemistry Elective(s)² (4cp)
Elective² (8cp)**Industrial requirements**65998 Industrial Training P/T¹

¹ Industrial experience is an integral part of this course. The minimum period of relevant employment required is the equivalent of one year's full-time employment. The Industrial Training Committee of the Chemistry Department provides guidance on this occupational requirement. The industrial training component in the sandwich program must be undertaken after the completion of the third or fourth semester of academic work. It must be undertaken before the last semester of academic work. The corresponding subject in the Honours degree program is 65995 Industrial Training (Honours).

² Chemistry electives offered in 1995 (subject to satisfactory enrolments):

Autumn semester

65503 Electronics and Instrumentation (5cp)

65702 Applied Organic Chemistry 2 (8cp)

65703 Metallurgical Chemistry (8cp)

Spring semester

65502 Chemical Process Control (8cp)

65601 Environmental Chemistry (8cp)

65603 Surface Chemistry (4cp)

65704 Coordination and Organometallic Chemistry (8cp)

PROGRAM FOR HOLDERS OF THE ASSOCIATE DIPLOMA IN CHEMICAL TECHNOLOGY

A special program operates for students who have successfully completed the Associate Diploma in Chemical Technology of the Sydney Technical College and who are admitted into the Applied Chemistry degree course. Students may seek exemptions from some or all of the following subjects:

31870 Introduction to Microcomputers (2cp)

31871 Computing for Science (3cp)

65101 Chemistry 1M (6cp)

65202 Organic Chemistry 1 (6cp)

66031 Technical Communication (4cp)
Elective First Year subject (6cp)

The study pattern for Associate Diploma holders is set out below.

Semester 1 (for full-time) or Year 1 (for part-time)

33171 Science Mathematics 1 (4cp)

68101 Physics 1 (6cp)

65201 Chemistry 2M (6cp)

65301 Spectroscopy and Structure (7cp)

Semester 2 or Year 2

33172 Science Mathematics 2 (3cp)

60301 Treatment of Scientific Data (3cp)

65302 Inorganic Chemistry (7cp)

65504 Chemical Safety (4cp)

68201 Physics 2 (6cp)

Semester 3 or Year 3

65404 Chemical Thermodynamics (4cp)

65403 Electrochemistry (4cp)

65402 Organic Chemistry 2 (new) (8cp)
Chemistry Elective(s) (8cp)**Semester 4 or Year 4**

33173 Science Mathematics 3 (3cp)

65401 Analytical Chemistry 1 (8cp)

65602 Reaction Kinetics (4cp)
Chemistry Elective(s) (8cp)**Semester 5 or Year 5**65501 Analytical Chemistry 2 (8cp)
Chemistry elective (8cp)
Elective (8cp)

Bachelor of Applied Science in Geology

This degree course is designed for students seeking careers as professional geologists. The basic award for successful completion of the course is Bachelor of Applied Science. At the end of Stage 4 of the course, better students may transfer to the new Honours degree program.

The Pass course consists of six stages of formal study and at least one year of full-time (or its equivalent) relevant industrial experience. The formal study includes basic study of chemistry, physics, mathematics and geology, followed by general training in lithology and geological mapping, computer science, the treatment of scientific data, geodynamics and sedimentary, igneous and metamorphic geology. In the middle and later stages of the course, structural geology, exploration geophysics, remote sensing and tectonics are studied in association with exploration, resource, engineering and environmental geology, mining law, and financial aspects of the mineral industry. In these stages the student also studies a range of subjects in preparation for field and laboratory work in metalliferous and non-metalliferous exploration, and the geology of fossil fuels.

Industrial training is an essential part of the degree program, and is normally completed in two six-month periods, one after completion of Stage 4 and one on completion of Stage 6. The Department of Applied Geology maintains close liaison with potential employers and assists students to obtain appropriate positions. The student may make his or her own arrangements, but the Head of Department must be satisfied as to the suitability of the employment.

The common course patterns are four years of full-time enrolment, including two six-month periods of industrial training; or six years of part-time¹ attendance, while concurrently employed full-time in a relevant geological field; or alternating periods of full-time

study with similar periods of full-time relevant employment.

Full-time attendance involves 24 hours each week at the University; this enables a full stage of the course to be completed in one semester.

Part-time attendance involves about 12 hours each week at the University; with this form of attendance the equivalent of a full stage may be completed in one year. It is normal practice for employers to release part-time students for at least one half-day per week for attendance at classes. Students commonly attend the University for one half-day and three evenings each week, or for two half-days and two evenings each week.

¹ Industrial training can be achieved by concurrent suitable employment. The matter should be discussed with the Head, Department of Applied Geology.

SANDWICH PROGRAM – PASS DEGREE

In these programs, each stage corresponds to one semester spent in full-time attendance at the University. Credit point values are shown in brackets.

Stage 1

Autumn semester

- 66101 Geology 1M (6cp)
- 65011 Chemistry 1 F/T(6cp)
- 68101 Physics 1 (6cp)

or

- 91388 Concepts in Biology (6cp)
- 33170 Basic Science Mathematics (3cp)

or

- 33171 Science Mathematics 1 (4cp)
- 31870 Introduction to Microcomputers (2cp)

Stage 2

Spring semester

- 66201 Geological Mapping (4cp)
- 66202 Lithology (2cp)
- 66203 Geodynamics (3cp)
- 65021 Chemistry 2 F/T (6cp)
- 68041 Physics 1 (LS) (6cp)

or

- 68201 Physics 2 (6cp)

33171 Science Mathematics 1 (4cp)

or

33172 Science Mathematics 2 (3cp)

Stage 3

Autumn semester

31871 Computing for Science (3cp)

60301 Treatment of Scientific Data (3cp)

66301 Mineralogy and Petrology
(2 sem) (4cp)

66302 Sedimentary Geology (2 sem)
(3cp)

66303 Geochemistry (3cp)

66402 Structural Geology (2 sem)
(3½cp)

66406 Exploration Geophysics (4cp)

Stage 4

Spring semester

66301 Mineralogy and Petrology
(2 sem) (4cp)

66302 Sedimentary Geology (2 sem)
(3cp)

66401 Technical Communication (3cp)

66402 Structural Geology (2 sem)
(3½cp)

66403 Economic Geology (4cp)

66405 Basin Analysis (4cp)

66603 Remote Sensing (3cp)

Autumn semester

66996 Industrial Training 1¹

Stage 5¹

Spring semester

66404 Resource Management (3cp)

66501 Engineering and Environmental
Geology (5cp)

66502 Advanced Petrology (4cp)

66503 Fossil Fuels (4cp)

66504 Exploration Geochemistry (2cp)

66507 Project Seminar (3cp)

66505 Advanced Structural Geology
(4cp)

66506 Advanced Geological Mapping
(3cp)

Stage 6¹

Autumn semester

66601 Exploration and Mining Geology
(4cp)

66604 Field Project (9cp)

66602 Tectonics (3cp)

One of

66605 Advanced Fossil Fuels (4cp)

66606 Mineral Deposits (4cp)

66607 Advanced Engineering Geology
(4cp)

Spring semester

66997 Industrial Training 2

**PART-TIME PROGRAM – PASS
DEGREE**

Stage 1

Autumn semester

66011 Geology 1 (6cp)

31870 Introduction to Microcomputers
(2cp)

33170 Basic Science Mathematics (3cp)

or

33171 Science Mathematics 1 (4cp)

Spring semester

65011 Chemistry 1 F/T (6cp)

68101 Physics 1 (6cp)

or

68041 Physics 1 (LS) (6cp)

Stage 2

Autumn semester

65021 Chemistry 2 F/T (6cp)

68201 Physics 2 (6cp)

or

91388 Concepts in Biology (6cp)

Spring semester

66201 Geological Mapping (4cp)

66202 Lithology (2cp)

66203 Geodynamics (3cp)

33171 Science Mathematics 1 (4cp)

or

33172 Science Mathematics 2 (3cp)

Stage 3

Autumn semester

31871 Computing for Science (3cp)

60301 Treatment of Scientific Data (3cp)

66303 Geochemistry (3cp)

Spring semester

66301 Mineralogy and Petrology (8cp)

66302 Sedimentary Geology (6cp)

Industrial requirements

66998 Industrial Training P/T

Stage 4*Autumn semester*

- 66402 Structural Geology (7cp)
 66405 Basin Analysis (4cp)
 66406 Exploration Geophysics (4cp)

Spring semester

- 66401 Technical Communication (3cp)
 66403 Economic Geology (4cp)

Industrial requirements

- 66998 Industrial Training P/T

Stage 5¹*Autumn semester*

- 66503 Fossil Fuels (4cp)
 66502 Advanced Petrology (4cp)
 66505 Advanced Structural Geology (4cp)

Spring semester

- 66501 Engineering and Environmental Geology (5cp)
 66504 Exploration Geochemistry (2cp)
 66507 Project Seminar (3cp)
 66506 Advanced Geological Mapping (3cp)

Industrial requirements

- 66998 Industrial Training P/T

Stage 6¹*Autumn semester*

- 66601 Exploration and Mining Geology (4cp)
 66603 Remote Sensing (3cp)

One of

- 66605 Advanced Fossil Fuels (4cp)
 66606 Mineral Deposits (4cp)
 66607 Advanced Engineering Geology (4cp)

Spring semester

- 66604 Field Project (9cp)
 66602 Tectonics (3cp)

Industrial requirements

- 66998 Industrial Training P/T

¹ With permission of the Head of Department, other subjects may be substituted for particular subjects in Stage 5 or Stage 6, where this is appropriate.

Bachelor of Applied Science in Materials Science

With the development of technology has come an increasing demand for new, more specialised and more reliable materials. Modern engineering and scientific enterprises continue to involve larger and more complex structures or devices. Factors such as the operational behaviour, relative costs and the aesthetic appeal of different materials become more and more stringently specified. It is from this background that Materials Science has emerged as a separate field of study out of the traditional disciplines of physics, chemistry, metallurgy and engineering.

Materials Science deals with the scientific principles governing the engineering properties of materials and the application of these properties in modern technology. Metals, ceramics and organic materials are treated in an integrated manner to establish the criteria for materials selection in relation to service conditions, materials compatibility and material durability.

There are two degree programs available i.e. the Bachelor of Applied Science (Materials Science) and the Bachelor of Applied Science (Honours) in Materials Science. The first four stages of these degrees are the same. At the end of Stage 4 those students with an average mark of 65 or greater in Stages 3 and 4 may enrol in the Honours degree. Graduates from both these degrees will be well equipped to work in materials-science-related industry. The Honours degree graduates will, however, be able to undertake postgraduate research more readily.

ATTENDANCE PATTERNS

The Pass course consists of six stages which may be completed on a full- or part-time basis. For full-time students, three years of study are integrated with a 12-month period of employment in suitable industries. For part-time students, the course consists of six years of part-time study whilst employed in a relevant industry.

All students enrolled in the Materials Science Pass degree course are required to undertake one calendar year of full-time, or the part-time equivalent, industrial training of an approved nature. This industrial training is an integral and compulsory part of the degree program. A program of this type is called a cooperative education or sandwich program.

Under a full-time pattern of attendance, involving approximately 24 hours each week at the University, a full stage may be completed in one semester. Allowing for a minimum period of one year of vocational experience, the Pass course may be completed in four years.

Part-time attendance involves approximately 12 hours each week at the University, and with this form of attendance a full stage may be completed in one year. Students attending entirely on a part-time basis must satisfy the Head of Department that they are employed in an area relevant to their academic program. They would require a minimum of six years to complete the course. Part-time attendance normally requires attendance at the University on one afternoon and two to three evenings each week.

SANDWICH PROGRAM – PASS DEGREE

Each stage corresponds to one semester of full-time attendance at the University. Credit point values are shown in brackets.

Stage 1

Autumn semester

66011 Geology 1 (6cp)

or

91388 Concepts in Biology (6cp)

65011 Chemistry 1 F/T (6cp)

68101 Physics 1 (6cp)

31870 Introduction to Microcomputers (2cp)

33170 Basic Science Mathematics (3cp)

or

33171 Science Mathematics 1 (4cp)

Stage 2

Spring semester

65021 Chemistry 2 F/T (6cp)

68201 Physics 2 (6cp)

65024 Introductory Organic Chemistry (3cp)

67202 Introduction to Crystallography (2cp)

67201 Materials Science 1 (4cp)

33171 Science Mathematics 1 (4cp)

or

33172 Science Mathematics 2 (3cp)

Stage 3

Autumn semester

51368 Written and Oral Reporting (2cp)

60301 Treatment of Scientific Data (3cp)

65031 Thermodynamics (3cp)

67302 Polymers 1 (3cp)

67303 Mechanical Properties of Materials (6cp)

67301 Materials Science 2 (4cp)

33172 Science Mathematics 2 (3cp)

or

33173 Science Mathematics 3 (3cp)

Stage 4

Spring semester

31871 Computing for Science (3cp)

67404 Physical Metallurgy 1 (4cp)

67402 Polymers 2 (4cp)

67401 Materials Science 3 (3cp)

67405 Physical Metallurgy 2 (4cp)

67403 Ceramics 1 (4cp)

33173 Science Mathematics 3 (3cp)

or

67406 Instrumentation for Materials Scientists (2cp)

Autumn semester

67996 Industrial Training 1

Spring semester

67997 Industrial Training 2

Stage 5

Autumn semester

68071 Applied Physics (Materials) (4cp)

67504 Physical Metallurgy 3 (4cp)

67501 Ceramics 2 (4cp)

67502 Polymers 3 (4cp)

67503 Ceramics 3 (4cp)

67505 Project P/T (2 sem) (4cp)

Stage 6*Spring semester*

- 65061 Corrosion Technology (4cp)
 65062 Extractive Metallurgy (6cp)
 67601 Materials Degradation (2cp)
 67602 Surface Properties of Materials (4cp)
 67603 Design and Materials Selection (2cp)
 67604 Composites (2cp)
 67505 Project P/T (2 sem) (4cp)

PART-TIME PROGRAM – PASS DEGREE

Each stage corresponds to two semesters of part-time attendance at the University. Credit point values are shown in brackets.

Stage 1*Autumn semester*

- 31870 Introduction to Microcomputers (2cp)
 33170 Basic Science Mathematics (3cp)
or
 33171 Science Mathematics 1 (4cp)
 66011 Geology 1 (6cp)

or

- 91388 Concepts in Biology (6cp)

Spring semester

- 65011 Chemistry 1 F/T (6cp)
 68101 Physics 1 (6cp)

Stage 2*Autumn semester*

- 65021 Chemistry 2 F/T (6cp)
 68201 Physics 2 (6cp)

Spring semester

- 65024 Introductory Organic Chemistry (3cp)
 67201 Materials Science 1 (4cp)
 67202 Introduction to Crystallography (2cp)
 33171 Science Mathematics 1 (4cp)

or

- 33172 Science Mathematics 2 (3cp)

Stage 3*Autumn semester*

- 51368 Written and Oral Reporting (2cp)
 65031 Thermodynamics (3cp)
 67302 Polymers 1 (3cp)
 67301 Materials Science 2 (4cp)

Spring semester

- 67404 Physical Metallurgy 1 (4cp)
 67401 Materials Science 3 (3cp)
 67403 Ceramics 1 (4cp)

Industrial requirements

- 67998 Industrial Training P/T

Stage 4*Autumn semester*

- 60301 Treatment of Scientific Data (3cp)
 67303 Mechanical Properties of Materials (6cp)
 33172 Science Mathematics 2 (3cp)

or

- 33173 Science Mathematics 3 (3cp)

Spring semester

- 67402 Polymers 2 (4cp)
 67405 Physical Metallurgy 2 (4cp)
 31871 Computing for Science (3cp)
 33173 Science Mathematics 3 (3cp)

or

- 21139 Business Organisation (2cp)

Industrial requirements

- 67998 Industrial Training P/T

Stage 5*Autumn semester*

- 68071 Applied Physics (Materials) (4cp)
 67504 Physical Metallurgy 3 (4cp)
 67501 Ceramics 2 (4cp)

Spring semester

- 65061 Corrosion Technology (4cp)
 65062 Extractive Metallurgy (6cp)
 67603 Design and Materials Selection (2cp)

Industrial requirements

- 67998 Industrial Training P/T

Stage 6*Autumn semester*

- 67502 Polymers 3 (4cp)
 67503 Ceramics 3 (4cp)
 67505 Project P/T (2 sem) (4cp)

Spring semester

- 67602 Surface Properties of Materials (4cp)
 67601 Materials Degradation (2cp)
 67604 Composites (2cp)
 67505 Project P/T (2 sem) (4cp)

Industrial requirements

- 67998 Industrial Training P/T

Bachelor of Applied Science in Physics

The development of modern technology and its application in a wide variety of industries has created a demand for graduates who have a scientific approach to applied problem solving, a deep understanding of the physical principles underlying systems, who are able to utilise modern equipment for measurement and control and are flexible and adaptable to changing job needs. Such graduates are applied physicists. Employment is found by applied physicists in a wide range of private industries and public authorities.

Both a Pass course and an Honours course are offered. The first four stages of both courses are identical, with all students enrolling in the Pass course on commencing studies.

The first two stages of the course consist of the study of basic science subjects.

The course subjects emphasise measurement, and the use and design of instrumentation for measurement and control. There is thus an emphasis in the course on modern electronics and computers.

ATTENDANCE PATTERNS

The Pass course consists of six stages which may be completed on a full-time (sandwich) or part-time basis.

Under a sandwich pattern of attendance, involving 24 hours each week at the University, a full stage may be completed in one semester. Allowing for a minimum period of one year of vocational experience, the course may be completed in four years. The normal attendance pattern is the sandwich pattern which is as follows:

Year 1	Stage 1 – full-time at the University Stage 2 – full-time at the University
Year 2	Stage 3 – full-time at the University Stage 4 – full-time at the University

Year 3	First industrial period of six months Second industrial period of six months
Year 4	Stage 5 – full-time at the University Stage 6 – full-time at the University

Part-time attendance involves 12 hours each week at the University, and with this form of attendance a full stage may be completed in one year. A student attending entirely on a part-time basis must satisfy the Associate Dean that he/she is employed in an area which is relevant to his/her academic program. The student would require a minimum of six years to complete the course. Being in full-time employment, the student would usually attend classes at the University for three evenings and one afternoon each week, assuming the commonly allowed day-release arrangements of one afternoon per week from employment.

Industrial training is regarded as an integral part of the course. All students, both full-time and part-time, must complete one year of relevant industrial experience.

SANDWICH PROGRAM – PASS DEGREE

Each stage corresponds to one semester of full-time attendance at the University. Credit point values are shown in brackets.

Stage 1

Autumn semester

68101	Physics 1 (6cp)
65011	Chemistry 1 F/T (6cp)
66011	Geology 1 (6cp)

or

91388	Concepts in Biology (6cp)
31870	Introduction to Microcomputers (2cp)
33171	Science Mathematics 1 (4cp)

Stage 2

Spring semester

68201	Physics 2 (6cp)
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- 65021 Chemistry 2 F/T (6cp)
 67202 Introduction to Crystallography (2cp)
 67201 Materials Science 1 (4cp)
 33172 Science Mathematics 2 (3cp)
 33173 Science Mathematics 3 (3cp)

Stage 3

Autumn semester

- 31871 Computing for Science (3cp)
 33221 Engineering Mathematics 2A (3cp)
 60301 Treatment of Scientific Data (3cp)
 68301 Physics 3 (3cp)
 68302 Applied Optics (3cp)
 68303 Electrotechnology (3cp)
 68304 Electronics 1 (6cp)

Stage 4

Spring semester

- 33330 Physical Mathematics (3cp)
 51368 Written and Oral Reporting (2cp)
 68403 Thermodynamics and Energy (3cp)
 68405 Vacuum and Thin Film Physics (3cp)
 68406 Computational Physics (4cp)
 68401 Quantum Physics 1 (3cp)
 68402 Applied Mechanics (3cp)
 68404 Electronics 2 (3cp)

Autumn semester

- 68996 Industrial Training 1

Spring semester

- 68997 Industrial Training 2

Stage 5

Autumn semester

- 68503 Materials Physics (3cp)
 68505 Solid-state Physics (3cp)
 68516 Techniques of Materials Analysis (6cp)
 68502 Field Theory (3cp)
 68504 Microprocessors in Instrumentation (3cp)
 68508 Project A (2 sem) (3cp)

and

Elective (3cp)

Stage 6

Spring semester

- 68501 Nuclear Physics (3cp)
 68603 Applied Thermodynamics (3cp)
 68605 Transducers and Devices (3cp)

- 68604 Principles of Instrumentation (3cp)
 68601 Quantum Physics 2 (3cp)
 68602 Physical Optics (3cp)
 68508 Project A (2 sem) (3cp)
 68608 Project B (3cp)

Note

With the agreement of the Head of Department, up to six credit points may be varied to allow students to develop individual interests.

PART-TIME PROGRAM – PASS DEGREE

Each stage corresponds to two semesters of part-time attendance at the University. Credit point values are shown in brackets.

Stage 1

Autumn semester

- 31870 Introduction to Microcomputers (2cp)
 33171 Science Mathematics 1 (4cp)
 66011 Geology 1 (6cp)

or

- 91388 Concepts in Biology (6cp)

Spring semester

- 65011 Chemistry 1 F/T (6cp)
 68101 Physics 1 (6cp)

Stage 2

Autumn semester

- 65021 Chemistry 2 F/T (6cp)
 68201 Physics 2 (6cp)

Spring semester

- 33172 Science Mathematics 2 (3cp)
 33173 Science Mathematics 3 (3cp)
 60301 Treatment of Scientific Data (3cp)
 67202 Introduction to Crystallography (2cp)

Stage 3

Autumn semester

- 31871 Computing for Science (3cp)
 33221 Engineering Mathematics 2A (3cp)
 68302 Applied Optics (3cp)
 67201 Materials Science 1 (4cp)

Spring semester

- 33330 Physical Mathematics (3cp)
 60301 Treatment of Scientific Data (3cp)

- 68403 Thermodynamics and Energy (3cp)
68402 Applied Mechanics (3cp)

Stage 4

Autumn semester

- 68301 Physics 3 (3cp)
68303 Electrotechnology (3cp)
68304 Electronics 1 (6cp)

Spring semester

- 68401 Quantum Physics 1 (3cp)
68404 Electronics 2 (3cp)
68405 Vacuum and Thin Film Physics (3cp)
68406 Computational Physics (4cp)

Stage 5

Autumn semester

- 68503 Materials Physics (3cp)
68505 Solid-state Physics (3cp)
68516 Techniques of Materials Analysis (6cp)
68996 Industrial Training 1

Spring semester

- 68501 Nuclear Physics (3cp)
68603 Applied Thermodynamics (3cp)
68604 Principles of Instrumentation (3cp)
68605 Transducers and Devices (3cp)
68997 Industrial Training 2

Stage 6

Autumn semester

- 68502 Field Theory (3cp)
68504 Microprocessors in Instrumentation (3cp)
68508 Project A (2 sem) (3cp)
Elective (3cp)

Spring semester

- 68601 Quantum Physics 2 (3cp)
68602 Physical Optics (3cp)
68508 Project A (2 sem) (3cp)
68608 Project B (3cp)

Note

With the agreement of the Head of Department, up to six credit points may be varied to allow students to develop individual interests.

Bachelor of Applied Science in Science Education

This course provides students with a degree in Science and a professional qualification in Education. The degree can be completed in four years, and comprises three-and-a-half years' full-time academic studies in science and education, and one-half year's industrial training in a scientific discipline.

The course is a preparation for secondary school science teachers of chemistry, physics and geology. Graduates find employment in private and public secondary schools. The opportunity to seek employment in the relevant scientific discipline also exists.

The degree is fully recognised by the NSW Department of School Education and by professional scientific bodies.

COURSE PROGRAM – CHEMISTRY MAJOR

Year 1

Autumn semester

- 65101 Chemistry 1M (6cp)
68101 Physics 1 (6cp)
31870 Introduction to Microcomputers (2cp)
33171 Science Mathematics 1 (4cp)
66011 Geology 1 (6cp)

or

- 91388 Concepts in Biology (6cp)

Spring semester

- 65201 Chemistry 2M (6cp)
65202 Organic Chemistry 1 (6cp)
68201 Physics 2 (6cp)
31871 Computing for Science (3cp)
33172 Science Mathematics 2 (3cp)

Year 2

Autumn semester

- 60301 Treatment of Scientific Data (3cp)
65301 Spectroscopy and Structure (7cp)
65302 Inorganic Chemistry (7cp)
66031 Technical Communication (4cp)
33173 Science Mathematics 3 (3cp)

Spring semester

- 65401 Analytical Chemistry 1 (8cp)
 65402 Organic Chemistry 2 (8cp)
 65403 Electrochemistry (4cp)
 65404 Chemical Thermodynamics (4cp)

*Year 3**Autumn semester*

- Education Studies 1 (24cp)

Spring semester

- 65996 Industrial Training 1

*Year 4**Autumn semester*

- Electives (24cp)

Spring semester

- Education Studies 2 (24cp)

COURSE PROGRAM – PHYSICS MAJOR

*Year 1**Autumn semester*

- 65011 Chemistry 1 F/T (6cp)
 68101 Physics 1 (6cp)
 31870 Introduction to Microcomputers
 (2cp)
 33171 Science Mathematics 1 (4cp)
 66011 Geology 1 (6cp)

or

- 91388 Concepts in Biology (6cp)

Spring semester

- 65021 Chemistry 2 F/T (6cp)
 68201 Physics 2 (6cp)
 67201 Materials Science 1 (4cp)
 67202 Introduction to Crystallography
 (2cp)
 33172 Science Mathematics 2 (3cp)
 33173 Science Mathematics 3 (3cp)

*Year 2**Autumn semester*

- 31871 Computing for Science (3cp)
 33221 Engineering Mathematics 2A
 (3cp)
 60301 Treatment of Scientific Data (3cp)
 68301 Physics 3 (3cp)
 68302 Applied Optics (3cp)
 68303 Electrotechnology (3cp)
 68304 Electronics 1 (6cp)

Spring semester

- 33330 Physical Mathematics (3cp)
 51368 Written and Oral Reporting (2cp)
 68401 Quantum Physics 1 (3cp)
 68402 Applied Mechanics (3cp)
 68403 Thermodynamics and Energy
 (3cp)
 68404 Electronics 2 (3cp)
 68405 Vacuum and Thin Film Physics
 (3cp)
 68406 Computational Physics (4cp)

*Year 3**Autumn semester*

- Education Studies 1 (24cp)

Spring semester

- 68996 Industrial Training 1

*Year 4**Autumn semester*

- Electives (24cp)

Spring semester

- Education Studies 2 (24cp)

COURSE PROGRAM – GEOLOGY MAJOR

*Year 1**Autumn semester*

- 66101 Geology 1M (6cp)
 65011 Chemistry 1 F/T (6cp)
 31870 Introduction to Microcomputers
 (2cp)
 68101 Physics 1 (6cp)

or

- 91388 Concepts in Biology (6cp)
 33170 Basic Science Mathematics (3cp)

or

- 33171 Science Mathematics 1 (4cp)

Spring semester

- 66201 Geological Mapping (4cp)
 66202 Lithology (2cp)
 66203 Geodynamics (3cp)
 65021 Chemistry 2 F/T (6cp)
 68041 Physics 1 (LS) (6cp)

or

- 68201 Physics 2 (6cp)
 33171 Science Mathematics 1 (4cp)

or

- 33172 Science Mathematics 2 (3cp)

Year 2*Autumn semester*

- 66301 Mineralogy and Petrology (8cp)
- 66302 Sedimentary Geology (6cp)
- 66303 Geochemistry (3cp)
- 31871 Computing for Science (3cp)
- 60301 Treatment of Scientific Data (3cp)

Spring semester

- 66401 Technical Communication (3cp)
- 66402 Structural Geology (7cp)
- 66403 Economic Geology (4cp)
- 66404 Resource Management (3cp)
- 66405 Basin Analysis (4cp)
- 66406 Exploration Geophysics (4cp)

Year 3*Autumn semester*

- Education Studies 1 (24cp)

Spring semester

- 66996 Industrial Training 1

Year 4*Autumn semester*

- Electives (24cp)

Spring semester

- Education Studies 2 (24cp)

**Bachelor of Applied Science
(Honours) in Chemistry**

The Bachelor of Applied Science Honours degree in Chemistry is a four-year full-time program (seven years part-time). The first two years are the same as the Pass degree program. To be eligible for transfer to the Honours degree program students must have a Weighted Average Mark (WAM) of at least 65 for subjects in Stages 3 and 4.

Stage 5 and subsequent stages include a total of 24 credit points of advanced level coursework in addition to the coursework undertaken in common with Pass students. These subjects involve the study of additional advanced material for Honours students and their assessment includes an additional Honours examination in each case.

Honours students undertake a substantial research project which is worth 24 credit points. This project also involves informal lectures and/or tutorials on topics relating to the student's research project plus discussion group activities concerning research methods. Honours students are required to deliver an Honours seminar to all academic staff and other senior students within the Department.

Special arrangements will be made with employers to ensure that Honours students are given more demanding work and have their industrial training assessed at a higher level.

Students wishing to undertake Honours in 1995 should contact Dr Ashby (330 1732) or Associate Professor Norton (330 1764) for advice concerning projects available and the pattern of Honours most suitable for them, or consult the Chemistry noticeboards for details of available projects and supervisors.

**SANDWICH PROGRAM – HONOURS
DEGREE**

Years 1 and 2

As for Stages 1 to 4 of the Pass course.

Year 3*Autumn semester*

- 33173 Science Mathematics 3¹ (3cp)
 65551 Analytical Chemistry 2
 (Advanced) (8cp)
 65595 Industrial Training (Honours)

Spring semester

- 65602 Reaction Kinetics¹ (4cp)
 65595 Industrial Training (Honours)
 Honours Elective² (8cp)

Year 4*Autumn semester*

- Chemistry Elective² (4cp)
 Honours Elective² (8cp)
 65858 Honours Research Project (2 sem)
 (12cp)

Spring semester

- Chemistry Elective² (4cp)
 Honours Elective² (8cp)
 65858 Honours Research Project (2 sem)
 (12cp)

Honours students who elect not to study while on Industrial Training will require an extra semester of attendance to complete the course. A suitable study pattern is shown below.

Year 3*Autumn semester*

- 65595 Industrial Training (Honours)

Year 4*Autumn semester*

- 33173 Science Mathematics 3 (3cp)
 65551 Analytical Chemistry 2
 (Advanced) (8cp)
 65602 Reaction Kinetics (4cp)
 Honours Elective² (8cp)

Spring semester

- Chemistry Elective² (4cp)
 Honours Elective² (8cp)
 65858 Honours Research Project
 (2 sem) (12cp)

Year 5*Autumn semester*

- Chemistry Elective² (4cp)
 Honours Elective² (8cp)
 65858 Honours Research Project (2 sem)
 (12cp)

PART-TIME PROGRAM – HONOURS DEGREE**Years 1 to 4**

As for Stages 1 to 4 of the Pass course.

Year 5*Autumn semester*

- 33173 Science Mathematics 3¹ (3cp)
 65551 Analytical Chemistry 2
 (Advanced) (8cp)
 65995 Industrial Training (Honours)

Spring semester

- 65602 Reaction Kinetics¹ (4cp)
 65995 Industrial Training (Honours)
 Honours Elective² (8cp)

Year 6*Autumn semester*

- Chemistry Elective² (4cp)
 Honours Elective² (8cp)

Spring semester

- Chemistry Elective² (4cp)
 Honours elective² (8cp)

Year 7*Autumn semester*

- 65858 Honours Research Project
 (2 sem) (12cp)

Spring semester

- 65858 Honours Research Project
 (2 sem) (12cp)

¹ Interchangeable

² Chemistry Electives to be offered in 1995 (subject to satisfactory enrolments):

Autumn semester

- 65503 Electronics and Instrumentation (5cp)

Spring semester

- 65502 Chemical Process Control (8cp)
 65603 Surface Chemistry (4cp)

Honours electives to be offered in 1995 (subject to satisfactory enrolments):

Autumn semester

- 65752 Applied Organic Chemistry 2 (Advanced)
 (8cp)

- 65753 Metallurgical Chemistry (Advanced) (8cp)

Spring semester

- 65754 Coordination and Organometallic
 Chemistry (Advanced) (8cp)
 65651 Environmental Chemistry (Advanced)
 (8cp)

Bachelor of Applied Science (Honours) in Geology

Those students who wish to obtain an Honours degree will be offered entry to a new course structure (the Honours 'strand'). This strand diverges from the Pass degree strand at the end of Stage 4 coursework. To obtain entry to this strand, students will be expected to have an average mark of 65 or greater in their Stages 3 and 4 Geology subjects, and to be making satisfactory progress through their degree. Students accepting entry will, like students following the Pass course, go on Industrial Training in their fifth semester of enrolment. They will subsequently undertake three semesters of work at UTS but will not be required to do a second period of Industrial Training. Most of the final semesters in the Honours strand will be devoted to a research project, which will be of substantially greater scope than the Field Project in the Pass degree.

HONOURS PROGRAM

Years 1 to 2

As for Stages 1 to 4 of the Pass course.

Stage 5

Autumn semester

66995 Industrial Training (Hons)

Spring semester

66404 Resource Management (3cp)

66501 Engineering and Environmental Geology (5cp)

66504 Exploration Geochemistry (2cp)

66506 Advanced Geological Mapping (3cp)

66551 Advanced Structural Geology (Hons) (5cp)

66552 Advanced Petrology (Hons) (5cp)

66553 Fossil Fuels (Hons) (5cp)

Stage 6

Autumn semester

66601 Exploration and Mining Geology (4cp)

66602 Tectonics (3cp)

66858 Project (Hons) (2 sem) (8cp)

Two of

66651 Convergent Margin Tectonics (Hons) (3cp)

66655 Structural Geology of Ore Deposits (Hons) (3cp)

66653 Applied Clastic Basin Analysis (Hons) (3cp)
External SUCOGG Elective

Stage 7

Spring semester

66858 Project (Hons) (2 sem) (14cp)

One of

66654 Research Developments in Geoscience (3cp)
External SUCOGG elective

Note

Where appropriate, and with the permission of the Head of Department, other subjects may be substituted for particular subjects in Stages 5 to 7.

Bachelor of Applied Science (Honours) in Materials Science

ATTENDANCE PATTERNS

The Honours course consists of eight stages which may be completed on a full- or part-time basis. For full-time students the course includes a six-month period of employment in suitable industries. For part-time students, the course consists of seven years of part-time study whilst employed in a relevant industry.

Students have flexibility of choice and may complete portions of their course on a full-time or part-time basis.

All students enrolled in the Materials Science Honours degree course are required to undertake six months full-time or the part-time equivalent industrial training of an approved nature. This industrial training is an integral and compulsory part of the degree program. A program of this type is called a cooperative education or sandwich program.

Under a full-time pattern of attendance, involving approximately 24 hours each week at the University, a full stage may be completed in one semester.

Part-time attendance involves approximately 12 hours each week at the University, and with this form of attendance a full stage may be completed in one year. Students attending entirely on a part-time basis must satisfy the Head of Department that they are employed in an area relevant to their academic program. They would require a minimum of six years to complete the course. Part-time attendance normally requires attendance at the University on one afternoon and two to three evenings each week.

SANDWICH PROGRAM – HONOURS DEGREE

Stages 1 to 4 are identical to the Materials Science Pass degree program.

Stage 5

Autumn semester

- 68071 Applied Physics (Materials) (4cp)
- 67501 Ceramics 2 (4cp)
- 67551 Materials Characterisation (4cp)
- 67552 Polymers 3 (Honours) (4cp)
- 67553 Ceramics 3 (Honours) (4cp)
- 67554 Physical Metallurgy 3 (Honours) (4cp)

Stage 6

Spring semester

- 65061 Corrosion Technology (4cp)
- 65062 Extractive Metallurgy (6cp)
- 67601 Materials Degradation (2cp)
- 67602 Surface Properties of Materials (4cp)
- 67603 Design and Materials Selection (2cp)
- 67604 Composites (2cp)
- 67651 Advanced Materials (4cp)

Stage 7

Autumn semester

- 67995 Industrial Training (Honours)
- 67858 Honours Project (2 sem) (12cp)

Stage 8

Spring semester

- 67858 Honours Project (2 sem) (12cp)

PART-TIME PROGRAM – HONOURS DEGREE

Years 1 to 4 are identical to Stages 1 to 4 of the Pass degree course.

Year 5

Autumn semester

- 67501 Ceramics 2 (4cp)
- 67554 Physical Metallurgy 3 (Honours) (4cp)
- 68071 Applied Physics (Materials) (4cp)

Spring semester

- 65061 Corrosion Technology (4cp)
- 65062 Extractive Metallurgy (6cp)
- 67603 Design and Materials Selection (2cp)

Year 6*Autumn semester*

- 67551 Materials Characterisation (4cp)
 67552 Polymers 3 (Honours) (4cp)
 67553 Ceramics 3 (Honours) (4cp)
 67995 Industrial Training (Honours)

Spring semester

- 67601 Materials Degradation (2cp)
 67602 Surface Properties of Materials (4cp)
 67604 Composites (2cp)
 67651 Advanced Materials (4cp)

Industrial requirements

- 67995 Industrial Training (Honours)

Year 7*Autumn semester*

- 67858 Honours Project (2 sem) (12cp)

Spring semester

- 67858 Honours Project (2 sem) (12cp)

Bachelor of Applied Science (Honours) in Physics**INTRODUCTION**

Students studying for the Applied Physics degree at UTS have the opportunity of undertaking an Honours degree after four semesters of study. Many Honours students go on to postgraduate studies and embark on a career in research.

COURSE

On commencing studies at UTS, all Applied Physics students enrol in the Pass degree. For the first four semesters all students undertake the same program of study. Those students who perform well over this period may then transfer into the Honours program. Such students then undertake either two years of full-time study or three years of part-time study to complete the degree. Both Pass and Honours degrees are of four years' duration. The Honours degree however, involves higher assessment standards, more advanced academic work, an industrial project and a substantial final year research project.

ADMISSION

Students are normally admitted to the course if they have achieved an average mark of 65 or better for subjects in Stages 3 and 4 in the Applied Physics degree course.

PROGRESS

Students admitted to the Honours course are required to maintain an average mark of at least 65 in both the academic component and the industrial Honours project. Students who do not maintain this standard, or do not wish to continue in the Honours course, revert to the Pass course.

ASSESSMENT OF HONOURS

The overall Honours mark at the end of the course is a weighted mark according to the following scheme:

Honours Research Project	40%
Honours Industrial Project	15%
Advanced subjects	30%
Subjects (above Stage 4) which are taken in common with Pass students	15%

The class of Honours awarded is normally determined as follows:

Class 1	Honours mark of 80 or greater
Class 2 Division 1	Honours mark between 70 and 79
Class 2 Division 2	Honours mark between 60 and 69
Class 3	Honours mark between 50 and 59

FULL-TIME PROGRAM

Credit point values are shown in brackets.

Years 1 to 2

As for Stages 1 to 4 of the Pass course.

Year 3

Autumn semester

- 68502 Field Theory¹ (3cp)
- 68995 Industrial Training (Honours)

Spring semester

- 68501 Nuclear Physics (3cp)
- 68503 Materials Physics (3cp)
- 68601 Quantum Physics 2¹ (3cp)
- 68602 Physical Optics¹ (3cp)
- 68603 Applied Thermodynamics¹ (3cp)
- 68604 Principles of Instrumentation (3cp)

Year 4

Autumn semester

- 68504 Microprocessors in Instrumentation (3cp)
- 68505 Solid-state Physics¹ (3cp)
- 68556 Advanced X-ray Techniques (4cp)
- 68557 Advanced Electron Microscopy Techniques (4cp)
- 68858 Project (Honours) (2 sem) (12cp)

Spring semester

- 68553 Computer Modelling of Physical Systems (3cp)
- 68652 Device Physics (6cp)
- 68655 Advanced Solid-state Physics (4cp)
- 68858 Project (Honours) (2 sem) (12cp)

¹ Subjects taken in common with Pass students.

Note

With the agreement of the Head of Department, up to six credit points may be varied to allow students to develop individual interests.

PART-TIME PROGRAM

Credit point values are shown in brackets.

Years 1 to 4

As for Stages 1 to 4 of the Pass course.

Year 5

Autumn semester

- 68502 Field Theory¹ (3cp)
- 68504 Microprocessors in Instrumentation¹ (3cp)
- 68505 Solid-state Physics¹ (3cp)
- 68995 Industrial Training (Honours)

Spring semester

- 68503 Materials Physics¹ (3cp)
- 68601 Quantum Physics 2¹ (3cp)
- 68602 Physical Optics¹ (3cp)
- 68604 Principles of Instrumentation¹ (3cp)

Year 6

Autumn semester

- 68553 Computer Modelling of Physical Systems (3cp)
- 68556 Advanced X-ray Techniques (4cp)
- 68557 Advanced Electron Microscopy Techniques (4cp)

Spring semester

- 68501 Nuclear Physics (3cp)
- 68652 Device Physics (6cp)
- 68655 Advanced Solid-state Physics (4cp)

Year 7

Autumn semester

- 68858 Project (Honours) (2 sem) (12cp)

Spring semester

- 68603 Applied Thermodynamics¹ (3cp)
- 68858 Project (Honours) (2 sem) (12cp)

¹ Subjects taken in common with Pass students.

Note

With the agreement of the Head of Department, up to six credit points may be varied to allow students to develop individual interests.

Bachelor of Health Science in Acupuncture

ADMISSION

All applicants to the degree program will apply through the Universities Admission Centre (UAC). Mature-age applicants will be required to provide additional information and may be required to attend an interview as part of the selection process undertaken by the College of Acupuncture.

COURSE STRUCTURE

Stage 1

Autumn semester

- 91601 Anatomy and Physiology 1 (6cp)
- 92167 Foundations of Helping and Caring (4cp)
- 99501 Introduction to Acupuncture, Channel, Point and Organ Physiology (5cp)
- 99502 Theoretical and Philosophical Foundations of Traditional Acupuncture (6cp)
- 99503 Clinical Theory, Practice and Observation and Clinic – Level 1 (3cp)

Stage 2

Spring semester

- 91602 Anatomy and Physiology 2 (6cp)
- 91607 Research Methods 1 (4cp)
- 99504 The Physiology of Energy and its Pathways (3cp)
- 99505 Point Location 1 and Acupressure Workshops (5cp)
- 99506 Needle and Moxibustion Techniques and Clinic – Level 2 (3cp)
- 51389 Professional Writing and Communication (3cp)

Stage 3

Autumn semester

- 91603 Anatomy and Physiology 3 (4cp)
- 91608 Research Methods 2 (4cp)
- 99508 Chinese Diagnostic System and Advanced Pulse Diagnosis (6cp)
- 99509 Special Points and Systems (5cp)

- 99510 Introduction to Chinese Massage, Point Location 2 and Clinic – Level 3 (5cp)

Stage 4

Spring semester

- 91604 Introductory Pharmacology and Microbiology (4cp)
- 99511 Historical and Advanced Theoretical Foundations of Acupuncture (6cp)
- 99512 Advanced Chinese Diagnosis (7cp)
- 99513 Point Location 3 and Clinic – Level 4 (4cp)
- Elective (3cp)

Stage 5

Autumn semester

- 91605 Pathophysiology (4cp)
- 99514 Microsystems and Special Methods of Treatment (5cp)
- 99515 Advanced Chinese Massage (3cp)
- 99516 Advanced Needle Technique with Ex-channel Point Location and Clinic – Level 5 (5cp)
- 99517 Independent Research Project Workshops (3cp)
- 99518 Clinical Features of Disease (4cp)

Stage 6

Spring semester

- 99519 Advanced Acupuncture Principles (4cp)
- 99520 Disease States 1 and 2 (8cp)
- 99521 Combined Acupuncture Therapy and Diagnostic Practice (5cp)
- 99522 Clinical Theory (Outpatient Clinic) and Clinic – Level 6 (4cp)
- 99536 First Aid Certificate Course (no cp)
- Elective (3cp)

Stage 7

Autumn semester

- 99523 Disease States 3 (4cp)
- 99524 Specialist Lecture Topics (4cp)
- 99525 Supervised Practice (2 sem) (12cp)
- 99526 Independent Research Project (2 sem) (13cp)
- 21816 Practice Management (3cp)

Stage 8

Spring semester

- 99525 Supervised Practice (2 sem)
(12cp)¹
99526 Independent Research Project
(2 sem) (13cp)

¹ In Stage 8, 99527 Hospital Training in China (6cp) which is a one month hospital internship in China is offered as an alternative to 99525 Supervised Practice.

Electives are designed to broaden the student's cognitive and analytical skills as well as to introduce a wider experiential professional background. Students are required to take one elective in second year and one elective in third year.

The following elective subjects have been approved for Acupuncture students but students may choose course subjects from any UTS Faculty, subject to the approval of the Head of School offering the subject and the Director of the College of Acupuncture. Elective subjects for the acupuncture course are allocated three credit points but students may select subjects with six credit points or more.

Not all elective subjects are offered every year but, subject to availability of places, students may select electives from the following :

- 99528 An Introduction to Tai Qi Chuan
99529 A Systems View of Life
99530 Philosophy, Religion and Culture
99531 The Subtle Dimensions of Healing
99532 Social Crisis
99533 Acupuncture Health Politics in Australia
99535 Nutrition in a Traditional Chinese Medical Context
99543 Qi Gong : Its Use in Acupuncture

Bachelor of Science in Biomedical Science

The Biomedical Science degree consists of an initial program of biology, chemistry, physics, mathematics, statistics and computing followed by microbiology, biochemistry, pathology, immunology and bioinstrumentation. Students then complete the third year of the course by undertaking a number of elective subjects, totalling a minimum of 48 credit points. Some of these electives cover more advanced biomedical aspects of the second year core subjects while others introduce a range of important areas of applied biomedical science.

The undergraduate training provides a solid background in the physical sciences and emphasises practical experimentation. In the final stages of the course, research activities are encouraged through project assignments. Students acquire familiarity with advanced instruments and technology. They are encouraged to participate in seminar activities. The purpose of the course is to educate people in a number of interface areas between modern technology, biology and medicine.

EMPLOYMENT OPPORTUNITIES

A wide range of employment opportunities is available to graduates. Biomedical scientists work closely with clinical pathologists, surgeons and other medical specialists in the control and elimination of disease. There is a demand for biomedical scientists in the Commonwealth and State health departments, the Repatriation Department, CSIRO, universities, pharmaceutical firms, veterinary laboratories and private pathology laboratories.

COURSE STRUCTURE

Students can complete the degree in three years full-time or six years part-time or by a combination of both these attendance patterns. Subjects are divided into core subjects and elective subjects. All students enrolled in the

degree must satisfactorily complete all core subjects for award of the degree and, in addition, must satisfactorily complete the required number of credit points of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind. Recommended electives are given in the Elective Options Table, and recommended combinations of subjects are listed for the guidance of students. It should be noted that timetable constraints may prevent the undertaking of some elective combinations.

FULL-TIME PROGRAM

Stage 1

Autumn semester

- 33101 Mathematics 1 (LS) (3cp)
 33103 Statistics for Life Sciences (3cp)
 65012 Chemistry 1 (LS) (6cp)
 68041 Physics 1 (LS) (6cp)
 91311 Biology 1 (6cp)

Stage 2

Spring semester

- 33105 Introductory Biometrics (3cp)
 65022 Chemistry 2 (LS) (6cp)
 91312 Biology 2 (6cp)
 91317 Human Biology (6cp)
 91395 Biocomputing (3cp)

Stage 3

Autumn semester

- 91313 Biochemistry 1 (6cp)
 91314 Microbiology 1 (6cp)
 91316 Bioinstrumentation (6cp)
 91354 Anatomical Pathology (6cp)

Stage 4

Spring semester

- 91320 Biochemistry 2 (6cp)
 91326 Analytical Biochemistry (6cp)
 91330 Microbiology 2 (6cp)
 91351 Immunology 1 (3cp)
 91355 Haematology 1 (3cp)

Stage 5

Autumn semester

- 91334 Molecular Biology 1 (4cp)
 Electives¹ (20cp)

Stage 6

Spring semester

- Electives¹ (24cp)

¹ For details of electives available for the Biomedical Science degree, see Elective Options Table.

PART-TIME PROGRAM

Stage 1

Autumn semester

- 65012 Chemistry 1 (LS) (6cp)
 91311 Biology 1 (6cp)

Spring semester

- 91312 Biology 2 (6cp)
 65022 Chemistry 2 (LS) (6cp)

Stage 2

Autumn semester

- 68041 Physics 1 (LS) (6cp)
 33101 Mathematics 1 (LS) (3cp)
 33103 Statistics for Life Sciences (3cp)

Spring semester

- 33105 Introductory Biometrics (3cp)
 91395 Biocomputing (3cp)
 91317 Human Biology (6cp)

Stages 3 and 4 – in 1995 and odd years

Autumn semester

- 91314 Microbiology 1 (6cp)
 91354 Anatomical Pathology (6cp)

Spring semester

- 91330 Microbiology 2 (6cp)
 91351 Immunology 1 (3cp)
 91355 Haematology 1 (3cp)

Stages 3 and 4 – in 1996 and even years

Autumn semester

- 91313 Biochemistry 1 (6cp)
 91316 Bioinstrumentation (6cp)

Spring semester

- 91320 Biochemistry 2 (6cp)
 91326 Analytical Biochemistry (6cp)

Stage 5

Autumn semester

- 91334 Molecular Biology 1 (4cp)
 Electives¹ (8cp)

Spring semester

- Electives¹ (12cp)

Stage 6**Autumn semester**Electives¹ (12cp)**Spring semester**Electives¹ (12cp)

¹ For details of electives available for the Biomedical Science degree, see Elective Options Table.

Notes

The order in which part-time students undertake Stage 3, 4, 5 and 6 subjects, is determined by the fact that subjects are offered in appropriate time slots in alternate years only. Students entering the program in even and odd years will take their preferred combination of subjects in different sequence.

ELECTIVE OPTIONS TABLE FOR BIOMEDICAL SCIENCE COURSE

Code	Name	Credit points	Sem A/S	Recommended subject for stage
91321	Biochemistry 3	8	A	5
91322	Biochemistry 4	8	S	6
91331	Microbiology 3	8	A	5
91335	Molecular Biology 2	8	S	6
91337	Virology	4	A	5
91341	Blood Bank	4	S	6
91342	Clinical Biochemistry 1	4	A	5
91343	Clinical Biochemistry 2	4	S	6
91350	Principles of Pharmacology and Toxicology	4	S	6
91358	Haematology 2	8	A	5
91359	Immunology 2	8	S	6
91372	Clinical Bacteriology and Parasitology	12	S	6
91383	Clinical Mycology	4	S	6
91374	Tissue Culture	4	A	5
91377	Cytopathology	16	Full Year	5 and 6
91396	Advanced Biocomputing	4	S	6
91398	Special Reading Assignment LS ¹	4	A&S	5 or 6
91399	Individual Project LS ¹	8	A&S	5 or 6
xxxxx	Miscellaneous elective ²	4	A&S	5 or 6

Key:

A = Timetabled in Autumn semester

S = Timetabled in Spring semester

LS = Life Sciences

¹ = Supervision Form must be completed

² = This may include subjects from other courses within the biological and biomedical sciences; subjects from another UTS school or faculty; or subjects from another university undertaken on a cross-institution enrolment basis. Programs that include more than 4cp of miscellaneous subjects require approval of the Associate Dean.

Notes

Subjects marked 5 and 6 can be undertaken by part-time students when programmable provided the prerequisite requirements are met.

Owing to timetabling constraints, not all electives may be available to all students in any given semester.

Subjects not marked may be able to be taken as electives following discussion with an appropriate member of academic staff.

RECOMMENDED SUBJECT STRANDS

Completion of any combination of subjects totalling a minimum of 48 credit points from the table of approved electives will fulfil the requirements of Stages 5 and 6 of the Biomedical Science degree course. However, students are strongly recommended to include in their programs at least one of the following combinations of subjects. Each combination constitutes a cohesive strand of study in a particular discipline or related disciplines.

Biochemistry strand

Stage 5

91321 Biochemistry 3 (8cp)
91334 Molecular Biology 1 (4cp)
91342 Clinical Biochemistry 1 (4cp)
plus additional electives (8cp)

Stage 6

91322 Biochemistry 4 (8cp)
91343 Clinical Biochemistry 2 (4cp)
plus additional electives (12cp)

Microbiology strand

Stage 5

91331 Microbiology 3 (8cp)
91334 Molecular Biology 1 (4cp)
91337 Virology (4cp)
plus additional electives (8cp)

Stage 6

91372 Clinical Bacteriology and Parasitology (12cp)
plus additional electives (12cp)

Pathology strand

Stage 5

91334 Molecular Biology 1 (4cp)
91358 Haematology 2 (8cp)
91377 Cytopathology (2 sem) (16cp)
plus additional electives (4cp)

Stage 6

91341 Blood Bank (4cp)
91359 Immunology 2 (8cp)
91377 Cytopathology (2 sem) (16cp)
plus additional electives (4cp)

Immunology strand

Stage 5

91334 Molecular Biology 1 (4cp)
91358 Haematology 2 (8cp)
91374 Tissue Culture (4cp)
plus additional electives (8cp)

Stage 6

91335 Molecular Biology 2 (8cp)
91341 Blood Bank (4cp)
91359 Immunology 2 (8cp)
plus additional electives (4cp)

FORMER MAJORS AND DOUBLE MAJORS IN BIOMEDICAL SCIENCE

Prior to 1994 it was a requirement for students in the Bachelor of Science in Biomedical Science degree course to complete in Stages 5 and 6 one of several prescribed sets of subjects designated as a major. In response to changes in requirements of the biomedical science and related professional areas, and the need of students for greater flexibility in subject selection, this degree now offers recommended subject combinations, or strands, which are for the guidance of students but are not mandatory requirements.

Previously, it was possible to undertake a double major by completing a combination of prescribed subjects for two majors. Although this formal structure no longer exists, it remains possible for students who wish to broaden their knowledge base to complete additional subjects, as the requirement for award of the degree is now a 'minimum' of 144 credit points. All subjects undertaken will be shown on a student's official University transcript.

Bachelor of Science in Biotechnology

The Bachelor of Science in Biotechnology is fully recognised for membership of both the Australian Institute of Biology Inc. and the Australian Society for Microbiology as well as being a professional qualification with emphasis on DNA technology and its applications. The course encompasses basic sciences plus microbiology, biochemistry, immunology, industrial biotechnology and molecular biology. At the completion of the course students will have acquired a sound background in industrial microbiology, and competence in a wide range of standard biological, microbiological and biochemical laboratory techniques.

EMPLOYMENT OPPORTUNITIES

Today's biotechnologist has an expanding variety of career opportunities, and graduates from this degree can expect to find employment opportunities in the food, beverage, chemical, pharmaceutical and fermentation industries, particularly in production, quality control, or research and development areas. These industries depend on a high level of professional competence in standard techniques of microbiology and biochemistry. An increasing number of products involve the application of some of the molecular or other aspects of biotechnology in their manufacture. A variety of research and development opportunities exist e.g. AIDS research, or the production of transformed plants or animals with designer genes. Good employment opportunities also exist with State and federal government scientific instrumentalities, and in research and other laboratories in tertiary institutions, hospitals and industry. In recent years a number of smaller, specialised development and consulting companies have developed from biotechnology research programs. These organisations require graduates with a strong basis in biotechnology and applied microbiology. Many employers in the biotechnology field, being them-

selves active in research and development, have close links with tertiary education institutions, and can offer graduates the possibility of higher degree studies in conjunction with employment.

COURSE STRUCTURE

Students can complete the degree in three years full-time or six years part-time or by a combination of both these attendance patterns. Subjects are divided into core subjects and elective subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree and, in addition, must satisfactorily complete a total of 12 credit points of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind. Examples of recommended electives are given in the Elective Options Table; however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include a particular area of study via subjects available from within the biological and biomedical sciences, or via subjects from other faculties of UTS and other individual elective sequences as may be approved by the Associate Dean, including subjects offered by other universities.

FULL-TIME PROGRAM

Stage 1

Autumn semester

- 33101 Mathematics 1 (LS) (3cp)
- 33103 Statistics for Life Sciences (3cp)
- 65012 Chemistry 1 (LS) (6cp)
- 68041 Physics 1 (LS) (6cp)
- 91311 Biology 1 (6cp)

Stage 2

Spring semester

- 33105 Introductory Biometrics (3cp)
- 65022 Chemistry 2 (LS) (6cp)
- 91312 Biology 2 (6cp)
- 91317 Human Biology (6cp)
- 91395 Biocomputing (3cp)

Stage 3*Autumn semester*

- 91313 Biochemistry 1 (6cp)
 91314 Microbiology 1 (6cp)
 91315 Biomonitoring (3cp)
 91316 Bioinstrumentation (6cp)
 91376 Environmental Measurement (3cp)

Stage 4*Spring semester*

- 91320 Biochemistry 2 (6cp)
 91326 Analytical Biochemistry (6cp)
 91330 Microbiology 2 (6cp)
 91351 Immunology 1 (3cp)
 91373 Applied Mycology (3cp)

Stage 5*Autumn semester*

- 91331 Microbiology 3 (8cp)
 91334 Molecular Biology 1 (4cp)
 91369 Applied and Environmental
 Microbiology (8cp)
 plus Electives¹ (4cp)

Stage 6*Spring semester*

- 91335 Molecular Biology 2 (8cp)
 91368 Bioprocessing (8cp)
 plus Electives¹ (8cp)

¹ For details of the electives available for the Biotechnology degree, see Elective Options Table.

Note

Total elective credit points to be completed: 12

PART-TIME PROGRAM**Stage 1***Autumn semester*

- 65012 Chemistry 1 (LS) (6cp)
 91311 Biology 1 (6cp)

Spring semester

- 65022 Chemistry 2 (LS) (6cp)
 91312 Biology 2 (6cp)

Stage 2*Autumn semester*

- 33101 Mathematics 1 (LS) (3cp)
 33103 Statistics for Life Sciences (3cp)
 68041 Physics 1 (LS) (6cp)

Spring semester

- 33105 Introductory Biometrics (3cp)
 91317 Human Biology (6cp)
 91395 Biocomputing (3cp)

Stages 3 and 4 – in 1995 and odd years*Autumn semester*

- 91314 Microbiology 1 (6cp)
 91315 Biomonitoring (3cp)
 91376 Environmental Measurement
 (3cp)

Spring semester

- 91330 Microbiology 2 (6cp)
 91351 Immunology 1 (3cp)
 91373 Applied Mycology (3cp)

Stages 3 and 4 – in 1996 and even years*Autumn semester*

- 91313 Biochemistry 1 (6cp)
 91316 Bioinstrumentation (6cp)

Spring semester

- 91320 Biochemistry 2 (6cp)
 91326 Analytical Biochemistry (6cp)

Stages 5 and 6 – in 1995 and odd years*Autumn semester*

- 91331 Microbiology 3 (8cp)
 91334 Molecular Biology 1 (4cp)

Spring semester

- 91335 Molecular Biology 2 (8cp)
 plus Electives¹ (4cp)

Stages 5 and 6 – in 1996 and even years*Autumn semester*

- 91369 Applied and Environmental
 Microbiology (8cp)
 plus Electives¹ (4cp)

Spring semester

- 91368 Bioprocessing (8cp)
 plus Electives¹ (4cp)

¹ For details of the electives available for the Biotechnology degree, see Elective Options Table.

Notes

Total elective credit points to be completed: 12

Some electives for part-time students are offered in alternate years only. Students entering the program in even and odd years will take their preferred combination of electives in different sequence.

The order in which part-time students undertake Stage 3, 4, 5 and 6 subjects, is determined by the fact that subjects are offered in appropriate time slots in alternate years only.

Bachelor of Science in Environmental Biology

The Bachelor of Science in Environmental Biology is fully recognised for membership of the Australian Institute of Biology Inc. and fully qualifies graduates as biological scientists with specialisation in environmental science.

The course provides a degree in biological science and the advanced technological skills to tackle complex environmental problems such as an ability to apply sampling and measurement methods for such purposes as pollution monitoring or the preparation of environmental assessments. After foundation studies in the basic sciences, students will specialise in the ecology and physiology of plants, animals and micro-organisms, and in freshwater, marine and terrestrial eco-systems. Students will also have the opportunity to take part in field trips to many parts of the State, for example north and south coastal areas, Snowy Mountains, the Murrumbidgee Irrigation Area, the far west and Jervis Bay. **Students should note that excursions for field study elective subjects may be held in the weeks prior to semester and in other non-teaching weeks during the year. In 1995, the excursions for Stage 5 subjects, Terrestrial Ecology and Aquatic Ecology will be held in February. An excursion to Jervis Bay (as part of Field Studies: Marine Sciences) is also offered during February and/or July of each year. Students should consult with lecturers before annual recess.**

EMPLOYMENT OPPORTUNITIES

Graduates of the course may be employed as scientific officers with government agencies such as the Water Board, Environment Protection Authority, Departments of Environment, Fisheries, CaLM Planning, National Parks and Wildlife Service, museums and herbaria; with local government authorities; or as technical and research officers with universities and colleges, or as environmental consultants, or environmental, toxicological or biological scientists in private enterprise. Many organisations

provide opportunities for graduates to undertake research projects for a higher degree in the Faculty.

COURSE STRUCTURE

Students can complete the degree in three years full-time or six years part-time or by a combination of both attendance patterns. Subjects are divided into core subjects and elective subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree, and, in addition, must satisfactorily complete a total of 16 credit points of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind. Examples of recommended electives are given in the Elective Options Table; however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include a particular area of study via subjects available from within the biological and biomedical sciences, and other individual electives as may be approved by the Associate Dean, for example, from another faculty or university.

FULL-TIME PROGRAM

Stage 1

Autumn semester

- 33101 Mathematics 1 (LS) (3cp)
- 33103 Statistics for Life Sciences (3cp)
- 65012 Chemistry 1 (LS) (6cp)
- 68041 Physics 1 (LS) (6cp)
- 91311 Biology 1 (6cp)

Stage 2

Spring semester

- 33105 Introductory Biometrics (3cp)
- 65022 Chemistry 2 (LS) (6cp)
- 91312 Biology 2 (6cp)
- 91317 Human Biology (6cp)
- 91395 Biocomputing (3cp)

Stage 3

Autumn semester

- 91313 Biochemistry 1 (6cp)
- 91314 Microbiology 1 (6cp)
- 91316 Bioinstrumentation (6cp)
- 91360 Quantitative Ecology (6cp)

Stage 4*Spring semester*

- 91362 Plant Ecophysiology (6cp)
91363 Animal Ecophysiology (6cp)

plus any two of

- 91320 Biochemistry 2 (6cp)
91326 Analytical Biochemistry (6cp)
91330 Microbiology 2 (6cp)

Stage 5*Autumn semester*

- 91364 Aquatic Ecology (8cp)
91365 Terrestrial Ecology (8cp)
plus Electives¹ (8cp)

Stage 6*Spring semester*

- 91366 Pest Control and Toxicology (8cp)
91367 Applied Ecology (8cp)
plus Electives¹ (8cp)

¹ For details of the electives available for the Environmental Biology degree, see Elective Options Table.

Note

Total elective credit points to be completed: 16

PART-TIME PROGRAM**Stage 1***Autumn semester*

- 65012 Chemistry 1 (LS) (6cp)
91311 Biology 1 (6cp)

Spring semester

- 65022 Chemistry 2 (LS) (6cp)
91312 Biology 2 (6cp)

Stage 2*Autumn semester*

- 33101 Mathematics 1 (LS) (3cp)
33103 Statistics for Life Sciences (3cp)
68041 Physics 1 (LS) (6cp)

Spring semester

- 33105 Introductory Biometrics (3cp)
91317 Human Biology (6cp)
91395 Biocomputing (3cp)

Stages 3 and 4 – in 1995 and odd years*Autumn semester*

- 91314 Microbiology 1 (6cp)
91360 Quantitative Ecology (6cp)

Spring semester

- 91362 Plant Ecophysiology (6cp)
91363 Animal Ecophysiology (6cp)

Stages 3 and 4 – in 1996 and even years*Autumn semester*

- 91313 Biochemistry 1 (6cp)
91316 Bioinstrumentation (6cp)

*Spring semester**Any two of*

- 91320 Biochemistry 2 (6cp)
91326 Analytical Biochemistry (6cp)
91330 Microbiology 2 (6cp)

Stages 5 and 6 – in 1995 and odd years*Autumn semester*

- 91365 Terrestrial Ecology (8cp)
plus Electives¹ (4cp)

Spring semester

- 91366 Pest Control and Toxicology (8cp)

or²

- 91367 Applied Ecology (8cp)
plus Electives¹ (4cp)

Stages 5 and 6 – in 1996 and even years*Autumn semester*

- 91364 Aquatic Ecology (8cp)
plus Electives¹ (4cp)

Spring semester

- 91366 Pest Control and Toxicology (8cp)

or²

- 91367 Applied Ecology (8cp)
plus Electives¹ (4cp)

¹ For details of the electives available for the Environmental Biology degree, see Elective Options Table.

² The order in which part-time students undertake Stages 3, 4, 5 and 6 subjects is determined by the fact that subjects are offered in appropriate time slots in alternate years only. Students are expected to undertake 91367 Applied Ecology in their final year of study.

Notes

Total elective credit points to be completed: 16

Subjects for part-time students may be offered in a different order or combination in any one year.

Students should note that excursions may be held in the week prior to semester.

Bachelor of Science in Urban Horticulture

The Bachelor of Science in Urban Horticulture is fully recognised for membership of the Australian Institute of Biology Inc. and the Australian Institute of Horticulture Inc. as a professional qualification in plant science and as a specialist qualification in ornamental and amenity, landscape and environmental horticulture.

The course provides students with a sound background in plant science and horticultural management. After introductory studies in horticulture and foundation studies in the basic sciences, students will specialise in plant science. Areas studied include plant structure, physiology, ecology, genetics and soil science. As there is a particular emphasis on ornamental and amenity horticulture, students also undertake studies in plant cultivation, protection, breeding and Australian plants. Horticultural management is studied in relation to financial management, plant production systems and open space areas.

Excursions will be undertaken in the Sydney metropolitan area and to other parts of the State. **Students should note that excursions may be held in the weeks prior to semester and in other non-teaching weeks during the semester. In 1995, for example, the Terrestrial Ecology and Marine Ecology excursions will be held in February prior to formal classes.**

EMPLOYMENT OPPORTUNITIES

Graduates of the course are in increasing demand as professional horticulturists. As an urban horticulturist you might be a researcher in a plant sciences laboratory, work on the selection and breeding of new ornamental varieties, including Australian native species, be responsible for the planning and management of nursery production, park and recreation areas, or the revegetation and management of natural areas disturbed by human impact. Many graduates also enter universities and research organisations.

COURSE STRUCTURE

Students can complete the degree in three years full-time or six years part-time or a combination of both attendance patterns. The undergraduate program emphasises practical experimentation and research activities are encouraged through project assignments. The students acquire familiarity with advanced instruments and technology, and are encouraged to participate in seminar activities. The course has been developed in close liaison with all branches of the industry and with the Horticulture School of the Ryde College of TAFE whose glasshouse and associated facilities are used, in addition to those of UTS.

Subjects are divided into core subjects and elective subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree and, in addition, must satisfactorily complete a total of eight credit points of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind. Examples of recommended electives are given in Elective Options Table; however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include a particular area of study via subjects available and approved by the Head of Department, for example from another faculty or university.

FULL-TIME PROGRAM

Stage 1

Autumn semester

- | | |
|-------|---|
| 65012 | Chemistry 1 (LS) (6cp) |
| 91201 | Horticultural Experimentation (3cp) |
| 91210 | Landscape Horticulture (3cp) |
| 91242 | Horticultural Procedures F/T (2 sem) ¹ (6cp) |
| 91311 | Biology 1 (6cp) |

Stage 2*Spring semester*

- 65022 Chemistry 2 (LS) (6cp)
 91211 Horticultural Botany (3cp)
 91242 Horticultural Procedures F/T
 (2 sem)¹ (6cp)
 91312 Biology 2 (6cp)
 91395 Biocomputing (3cp)

Stage 3*Autumn semester*

- 91206 Plant Production (6cp)
 91208 Plant Protection (6cp)
 91314 Microbiology 1 (6cp)
 91360 Quantitative Ecology (6cp)

Stage 4*Spring semester*

- 91204 Soils and Growth Media (6cp)
 91205 Plant Breeding and Genetics
 (6cp)
 91218 Australian Plants (6cp)
 91362 Plant Ecophysiology (6cp)

Stage 5*Autumn semester*

- 91207 Plants in the Landscape (8cp)
 91229 Horticultural Financial
 Management (4cp)
 91236 Plant Tissue Culture (4cp)
 91365 Terrestrial Ecology (8cp)

Stage 6*Spring semester*

- 91215 Horticultural Research Project
 (8cp)
 91224 Horticultural Production
 Management (4cp)
 91225 Open Space Management (4cp)
 plus Electives² (8cp)

¹ Classes for the Horticultural Procedures subject are undertaken at the Horticulture School of the Ryde College of TAFE over two semesters. TAFE commencement dates for this subject will be earlier than the UTS commencement of classes date each semester. All necessary information will be given to commencing students at UTS enrolment.

² For details of the electives available for the Urban Horticulture degree, see Elective Options Table.

Notes

Total elective credit points to be completed: 8

Students should note that excursions for field study elective subjects may be held in the weeks prior to semester and in other non-teaching weeks during the year.

PART-TIME PROGRAM**Stage 1***Autumn semester*

- 91210 Landscape Horticulture (3cp)
 91244 Horticultural Procedures P/T
 (4 sem)¹ (3cp)
 91311 Biology 1 (6cp)

Spring semester

- 91211 Horticultural Botany (3cp)
 91244 Horticultural Procedures P/T
 (4 sem)¹ (3cp)
 91312 Biology 2 (6cp)

Stage 2*Autumn semester*

- 65012 Chemistry 1 (LS) (6cp)
 91201 Horticultural Experimentation
 (3cp)
 91244 Horticultural Procedures P/T
 (4 sem)¹ (3cp)

Spring semester

- 65022 Chemistry 2 (LS) (6cp)
 91244 Horticultural Procedures P/T
 (4 sem)¹ (3cp)
 91395 Biocomputing (3cp)

Stages 3 and 4 – in 1995 and odd years*Autumn semester*

- 91314 Microbiology 1 (6cp)
 91360 Quantitative Ecology (6cp)

Spring semester

- 91362 Plant Ecophysiology (6cp)
 91218 Australian Plants (6cp)

Stages 3 and 4 – in 1996 and even years*Autumn semester*

- 91208 Plant Protection (6cp)
 91206 Plant Production (6cp)

Spring semester

- 91204 Soils and Growth Media (6cp)
 91205 Plant Breeding and Genetics
 (6cp)

Stage 5 and 6 – in 1995 and odd years*Autumn semester*

- 91365 Terrestrial Ecology (8cp)
91236 Plant Tissue Culture (4cp)

Spring semester

- 91224 Horticultural Production
Management (4cp)
91225 Open Space Management (4cp)

or

- 91215 Horticultural Research Project³
(8cp)
plus Electives² (4cp)

Stages 5 and 6 – in 1996 and even years*Autumn semester*

- 91207 Plants in the Landscape (8cp)
91229 Horticultural Financial
Management (4cp)

Spring semester

- 91224 Horticultural Production
Management (4cp)
91225 Open Space Management (4cp)

or

- 91215 Horticultural Research Project³
(8cp)
plus Electives² (4cp)

¹ Classes for the Horticultural Procedures subject are undertaken at the Horticulture School of the Ryde College of TAFE over four semesters. TAFE commencement dates for this subject will be earlier than the UTS commencement of classes date each semester. All necessary information will be given to commencing students at UTS enrolment.

² For details of the electives available for the Urban Horticulture degree, see Elective Options Table.

³ Students are advised to undertake 91215 Horticultural Research Project (8cp) in their final semester.

Notes

Total elective credit points to be completed: 8

The order in which part-time students undertake Stage 3, 4, 5 and 6 subjects is determined by the fact that subjects are offered in appropriate time slots in alternate years only.

Entrants with a TAFE Certificate in Horticulture, or equivalent, are exempted from the subject Horticultural Procedures.

Students should note that excursions for field study elective subjects may be held in the weeks prior to semester and in

other non-teaching weeks during the year.

PART-TIME PROGRAM (FOR ENTRANTS WITH ASSOCIATE DIPLOMA IN HORTICULTURE OR EQUIVALENT)Stage 1*Autumn semester*

- 65012 Chemistry 1 (LS) (6cp)
91201 Horticultural Experimentation
(3cp)
91210 Landscape Horticulture (3cp)

Spring semester

- 91211 Horticultural Botany (3cp)
91312 Biology 2 (6cp)
91395 Biocomputing (3cp)

Stage 2*Autumn semester*

- 91206 Plant Production (6cp)
91314 Microbiology 1 (6cp)

Spring semester

- 91204 Soils and Growth Media (6cp)
65022 Chemistry 2 (LS) (6cp)

Stage 3*Autumn semester*

- 91208 Plant Protection (6cp)
91360 Quantitative Ecology (6cp)

Spring semester

- 91362 Plant Ecophysiology (6cp)
91205 Plant Breeding and Genetics
(6cp)

Stage 4*Autumn semester*

- 91207 Plants in the Landscape (8cp)
91229 Horticultural Financial
Management (4cp)
91236 Plant Tissue Culture (4cp)

Spring semester

- 91215 Horticultural Research Project
(8cp)
91224 Horticultural Production
Management (4cp)
91225 Open Space Management (4cp)

Note

Subjects for part-time students may be offered in a different order or combination in any one year.

**ELECTIVE OPTIONS TABLE FOR ENVIRONMENTAL BIOLOGY,
BIOTECHNOLOGY AND URBAN HORTICULTURE COURSES**

Code	Name	Credit Points	Semester A/S	Biotech	Envir Biology	Urb Hort
91205	Plant Breeding and Genetics	6	S	6	6	C
91206	Plant Production	6	A	N/A	5	C
91207	Plants in the Landscape	8	A	N/A	5	C
91208	Plant Protection	6	A	5	5	C
91218	Australian Plants	6	S	6	6	C
91236	Plant Tissue Culture	4	A	N/A	5	C
91319	Concepts in Biochemistry	8	A	N/A	N/A	5
91321	Biochemistry 3	8	A	5	5	N/A
91322	Biochemistry 4	8	S	6	N/A	N/A
91330	Microbiology 2	6	S	C	C	6
91331	Microbiology 3	8	A	C	5	N/A
91334	Molecular Biology 1	4	A	C	5	N/A
91335	Molecular Biology 2	8	S	C	6	N/A
91337	Virology	4	A	5	N/A	N/A
91347	Toxic Materials in the Environment	4	S	6	6	N/A
91350	Principles of Pharmacology and Toxicology	4	S	6	6	N/A
91359	Immunology 2	8	S	6	N/A	N/A
91362	Plant Ecophysiology	6	S	6	C	C
91363	Animal Ecophysiology	6	S	6	C	6
91364	Aquatic Ecology	8	A	N/A	C	5
91366	Pest Control and Toxicology	8	S	6	C	6
91371	Field Studies: Mountain Ecology (Nov '95)	8	S	N/A	5	5
91372	Clinical Bacteriology and Parasitology	12	S	6	N/A	N/A
91373	Applied Mycology	3	S	N/A	6	6
91374	Tissue Culture	4	A	5	5	N/A
91375	Field Studies: Marine Sciences	4	A&S	5 or 6	5 or 6	5 or 6
91383	Clinical Mycology	4	S	C	6	6
91396	Advanced Biocomputing	4	S	6	6	6
91398	Special Reading Assignment LS*	4	A&S	5 or 6	5 or 6	5 or 6
91399	Individual Project LS*	8	A&S	5 or 6	5 or 6	5 or 6
xxxxx	Miscellaneous elective/LS elective (i.e. a subject from another faculty or university)	4/8	A&S	5 or 6	5 or 6	5 or 6

KEY

- A = Timetabled in Autumn semester
- S = Timetabled in Spring semester
- C = Core subject for that course
- LS = Life Sciences
- 5 or 6 = Recommended elective Stage 5 or 6
- * = Supervision form must be completed
- N/A = Not available to students in this degree

Notes

Subjects marked 5 and/or 6 can be undertaken by part-time students when programmable provided the prerequisite requirements are met.

Owing to timetabling constraints, not all electives may be available to all students in any given semester.

Subjects not marked may be able to be taken as electives following discussion with an appropriate member of academic staff.

Students should note that excursions for field study elective subjects may be held in the weeks prior to semester and in other non-teaching weeks during the year.

Bachelor of Science (Honours)

ADMISSION

The Honours course is open to students who possess, or have fulfilled, all the requirements for a three-year Bachelor's degree in Biomedical Science, Biotechnology, Environmental Biology or Urban Horticulture from UTS, or equivalent qualification, with at least an average credit grade in the final two stages of the undergraduate program.

AIMS

An Honours program gives basic training in biological or biomedical research. Students may then enter occupations for which an Honours degree is the minimum entry requirement or continue with postgraduate research.

ATTENDANCE PATTERNS

The course is offered either as a full-time program over two semesters, or as a part-time program over four semesters. The course contains some coursework partly devoted to a critical review of the scientific literature. The research project, which is the major component of the course and extends over both semesters, normally takes the form of an experimental or analytical investigation, undertaken either in the laboratory or in the field. The work is in an area of biomedical science (biochemistry, immunology, pathology or microbiology), biotechnology, environmental biology (including environmental toxicology and coastal resource management), urban horticulture or clinical measurement/cardiac technology and the results are presented in an oral seminar and in a written report, both of which are formally assessed.

APPLICATION

Prospective candidates should make an application to the Academic Registrar by 31 October, for entry to the Honours

degree program in the first semester of the following year. There is provision for consideration of late applications.

SELECTION

Applications for entry to the Honours degree will be considered by the Honours Degree Committee. Applicants will be notified of acceptance by the Academic Registrar.

FEES AND HIGHER EDUCATION CONTRIBUTION SCHEME

Higher Education Contribution Scheme (HECS) will normally apply to all students enrolled in Honours courses. All enrolled students are required to pay the compulsory University Union and Students' Association charges on enrolment.

COMMENCEMENT DATE

Students are required to commence work on their Honours program on the Monday of the first week in February. This applies despite the fact that formal enrolment may be held after this date. Students should contact their supervisor for details.

AWARD

Each of the four undergraduate courses will be awarded as Honours degrees with the following grades: Class 1, Class 2 Division 1, Class 2 Division 2 and Class 3.

They will be referred to as Bachelor of Science (Honours)

Abbreviation: BSc (Hons)

Course code: KB04

FURTHER INFORMATION

Interested students should discuss the program and the possible research projects available, with Course Coordinators or with individual members of academic staff.

COURSE STRUCTURE

Full-time program

Year 1
Stages 1 and 2

Autumn and Spring semesters

91304 Honours (Biological and Biomedical Sciences) (48cp)

Part-time program

Year 1
Stages 1 and 2

Autumn and Spring semesters

91305 Honours (Biological and Biomedical Sciences) (24cp)

Year 2
Stages 3 and 4

Autumn and Spring semesters

91305 Honours (Biological and Biomedical Sciences) (24cp)

Bachelor of Science (Honours) in Applied Chemistry – Forensic Science

This course was introduced in 1994. The forensic subjects will start in 1996.

This chemistry course provides a program of instruction which, together with a research project, will prepare students for entry to professional work in the field of applied chemistry or as a specialist in the forensic science area. The course includes a firm foundation of studies in the basic sciences, with in-depth development of the discipline of chemistry, emphasising its forensic applications.

LENGTH

The Bachelor of Science (Honours) in Applied Chemistry – Forensic Science will comprise four years of full-time coursework including one semester of research work.

ATTENDANCE PATTERN

The course will be offered on a four-year full-time basis.

COURSE STRUCTURE

The first two years of the program are common for all chemistry students, after which those students studying for the degree in Forensic Science will undertake two years of forensic studies.

If the required standard for Honours is not achieved at the end of Stage 4 students' enrolment in the course will be discontinued and they will be offered the option of full credit transfer to the BAppSc (Chemistry).

FULL-TIME PROGRAM

Each Stage corresponds to one semester of full-time attendance.

Stage 1

Autumn semester

- 31870 Introduction to Microcomputers (2cp)
33171 Science Mathematics 1 (4cp)
65101 Chemistry 1M (6cp)
68101 Physics 1 (6cp)
66011 Geology 1 (6cp)

or

- 91388 Concepts in Biology (6cp)

Stage 2

Spring semester

- 31871 Computing for Science (3cp)
33172 Science Mathematics 2 (3cp)
65201 Chemistry 2M (6cp)
65202 Organic Chemistry 1 (6cp)
68201 Physics 2 (6cp)

Stage 3

Autumn semester

- 60301 Treatment of Scientific Data (3cp)
65301 Spectroscopy and Structure (7cp)
65302 Inorganic Chemistry (7cp)
65504 Chemical Safety (4cp)
66031 Technical Communication (4cp)

Stage 4

Spring semester

- 65401 Analytical Chemistry 1 (8cp)
65402 Organic Chemistry 2 (8cp)
65403 Electrochemistry (4cp)
65404 Chemical Thermodynamics (4cp)

Stage 5

Autumn semester

- 33173 Science Mathematics 3 (3cp)
65503 Electronics and Instrumentation¹ (5cp)
65551 Analytical Chemistry 2 (Advanced) (8cp)
65556 Forensic Examination of Physical Evidence 1 (4cp)
65557 Forensic Toxicology 1 (5cp)

Stage 6

Spring semester

- 65603 Surface Chemistry (4cp)
65656 Forensic Examination of Physical Evidence 2 (6cp)
65657 Forensic Toxicology 2 (8cp)
79990 Legal System (2cp)

91382 Introduction to Biological Fluids
(3cp)

Stage 7

Autumn semester

- 65756 Forensic Examination of Physical Evidence 3 (6cp)
65757 Narcotics and Drugs of Abuse (5cp)
65758 Accelerants, Incendiaries and Explosives (5cp)
79991 Forensic Science Case Study (8cp)

Stage 8

Spring semester

- 65856 Research Project (24cp)

¹ An alternative Chemistry elective may be selected.

Bachelor of Science/ Bachelor of Laws

The BSc LLB joint degree was first introduced at UTS in 1991. The course is aimed primarily at producing Law graduates with a strong background in science who wish to work in areas such as environmental law, patents and mining law.

Students completing the course are able to apply for admission as either a solicitor or barrister of the Supreme Court of New South Wales.

The joint degree is a five-year full-time course. Three law subjects studied in the first year of the course are taught over one year (two semesters), the remaining subjects are one semester. Students attend 11 to 15 hours of lectures, practicals and seminars per week. Students may be required to attend evening classes.

It is anticipated that a further option will be introduced in 1996 to allow students to take a major strand of study in one of the sciences. Students commencing in 1995 will be able to choose between the general strand and the major strand in 1996.

COURSE PROGRAM

Each stage corresponds to one semester of full-time attendance.

Stage 1

Autumn semester

- 65013 Chemistry (Sc Law) (5cp)
66013 Geology 1 (Sc Law) (5cp)
70113 Legal Process and History (10cp)
70100 Skills: Legal Research and Writing (2cp)
70400 Skills: Computerised Legal Research (2cp)

Stage 2

Spring semester

- 33171 Science Mathematics 1 (4cp)
65025 Chemistry 2 (Sc Law) (5cp)
70211 Law of Contract (8cp)
70212 Criminal Law (7cp)
70200 Skills: Case Analysis and Statutory Interpretation (2cp)

Stage 3*Autumn semester*

- 60301 Treatment of Scientific Data (3cp)
 66404 Resource Management (3cp)
 70311 Law of Tort (8cp)
 70611 Federal Constitutional Law (7cp)
 plus Law elective skill (2cp)

Stage 4*Spring semester*

- 33172 Science Mathematics 2 (3cp)
 67201 Materials Science 1 (4cp)
 68081 Physics 1 (Sc Law) (5cp)
 70312 Real Property (7cp)
 70411 Commercial Transactions (7cp)
 70300 Skills : Conveyancing (3cp)

Stage 5*Autumn semester*

- 67302 Polymers 1 (3cp)
 70513 Succession (4cp)
 70514 Family Law (5cp)
 70612 Administrative Law (7cp)
 91389 Biology 1 (Sc Law) (5cp)

Stage 6*Spring semester*

- 68082 Physics 2 (Sc Law) (5cp)
 70412 Corporate Law (7cp)
 70511 Equity and Trusts (7cp)
 70500 Skills: Drafting (2cp)
 91390 Biology 2 (Sc Law) (5cp)

Stage 7*Autumn semester*

- 71114 Remedies and Restitution (7cp)
 71113 Insolvency (3cp)
 70600 Skills: Pleadings (2cp)
 70705 Skills: Litigation (4cp)
 plus Science electives¹ (12cp)

Stage 8*Spring semester*

- 71112 Conflict of Laws (7cp)
 71212 Revenue Law (7cp)
 70900 Skills: Moot (3cp)
 plus Science electives¹ (12cp)

Stage 9*Autumn semester*

- 71211 Law of Evidence (7cp)
 71201 Skills: Alternative Dispute
 Resolution (2cp)
 plus Science electives¹ (11cp)
 plus Law elective² (7cp)

Stage 10*Spring semester*

- Science electives¹ (6cp)
 plus 2 Law elective skills (4cp)

¹ Science electives

The Science electives may be chosen from the following:

- 65301 Spectroscopy and Structure (7cp)
 65401 Analytical Chemistry 1 (8cp)
 65501 Analytical Chemistry 2 (8cp)
 65601 Environmental Chemistry (8cp)
 66061 Environmental Geology (3cp)
 66202 Lithology (2cp)
 66601 Exploration and Mining Geology (4cp)
 67301 Materials Science 2 (4cp)
 67402 Polymers 2 (4cp)
 68302 Applied Optics (3cp)
 91315 Biomonitoring (3cp)
 91376 Environmental Measurement (3cp)
 91313 Biochemistry 1 (6cp)
 91314 Microbiology 1 (6cp)
 91354 Anatomical Pathology (6cp)
 91317 Human Biology (6cp)
 91380 Concepts in Environmental Science (3cp)
 91351 Immunology 1 (3cp)
 91355 Haematology 1 (3cp)
 91320 Biochemistry 2 (6cp)
 91330 Microbiology 2 (6cp)

² Law elective

Choice of any subject with 77...prefix (from 77001 to 77054 inclusive).

Note:

The above information is correct as at 1 October 1994. Students should approach the Faculty of Law and Legal Practice for more up-to-date information.

UNDERGRADUATE SUBJECT DESCRIPTIONS

Guide to subject descriptions

The subject descriptions shown below indicate the subject code and name, the number of credit points for the subject (e.g. 3cp), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (e.g. 4hpw); for some subjects, there may also be practical components off-campus, and this is indicated in the text. Also shown are the prerequisites or corequisites if any, the method of assessment and a brief outline of the content.

Prerequisites are subjects which must be completed before taking the subject to which they refer. Corequisites may be completed before or be taken concurrently with the subject to which they refer.

60301

TREATMENT OF SCIENTIFIC DATA

3cp; 3hpw

prerequisites: 33171 Science Mathematics 1, 31870 Introduction to Microcomputers
subject coordinator: Dr L Kirkup

Errors: error calculations, error propagation. Presentation of data and graphical analysis; population and frequency distributions; sampling techniques; Least-squares; applications of concepts to the physical sciences.

65011

CHEMISTRY 1 F/T

6cp; 6hpw

Revision of basic concepts, atomic structure. Periodic table. Bonding. Stoichiometry. Heat changes in chemical reactions. Structure of matter. Changes of state. Redox reactions.

65012

CHEMISTRY 1 (LIFE SCIENCES)

6cp; 6hpw

Chemistry as it is related to the Life Sciences. Basic concepts, atomic structure, periodic table, bonding stoichiometry, thermodynamics, structure of matter.

65021

CHEMISTRY 2 F/T

6cp; 6hpw

Chemical equilibrium. Acid-base theory. Reaction kinetics. Electrochemistry. Manufacture of chemicals. Introduction to organic chemistry.

65022

CHEMISTRY 2 (LIFE SCIENCES)

6cp; 6hpw

prerequisite: 65012 Chemistry 1 (Life Sciences)
subject coordinator: Associate Professor W Stern

Chemical equilibrium and solubility. Reaction kinetics. Introduction to organic chemistry. Functional groups, reaction mechanism and stereochemistry.

65023

ENGINEERING CHEMISTRY

6cp; 6hpw

subject coordinators: Dr B Young and Dr J Kalman

This lecture series covers the following topics: mole concept, stoichiometry, structure of the atom, atomic spectra, periodic table, chemical bonding, electrochemistry and corrosion, gas laws, change of state, colloids, solution equilibria, applied organic chemistry and the structure of solids.

65024**INTRODUCTORY ORGANIC CHEMISTRY***3cp; 3hpw**prerequisite: 65011 Chemistry 1 F/T**subject coordinator: Dr H Patney*

Structures, bonding and nomenclature of organic compounds. Functional groups. Preparation properties and reactions of aliphatic hydrocarbons, alkylhalides, alcohols, ethers, amines, aldehydes, ketones, nitriles, acids and derivatives, benzene and derivatives. Qualitative analysis: IR and UV spectroscopy, chromatography. Structural and geometric isomerism. Examples of chain and condensation polymerisations. Consumption of plastics and natural polymers. Structures of some common polymers. Natural gas, oil and petroleum. The raw materials for plastics. Organic chemicals from wood and coal. Soaps, detergents, dyes etc.

65031**THERMODYNAMICS***3cp; 3hpw**prerequisites: 67201 Materials Science 1, 33172 Science Mathematics 2, or 65021 Chemistry 2 F/T**subject coordinator: Dr J Byrne*

First law of thermodynamics, internal energy and enthalpy changes in chemical and physical reactions. Entropy and the second and third laws of thermodynamics. Free energy and chemical equilibria. Phase equilibria. The thermodynamic properties of ideal and non-ideal solutions.

65061**CORROSION TECHNOLOGY***4cp; 4hpw**prerequisite: 67405 Physical Metallurgy 2**subject coordinator: Associate Professor R Jones*

A detailed survey of the various forms of corrosion, and the use of appropriate anti-corrosion techniques are discussed

in terms of modern theory and practice. Some attention is given to the economics of alternative anti-corrosion methods. Lectures are complemented by extensive practical work which emphasises the applied nature of the subject.

65062**EXTRACTIVE METALLURGY***6cp; 6hpw**prerequisites: 65031 Thermodynamics, plus all Stage 1, 2 and 3 subjects**subject coordinator: Dr A Cameron*

Occurrence of minerals. Comminution and the theory of time particles. Extractive metallurgy including physical separation methods, flotation, hydrometallurgy and pyrometallurgy.

65071**CORROSION TECHNOLOGY FOR ENGINEERS***3cp; 3hpw**prerequisites: 65023 Engineering Chemistry, 67021 Materials Engineering 1**subject coordinator: Associate Professor R Jones*

A detailed survey of the various forms of corrosion. The use of appropriate anti-corrosion techniques in terms of modern theory and practice. The economics of alternative anti-corrosion methods. The subject extends the prior knowledge that engineers have of the mechanical behaviour of metals, so that corrosion resistance also is considered an important aspect of materials selection.

65101**CHEMISTRY 1M***6cp; 6hpw**assumed knowledge: core of HSC 2-unit chemistry or equivalent**subject coordinator: Dr R Sleet*

Preparation for practical work, atomic structure, periodic tables, chemical bonding. Redox reactions, chemical energetics, properties of matter.

65201**CHEMISTRY 2M***6cp; 6hpw**prerequisite: 65101 Chemistry 1M or equivalent
subject coordinator: Dr R Sleet*

Chemical kinetics, chemical equilibrium, enthalpy and entropy, acid-base theory, complexions, electrochemistry, manufacture of chemicals.

65202**ORGANIC CHEMISTRY 1***6cp; 6hpw**prerequisite: 65101 Chemistry 1M FIT or equivalent
subject coordinator: Dr J Kalman*

Introduction to organic chemistry. Nomenclature, functional groups, reaction mechanisms, stereochemistry, chemical and instrumental analysis.

65301**SPECTROSCOPY AND STRUCTURE***7cp; 6hpw**prerequisite: 65201 Chemistry 2M or equivalent
subject coordinator: Dr R Ashby*

An introduction to the theory and practice of structure determination spectroscopic techniques including UV-visible, infra-red, nuclear magnetic resonance and mass spectrometry and X-ray diffractometry.

65302**INORGANIC CHEMISTRY***7cp; 6hpw**prerequisites: 65201 Chemistry 2M or equivalent
subject coordinator: Dr A Baker*

Covalent bonding in inorganic molecules. Valence bond theory. Chemistry of the transition elements and introductory coordination chemistry. Crystal field theory. Chelating agents and applications in analytical chemistry.

65401**ANALYTICAL CHEMISTRY 1***8cp; 6hpw**prerequisites: all Stage 2 subjects plus 65302
Inorganic Chemistry
subject coordinator: Dr M Dawson*

Lecture and laboratory topics selected from: separation techniques – solvent extraction; distillation; precipitation; chromatography, normal phase, reversed phase and ion chromatography, types of columns, types of separation media, mobile phases. Volumetric analysis – non-aqueous; complexometric; redox.

65402**ORGANIC CHEMISTRY 2***8cp; 6hpw**prerequisites: all Stage 2 subjects plus 65301
Spectroscopy and Structure
subject coordinator: Associate Professor
G Norton*

Nomenclature of polyfunctional compounds. Methods of structural elucidation. Aromatic reactions and syntheses. Carbanion reactions in aliphatic syntheses. Introduction to polymer chemistry. Carbohydrates and stereochemistry. Introduction to heterocyclic chemistry.

65403**ELECTROCHEMISTRY***4cp; 3hpw**prerequisites: all Stage 2 subjects plus 65301
Spectroscopy and Structure
subject coordinator: Associate Professor R Jones*

Revision of basic electrochemical concepts (Nernstian behaviour and conductivity) covered in earlier stages. Molar conductivity and applications. Nature of the electrical double layer, single electrode potentials, thermodynamics and electrode equilibria. pH – potential (Pourbaix) diagrams – their construction, application and limitations. Ionic solutions, activity and activity coefficients – Debye-Huckel theory. Polarisation at electrode surfaces and basic

electrode kinetics – Butler-Volmer relationship. Tafel relationships and behaviour. Mechanisms of selected reactions. Electrochemistry of energy conversion. Electrochemistry of corrosion processes. Experimental methods.

65404

CHEMICAL THERMODYNAMICS

4cp; 3hpw

prerequisites: all Stage 2 subjects plus 65301

Spectroscopy and Structure

subject coordinator: Dr J Byrne

Thermodynamic systems and processes. State and path functions. First law of thermodynamics. Standard reference states and calculation of standard enthalpy changes. Heat capacity and variation of enthalpy of reaction with temperature. Thermodynamically reversible and irreversible processes. Entropy function. Second law of thermodynamics. Variation of entropy with temperature. Third law. Absolute standard entropies. Standard and non-standard values for Gibbs free energy changes. Variation of G with extent of reaction. Equilibrium constants and the reaction isotherm. Fugacity, activity and deviations from ideal behaviour. Van Hoff isochore, Gibbs-Helmholtz equation and applications.

65501

ANALYTICAL CHEMISTRY 2

8cp; 6hpw

prerequisites: all Stage 3 subjects plus 65403 Electrochemistry and 65401 Analytical Chemistry 1

subject coordinator: Dr H Sharp

Lecture and laboratory topics selected from: electroanalytical chemistry – ion selective electrodes, voltametric methods; spectroscopic analysis – UV/VIS, emission spectroscopy, ICP-AES, flame and furnace AAS, X-ray fluorescence; radiochemistry; flow injection analysis; quality assurance.

65502

CHEMICAL PROCESS CONTROL

8cp; 6hpw

prerequisites: all Stage 4 subjects

subject coordinator: Dr B Young

Process control – measurement, controllers, control valves, processes. Control systems mathematics – block diagram algebra, Laplace Transforms, frequency response. Unit operations – heat exchange, distillation, separation processes. Advanced process control – bypass, cascade, feedforward.

65503

ELECTRONICS AND INSTRUMENTATION

5cp; 4hpw

prerequisites: all Stage 4 subjects

subject coordinator: Dr H Sharp

Electronics – revision of AC circuit theory, passive filters, semiconductors, transistors, integrated circuits. Amplifiers – operational amplifiers, instrumentation amplifiers. Active filters. Digital electronics. Microcomputer hardware, data acquisition and control. Noise, digital filtering. Instrumentation – pH and conductivity measurement, op-amp based voltametric analyses, spectrometers, chromatographic instrumentation, vacuum technology.

65504

CHEMICAL SAFETY

3cp; 2hpw

prerequisites: all Stage 1 subjects plus 65201 Chemistry 2M, 65202 Organic Chemistry

Structure of the State and Commonwealth legal system and the role of standards. Classes of dangerous goods. Packaging, labelling and transport codes. Workcover and Worksafe organisations and occupational health and safety in the workplace. Specific content of numerous Acts which regulate manufacture and distribution of materials and the operation of process plant.

65507**ADVANCED CHEMISTRY PROJECT**

prerequisites: all Stages 1–4 subjects

Students may choose a topic from a wide range, on which to carry out work of an individual, investigative nature.

65551**ANALYTICAL CHEMISTRY 2 (ADVANCED)**

8cp; 6hpw

prerequisites: all Stage 3 subjects plus 65401 Analytical Chemistry 1 and 65403

Electrochemistry

subject coordinator: Dr H Sharp

Additional material for Honours students: PC-based data acquisition and control. Additional assignment topics related to advanced chemical instrumentation techniques.

65556**FORENSIC EXAMINATION OF PHYSICAL EVIDENCE 1**

4cp; 3hpw

prerequisites: all Stage 3 subjects

subject coordinator: Associate Professor W Stern

This subject introduces students to the concept of and methods used for the physical examination of evidence. Lectures and laboratory work will examine retention, transfer and residence times of various compounds and consider the application and significance of specific analytical techniques. Optical and electron microscopic techniques will also be covered.

65557**FORENSIC TOXICOLOGY 1**

5cp; 4hpw

prerequisites: all Stage 3 subjects plus 65401 Analytical Chemistry 1 and 65402 Organic Chemistry 2

subject coordinator: Dr M Dawson

The aim of this subject is to familiarise students with the different classes, pharmacology and uses of drugs and poisons. There will also be an introduction to microbiology together with a

general review of the coronial system. Students will be required to attend laboratory sessions and to complete appropriate assignments.

65601**ENVIRONMENTAL CHEMISTRY**

8cp; 6hpw

prerequisites: all Stage 4 subjects plus 65501 Analytical Chemistry 2

subject coordinator: Dr M Dawson

The chemical nature and control of natural and polluted systems in the atmosphere and hydrosphere. The use of modern analytical techniques in study of such systems.

65602**REACTION KINETICS**

4cp; 3hpw

prerequisites: all Stage 4 subjects

subject coordinator: Dr L Evans

Kinetics: rate laws, reaction mechanism, rate theory.

65603**SURFACE CHEMISTRY**

4cp; 3hpw

prerequisites: all Stage 4 subjects

subject coordinator: Dr R Ashby

Interfacial phenomena, surface active agents, catalysis, rheology.

65651**ENVIRONMENTAL CHEMISTRY (ADVANCED)**

8cp; 6hpw

prerequisites: all Stage 4 subjects

corequisite: 65551 Analytical Chemistry 2 (Advanced)

subject coordinator: Dr M Dawson

Additional material for Honours students: Honours students will be required to submit two additional assignments and complete one additional, more challenging practical class. They will also be required to do additional reading from current research publications.

65656**FORENSIC EXAMINATION OF PHYSICAL EVIDENCE 2**

6cp; 4hpw

prerequisites: all Stage 4 subjects plus 65556 Forensic Examination of Physical Evidence 1
subject coordinator: Associate Professor W Stern

This subject considers the structure, chemistry and identification of a wide range of materials commonly encountered in forensic investigations. The lecture material is complemented by an extensive laboratory program.

65657**FORENSIC TOXICOLOGY 2**

8cp; 6hpw

prerequisites: all Stage 4 subjects plus 65551 Analytical Chemistry 2 (Advanced) and 65557 Forensic Toxicology 1
subject coordinator: Dr M Dawson

This subject has a substantial laboratory component in which knowledge of the chemistry of drugs and poisons is applied to the analysis of compounds in biological samples.

65701**APPLIED ORGANIC CHEMISTRY 1**

8cp; 6hpw

prerequisites: all Stage 4 subjects
subject coordinator: Associate Professor G Norton

The chemistry of natural and synthetic polymers. Polymerisation processes, mechanisms and kinetics. Molecular weight determinations. The properties of polymers in relation to structure and molecular weight.

65702**APPLIED ORGANIC CHEMISTRY 2**

8cp; 6hpw

prerequisites: all Stage 4 subjects
subject coordinator: Dr J Kalman

Selected advanced topics in organic chemistry including organic synthesis, photochemistry, natural products and instrumental methods.

65703**METALLURGICAL CHEMISTRY**

8cp; 6hpw

prerequisites: all Stage 4 subjects
subject coordinator: Dr A Cameron

Occurrence of minerals. Comminution and the theory of time particles. Extractive metallurgy including physical separation methods, flotation, hydrometallurgy and pyrometallurgy.

65704**COORDINATION AND ORGANOMETALLIC CHEMISTRY**

8cp; 6hpw

prerequisite: all Stage 4 subjects
subject coordinator: Dr A Baker

Spectral and magnetic properties of coordinating compounds. Structural chemistry including single crystal X-ray diffraction. Applications of thermodynamics and kinetics to inorganic chemistry. Organometallic chemistry: theory and industrial applications. Coordination chemistry and catalysis.

65705**CORROSION SCIENCE**

8cp; 6hpw

prerequisites: all Stage 4 subjects
subject coordinator: Associate Professor R Jones

The course provides a detailed survey of the various forms of corrosion, and the use of appropriate anti-corrosion techniques are discussed in terms of modern theory and practice. Some attention is given to the economics of alternative anti-corrosion methods. Lectures are complemented by extensive practical work which emphasises the applied nature of the subject.

65751**APPLIED ORGANIC CHEMISTRY 1
(ADVANCED)***8cp; 6hpw**prerequisites: all Stage 4 subjects**subject coordinator: Associate Professor
G Norton*

Additional material for Honours students: electroactive polymers. Chemical reactions of polymers. Advanced characterisation techniques.

65752**APPLIED ORGANIC CHEMISTRY 2
(ADVANCED)***8cp; 6hpw**prerequisites: all Stage 4 subjects**subject coordinator: Dr J Kalman*

Additional material for Honours students: interpretation of homonuclear and heteronuclear decoupling experiments and nuclear Overhauser effects. Fragmentation mechanisms in mass spectrometry. Photochemical reactions of aromatic compounds. Reactions involving cleavage of weak single bonds.

65753**METALLURGICAL CHEMISTRY
(ADVANCED)***8cp; 6hpw**prerequisites: all Stage 4 subjects**subject coordinator: Dr A Cameron*

Additional material for Honours students: roast reduction calculations. Calculations of blast furnace charges. Solvent extraction. Computer analysis of grinding and flotation circuits.

65754**COORDINATION AND
ORGANOMETALLIC CHEMISTRY
(ADVANCED)***8cp; 6hpw**prerequisites: all Stage 4 subjects**subject coordinator: Dr A Baker*

Additional material for Honours students: kinetics and mechanisms of reactions of organometallic compounds. Library assignment. Advanced project work.

65756**FORENSIC EXAMINATION OF
PHYSICAL EVIDENCE 3***6cp; 4hpw**prerequisites: all Stage 4 subjects plus 65556
Forensic Examination of Physical Evidence 1*

This subject provides further development in the application of the techniques of forensic examination of physical evidence. Topics will include the structure, chemistry and identification of paper, lubricants, cosmetics and dyes. Introduction to fingerprinting techniques.

65757**NARCOTICS AND DRUGS OF ABUSE***5cp; 4hpw**prerequisites: all Stage 4 subjects plus 65551
Analytical Chemistry 2 (Advanced) and 65557
Forensic Toxicology 1**subject coordinator: Dr M Dawson*

The topics to be covered include sources of drugs, profiling, sampling protocol and the identification and analysis of opioids, amphetamines, hallucinogens etc.

65758**ACCELERANTS, INCENDIARIES
AND EXPLOSIVES***5cp; 4hpw**prerequisites: all Stage 4 subjects plus 65551
Analytical Chemistry 2 (Advanced) and 65556
Forensic Examination of Physical Evidence 1**subject coordinator: Associate Professor W Stern*

A study of the chemistry of accelerants and explosives is essential knowledge for a forensic scientist. The course will consider appropriate techniques for the identification of various classes of materials. Demonstrations will be arranged with appropriate authorities.

65856**RESEARCH PROJECT**

24cp; at least 25 hpw

prerequisites: all of Stages 1–7 subjects

subject coordinator: Dr M Dawson

A research project on specific aspects of forensic science will be conducted under the joint supervision of a member of the academic staff of the University and an external (industrial) supervisor. Some of the work may be required to be conducted at sites away from UTS.

65858**HONOURS RESEARCH PROJECT**

24cp; 2 semesters

prerequisites: all of Stages 1–7 subjects

Defining a research project. Research aims and relationship to available time and resources. Establishing previous work and critical assessment of methodology and results. Appropriate research methods, data collection, data manipulation, logical development of detailed complex arguments. Research ethics. Structure and presentation of research findings.

65995**INDUSTRIAL TRAINING (APPLIED CHEMISTRY HONOURS)**

prerequisites: average mark of at least 65 for Stages 1–4

subject coordinators: Dr H Sharp and Dr R Sleet

A minimum of one semester working as a member of a group involved in professional practice in chemistry. The student will be placed in a challenging position requiring initiative, scientific judgement and team work.

65996**INDUSTRIAL TRAINING 1 (APPLIED CHEMISTRY)**

First six months full-time

65997**INDUSTRIAL TRAINING 2 (APPLIED CHEMISTRY)**

Second six months full-time

65998**INDUSTRIAL TRAINING (APPLIED CHEMISTRY) P/T****66011****GEOLOGY 1**

6cp; 6hpw

subject coordinator: to be advised

The dynamic Earth: earth materials; earth structure and the evolution of the continents and oceans; geological history; geological structure of Australia; resource and environmental geology. Two half-day field excursions in the Sydney area.

66032**GEOLOGY FOR ENGINEERS**

3cp; 3hpw

subject coordinator: Mr T Rannard

Nature of minerals; origin and classification of igneous, sedimentary and metamorphic rocks; rock weathering processes; river landscapes, marine landscapes; rock slope stability; uses of rock in construction; structural features of rocks; geological mapping techniques; introduction to rock mechanics.

66101**GEOLOGY 1M**

6cp; 6hpw

For students in the Applied Geology degree course. Equivalent to 66011 plus a one-day field excursion in the Sydney region.

66201**GEOLOGICAL MAPPING**

4cp; 3hpw

prerequisite: 66011 Geology 1 or 66101 Geology 1M

subject coordinator: Dr G Skilbeck

Maps and aerial photographs; contours; stratigraphic principles and correlation; folds and faults; interpretation of geological maps; surveying and mapping techniques. Geological framework of Australia. Six-day field camp.

66202**LITHOLOGY***2cp; 2hpw**prerequisite: 66011 Geology I or 66101**Geology IM**subject coordinator: Dr K Dadd*

Crystal symmetry and habit; crystal growth types; chemical classification of minerals; ore mineral associations; field classification and hand specimen description of igneous, sedimentary, metamorphic and volcanic rocks.

Includes origin and types of deposits. Practical includes hand specimen examination of common minerals and rocks.

66203**GEODYNAMICS***3cp; 3hpw**prerequisite: 66011 or 62312 Geology I or 66101 Geology IM**subject coordinator: Professor E Leitch*

Earth structure. Seismology. Earth magnetism. Gravity and isostasy. Radioactivity and geochronology. Internal heat and heat flow in the Earth. Crystal structure – oceanic and continental crust. Theory of sea-floor spreading. Continental drift and palaeomagnetism. Concept of plate tectonics. Features of divergent, transform and convergent plate margins.

66301**MINERALOGY AND PETROLOGY***8cp; 7hpw**prerequisite: 66202 Lithology**subject coordinator: Associate Professor B Franklin*

Crystal symmetry and Miller Indices; optical theory; use of the polarising microscope; optical properties, chemistry and paragenesis of rock-forming minerals; crystallisation paths of igneous minerals: occurrence, mineralogy and texture of igneous rocks; nature of magma and its cooling behaviour; magmatic differentiation; sources of magma – nature of crust and upper mantle; igneous rock associations. Types

of metamorphism and textures of metamorphic rocks; chemical equilibria and metamorphic mineral reactions; concept of metamorphic zones and facies; metamorphic rock association. Microscopic and megascopic description of rock types. Five-day field camp with 66302 Sedimentary Geology.

66302**SEDIMENTARY GEOLOGY***6cp; 5hpw**corequisite: 66301 Mineralogy and Petrology**subject coordinator: Dr E Frankel*

Nature and origin of sedimentary materials and stratigraphic sequences including processes of weathering, transportation, deposition and diagenesis. Sedimentology of principal depositional environments; petrographic and textural analysis of sediments; nature and identification of clay minerals; introduction to palaeontological techniques. Field work.

66303**GEOCHEMISTRY***3cp; 3hpw**corequisite: 66301 Mineralogy and Petrology**subject coordinator: Dr K Dadd*

Abundance and distribution of elements and their geochemical classification. Crystallochemical concepts and structure and classification of common minerals. Fundamentals of chemical thermodynamics and application of thermodynamics to geological systems. Isotopy. Aqueous geochemistry and its significance in chemical weathering chemical sedimentation, diagenesis and metamorphism.

66401**TECHNICAL COMMUNICATION***3cp; 4hpw**prerequisites: 66301 Mineralogy and Petrology, 66302 Sedimentary Geology**subject coordinator: to be advised*

The nature of technical communication, geological report writing and presentation. Visual communication: charts,

graphs, line drawings, maps, statistics. Legal problems of technical communication: contracts, copyright. House style, standard abbreviations and terminology. Editing, preparation and submission of technical manuscript for publication and/or printing. Oral presentation of technical reports, participation in symposia. Journal and library research.

66402

STRUCTURAL GEOLOGY

7cp; 6hpw

prerequisites: 66301 Mineralogy and Petrology,

66302 Sedimentary Geology

subject coordinator: Associate Professor

B Marshall

Stress, strain, rheological concepts, and problems pertaining to rock deformation: classification, recognition and formation of fracture systems in brittle and transitional environments; classification, recognition and formation of structures in ductile environments: collection and analysis of structural data in mine, field and laboratory data presentation: mineralisation in the structural environment. Field work.

66403

ECONOMIC GEOLOGY

4cp; 3½hpw

prerequisites: 66301 Mineralogy and Petrology,

66302 Sedimentary Geology

subject coordinator: to be advised

Introduction to the nature of ore bodies: genesis, classification and laboratory methods of investigating such deposits. Field guides to mineralisation: field investigation of mineralisation. Field work.

66404

RESOURCE MANAGEMENT

3cp; 3hpw

prerequisite: 66202 Lithology

subject coordinator: to be advised

Determination of reserves and resources on a global scale. Definition of reserve categories in use in Australia. The structure and financing of mining

companies including financial evaluation techniques using discounted cash flows. Stock exchange operation. Metal marketing and cartels. The New South Wales mining laws: comparison with law in other States. Government policies with respect to the mining industry and the effects of political decisions on mining operations; ethics in the mining industry and the geological profession.

66405

BASIN ANALYSIS

4cp; 3hpw

prerequisites: 66201 Geological Mapping,

66302 Sedimentary Geology, 66406 Explora-

tion Geophysics

subject coordinator: Dr G Skilbeck

Techniques of stratigraphic dating and correlation; interpretation of modern and ancient depositional environments; palaeocurrent analysis; provenance, dispersal and diagenesis; relations between basin structure, tectonism and sedimentation. Field work.

66406

EXPLORATION GEOPHYSICS

4cp; 3½hpw

prerequisites: 66203 Geodynamics, 66201

Geological Mapping, 31871 Computing for Science

subject coordinator: Dr G Skilbeck

Introduction to common methods of air and ground geophysics; theory, technique and equipment; interpretation principles; limitations, particularly in differing parts of Australia. Applications of selected techniques in regional exploration, ground follow-up and target-detailing. Down-hole methods of geophysics; geophysical logging. Integration of geophysics with other exploration techniques within ongoing exploration programs. Field work.

66501**ENGINEERING AND ENVIRONMENTAL GEOLOGY**

5cp; 6hpw and 4-day field excursion
 corequisite: 66402 Structural Geology
 subject coordinators: Associate Professor
 B Marshall and Dr E Frankel

Environmental ethics. Fundamental concepts in environmental planning. Geologic hazard recognition and planning. Australian environmental legislation. Environmental impact statement preparation. Environmental aspects of geological resource utilisation. Mine rehabilitation. Soil classification. Rheological properties of rocks and soils. Soil compaction for engineering purposes. Engineering rock mass concepts and classification. Engineering testing of rock and soil materials. Groundwater geology, hydrology, exploration and development. Soil and rock slope stability. Engineering geology in dam, reservoir, road and railway planning and design.

66502**ADVANCED PETROLOGY**

4cp; 3½hpw
 prerequisite: 66301 Mineralogy and Petrology
 corequisite: 66505 Advanced Structural Geology
 subject coordinator: Associate Professor
 B Franklin

Mineral stability fields in the crust. Constitution of the crust and upper mantle. Origin of basaltic magmas. Partial melting and fractional crystallisation hypotheses. The 'pyrolite' model. Orogenic igneous rock associations. Petrological evolution of the crust and upper mantle. Experimental metamorphic reactions. Metamorphic facies. Mineral parageneses in metamorphic rocks. Eclogites. Metamorphic belts. Metamorphism and crystal evolution. Field work.

66503**FOSSIL FUELS**

4cp; 3½hpw
 corequisites: 66302 Sedimentary Geology,
 66405 Basin Analysis
 subject coordinator: Dr E Frankel

World energy market. Geology of fossil fuel deposits including coal and associated strata, petroleum, natural gas and synfuels derived from oil shale, tar sands and other petroliferous sediments. Introduction to methods of resource size estimation. Field work.

66504**EXPLORATION GEOCHEMISTRY**

2cp; 3hpw
 corequisite: 66403 Economic Geology
 subject coordinator: to be advised

Introduction to geochemical exploration; sampling theory; statistical data processing and presentation; sample security; soil, sediment stream, rock and vegetation surveys; design of a geochemical exploration program.

66505**ADVANCED STRUCTURAL GEOLOGY**

4cp; 3½hpw
 prerequisites: 66402 Structural Geology, 66403
 Economic Geology
 corequisite: 66502 Advanced Petrology
 subject coordinator: Associate Professor
 B Marshall

Elastic, plastic and viscous behaviour in relation to the deformation of mono- and poly-mineralic aggregates; microfabric studies – grain boundary relationships, preferred orientation and the application of the U-stage; theoretical advances in the formation of folds, foliations and lineations; metamorphism and deformation in space and time – progressive deformation relationships on hand-specimen, mine and regional scales; metamorphism, deformation and remobilisation of ore deposits; tectonics and ore distribution; the evolution with geologic time of structure, tectonics and ore deposits. Field work.

66506**ADVANCED GEOLOGICAL MAPPING***3cp (field work)**prerequisites: 66201 Geological Mapping, 66402 Structural Geology**subject coordinator: to be advised*

Regional and detailed geological mapping using topographic, air photo and plan bases. Field measurement techniques. Position specification and location by visual, compass, altimeter and GPS methods. Recording field data. Use of information derived by remote sensing and geophysical surveys. Report preparation and data compilation. Presentation of geological maps and sections. Oral presentation of mapping results.

66507**PROJECT SEMINAR***3cp; 3hpw**subject coordinator: Dr E Frankel*

In preparation for 66604 Field Project, students are assigned seminar topics which include a literature search on an area of interest, background reading on relevant theoretical topics, and practical or field exercises designed to develop skills applicable to the particular Field Project proposed.

66551**ADVANCED STRUCTURAL GEOLOGY (HONOURS)***5cp**prerequisites: all Stage 4 subjects**subject coordinator: Associate Professor B Marshall*

Elastic, plastic and viscous behaviour in relation to the deformation of mono- and poly-minerallic aggregates; microfabric studies – grain boundary relationships, preferred orientation and the application of the U-stage; theoretical advances in the formation of folds, foliations and lineations; metamorphism and deformation in space and time – progressive deformation relationships at hand-specimen, mine and regional scales; metamorphism, deformation and

remobilisation of ore deposits; tectonics and ore distribution; the evolution with geologic time of structure, tectonics and ore deposits. Field work.

66552**ADVANCED PETROLOGY (HONOURS)***5cp**prerequisites: all Stage 4 subjects**subject coordinator: Associate Professor B Franklin*

Mineral stability fields in the crust. Petrological constitution of the crust and upper mantle. Fractionation processes in igneous petrology. The generation of basaltic magmas. Partial melting and fractional crystallisation hypothesis. The diversity and occurrence of basaltic rocks. Orogenic igneous rock associations. Temporal and spatial distribution of andesites. Granite diversity and origin. Pyroclastic rocks in the volcanic succession. Experimental metamorphic reactions and metamorphic facies. Metamorphism and crustal evolution. Metamorphism of the mafic/ultramafic rocks – regional metamorphism, burial metamorphism, blueschists, eclogites, sea-floor metamorphism. Metamorphism of pelites – regional metamorphism, granulites, low pressure pelitic metamorphism. Field work.

66553**FOSSIL FUELS (HONOURS)***5cp**prerequisites: all Stage 4 subjects**subject coordinators: Dr E Frankel and Dr G Skilbeck*

Overview of the world energy market and the historical development of the fuels industries. Geology of fossil fuels deposits, including coal and associated strata, petroleum, natural gas and synthetic fuels derived from oil shale, tar sand and other petroliferous sediments. Methods of resource size estimation. Geological aspects of the occurrence of fossil fuels in Australia and Papua New Guinea is covered in a research assignment. Three-day field

trip to examine coal industry in the Hunter Valley.

66601

EXPLORATION AND MINING GEOLOGY

4cp; 4hpw

prerequisites: 66402 Structural Geology, 66403 Economic Geology

subject coordinator: Mr T Rannard

Principles of project initiation and continuation; functions of the controlling on-site geologist; exploration programs and budgeting; critical path analysis. Prospect analysis using discounted cash flow methods. Relation of exploration programs to geological models. Prospecting methods and follow-up techniques. Drilling: commonly used methods; logging of drill products; interpretation of results. Drill-sections, level plans, grade and recovery predictions, reserves estimation. Mineral processing.

66602

TECTONICS

3cp; 3hpw

prerequisites: 66201 Geological Mapping, 66502 Advanced Petrology

subject coordinator: Professor E Leitch

Origin and evolution of the Earth's continental crust. Change in tectonic regime and time. Large-scale geologic cycles, major Precambrian–Cambrian boundary divisions. Archean geology and tectonics. Granite/greenstone and high-grade metamorphic terrains. Proterozoic crystal associations, special characteristics and tectonics. Reactivated basement models. Plate tectonics and crystal evolution. Plate tectonics and orogeny. Wilson cycle. Collision and activation orogenics. Tectonics of present-day plate margins. Case studies of the Red Sea/African Rift System (divergent), Gulf of California/San Andreas (transform) and Himalayan (convergent) boundaries. Detailed study of sea-floor spreading in the Mesozoic/Cenozoic. Concept of tectonostratigraphic terranes. Tectonic evolution of Australia.

66603

REMOTE SENSING

3cp; 3hpw

corequisite: 66201 Geological Mapping

subject coordinator: Dr G Skilbeck

Utilisation of differing parts of the electromagnetic spectrum in remote sensing. Distant and near remote sensing; radar and infra-red imagery; traditional black-and-white, and colour air-photography; multispectral photography and scanning; satellite imagery. Emphasis will be on geological applications of remote sensing in reconnaissance mapping, geotectonics, and mineral exploration. Practical work will predominantly involve principles of air-photo interpretation.

66604

FIELD PROJECT

9cp; 9hpw

prerequisite: 66507 Project Seminar

subject coordinator: Dr E Frankel

This is an assignment to be carried out under supervision of a specified member of staff. The assignment combines a literature search, field mapping and/or sampling, and a short laboratory investigation. Assessment is based on a formal typed report submitted to the supervisor before the last week of the semester.

66605

ADVANCED FOSSIL FUELS

4cp; 4hpw

prerequisite: 66503 Fossil Fuels

subject coordinator: Dr E Frankel

Exploration and production techniques for coal and petroleum deposits. Reservoir engineering and development of petroleum fields. Assessment of coal and gas reserves. Geological factors in coal mine development and operation. Economic assessment and risk analysis.

66606**MINERAL DEPOSITS***4cp; 3hpw**prerequisites: 66402 Structural Geology, 66403 Economic Geology**subject coordinator: to be advised*

Case studies of classical metallic and non-metallic mineral deposits; their genesis in the light of current theories of ore formation; evidence adduced from field and laboratory studies. Classification of mineral deposits relative to environment and method of formation. Field work.

66607**ADVANCED ENGINEERING GEOLOGY***4cp; 4hpw**prerequisite: 66501 Engineering and Environmental Geology**subject coordinator: Associate Professor B Marshall*

Quantification of geologic data for engineering purposes; stress and deformation in soil and rock masses, especially near surface excavations and underground openings; special techniques for field and laboratory investigations; evaluation and development of groundwater resources, probabilistic analysis of soil and rock slope stability.

66608**MINERAL SCIENCE PROJECT***2cp; 2hpw**subject coordinator: Associate Professor B Franklin*

A report and seminar prepared by the student on the mineral science project.

66651**CONVERGENT MARGIN TECTONICS (HONOURS)***3cp**prerequisites: Stage 5 Honours subjects
subject coordinators: Professor E Leitch and Dr J Aitchison (University of Sydney)*

Review of geology and geophysics of convergent margins. Basic tectonic

elements. Temporal and spatial variability of modern margins. Outline geology of the New England Fold Belt – an ancient convergent margin. Field study of Devonian and Carboniferous tectonic elements in New England – magmatic arc, arc-fringe, fore-arc basin, ophiolites, and off-scraped and underplated accretionary complexes. Critical appraisal of tectonic models, the tectonostratigraphic terrane approach.

66652**CONCEPTUAL MODELS OF ORE DEPOSITS (HONOURS)***3cp**prerequisites: Stage 5 Honours subjects
subject coordinator: Associate Professor B Marshall*

Introduction to conceptual models for ore deposits; empirical/genetic approaches; metallogenic concepts for magmatic, hydrothermal, and sedimentary deposits; structural controls in ore formation; examples of world class deposits.

66653**APPLIED CLASTIC BASIN ANALYSIS (HONOURS)***3cp**prerequisites: Stage 5 Honours subjects
subject coordinator: Dr G Skilbeck*

Detailed examination of clastic sedimentary environments with particular emphasis on sandstone body deposition and orientation. The applications of genetic stratigraphy and seismic stratigraphy are examined using real practical exercises on seismic and well data. On a field trip to the Sydney Basin and New England Fold Belt outcrops of fluvial, seashore marine and deep marine environments are examined in detail to demonstrate the three-dimensional nature of deposits.

66654**RESEARCH DEVELOPMENTS IN GEOSCIENCE**

3cp

prerequisites: Stage 5 Honours subjects
subject coordinator: Professor E Leitch

The subject is based around a series of nine 50-minute seminars given by Doctoral students, academic staff and visiting professional geoscientists. Students will be required to read specified reference material prior to the seminars, and to discuss this material, together with points arising out of the presentation, during a closely following tutorial.

66655**STRUCTURAL GEOLOGY OF ORE DEPOSITS (HONOURS)**

3cp

prerequisites: Stage 5 Honours subjects
subject coordinator: Associate Professor B Marshall

Deformation mechanisms and deformation mechanism maps; evaluation of behaviour of sulfides, silicates and mixtures under metamorphic conditions; mobilisation/remobilisation and movement of ore in brittle and ductile crust; emplacement of ore in sink-sites (ore shoot and orebody formation); structural analysis of orebodies in complex terrains (outcrop and drill core).

66858**PROJECT (HONOURS)**

28cp; 2 semesters

prerequisites: Stage 5 Honours subjects
subject coordinator: Professor E Leitch

Defining a research project. Research aims and relationship to available time and resources. Establishing previous work and critical assessment of methodology and results. Appropriate research methods, data collection, data manipulation, logical development of detailed complex arguments. Research ethics. Structure and presentation of research findings.

66995**INDUSTRIAL TRAINING (HONOURS)**

prerequisites: Stage 4 subjects
subject coordinator: Dr G Skilbeck

A minimum of one semester working as a member of a group involved in professional practice in applied geology. The student will be placed in a challenging position requiring initiative, scientific judgement and team work.

66996**INDUSTRIAL TRAINING 1 (APPLIED GEOLOGY)**

prerequisites: 66201 Geological Mapping, 66202 Lithology

The first period of at least six months full-time relevant industrial employment is necessary to satisfy this subject. The employment must have the approval of the Head of Department of Applied Geology.

66997**INDUSTRIAL TRAINING 2 (APPLIED GEOLOGY)**

prerequisites: Stage 4 Applied Geology Course

The second period of full-time relevant industrial employment. Only in exceptional circumstances, and with permission of the Head of Department, may formal subjects be undertaken concurrently with this subject.

66998**INDUSTRIAL TRAINING (APPLIED GEOLOGY) P/T****67011****MATERIALS 1**

3cp

An introductory course in the properties of building materials. Most commonly used materials are covered but not in depth.

67021**MATERIALS ENGINEERING 1**

3cp

prerequisites: 42611 Mechanics 1, 65023 Engineering Chemistry

A basic introduction to materials science. It provides a foundation in terms of microscopic structure and composition for the understanding of the behaviour of engineering materials. Topics dealt with include atomic structure of solids, phase diagrams, properties of metals and alloys, corrosion, polymers and rubbers, ceramics, timber and composites.

67022**MATERIALS SCIENCE FOR ENGINEERS**

3cp

corequisites: 65023 Engineering Chemistry, 43521 Mechanics of Solids 1

This subject deals with the basic properties of engineering materials. In a materials science section the major topics are classification and structure of solids; primary and secondary bonding; metals, polymers and ceramics, heat treatment and joining methods; durability and corrosion. In a second section of mechanical properties of materials the major topics are the behaviour of materials subjected to tensile and compressive loads; hardness; theories of failure. The lecture program is supported by a program of laboratory demonstrations and experiments.

67023**MATERIALS TECHNOLOGY**

3cp

prerequisite: 68031 Engineering Physics 1 (Electrical)

The objectives are to develop the student's familiarity with commonly used electrical engineering materials to the extent that he or she would classify them in order of hardness, strength, thermal and electrical conductivity, density, dielectric constant and permeability. Materials covered include ferrous and non-ferrous metals, plastics

and ceramics. The subject includes the topics of measurement of material properties, joining techniques. General production techniques and the selection methods are covered but the emphasis is placed on the properties and selection of metals ceramics, polymers and composites in electronic devices and instruments.

67061**MATERIALS ENGINEERING 2**

3cp

prerequisites: 33222 Engineering Mathematics 2B, 42631 Mechanics 3

An introduction to the behaviour of mechanical vibrations. The content includes free and forced response of spring/mass/damper systems, two- and multidegree of freedom systems, torsional vibrations and transverse vibration of beams. Laplace transformation, mechanical impedance and matrix methods are used and both analytical and computer-based numerical solutions are presented.

67201**MATERIALS SCIENCE 1**

4cp

*prerequisites: 65011 Chemistry 1 FIT, 68101 Physics 1**corequisites: 65021 Chemistry 2 FIT, 68201 Physics 2, 33171 Science Mathematics 1*
subject coordinator: Dr M Stevens

Introduction to the crystalline structure and physical properties of solids. Structure sensitive and structure insensitive properties. The properties of metals and metallic alloys in terms of modern theories. The control of structure and properties of commercially important alloys. Introduction to the structure and properties of polymer and ceramic materials and the techniques employed to modify their properties. Introduction to the mechanical testing of materials. The effects of stress state temperature straining rate and repetitive loadings on the behaviour of materials (creep, fatigue and brittle fracture).

67202**INTRODUCTION TO CRYSTALLOGRAPHY**

2cp

subject coordinator: Dr B Ben-Nissan

Introduction to crystallography, crystal systems, symmetry, Miller indices, the stereographic projection, zone axis theory. Introduction to the reciprocal lattice. X-rays, diffraction methods, interpretation of powder photographs, the determination of crystal structures, intensities of X-ray reflection and intensity calculations. The orientation of single crystals and the determination of texture in polycrystalline materials.

67301**MATERIALS SCIENCE 2**

4cp

prerequisites: 67201 Materials Science 1, 33172 Science Mathematics 2, 68201 Physics 2, 65021 Chemistry 2 FIT
subject coordinator: Dr M Stevens

Introduction to quantum mechanics and quantum numbers applied to atomic structure. Bond theory of solids. Electrical properties – conductivity, superconductivity and p-n junctions, superconductivity, dielectric properties. Thermal properties – heat capacity, thermal conductivity and thermoelectric power. Magnetic properties – atomic magnetism, magnetisation curves and hysteresis, domain theory, magnetic materials.

67302**POLYMERS 1**

3cp

prerequisites: 67201 Materials Science 1, 65024 Introductory Organic Chemistry
corequisite: 67301 Materials Science 2
subject coordinator: to be advised

The preparation, properties and applications of common commercial plastics. Qualitative analysis of polymers. Number and weight average molecular weights. Bonding, structures and morphology of polymers. Structure/property relationships. Thermal properties of polymers and copolymers. The

structures and properties of natural polymers (rubber, wood, cellulose, rosin, wool). Synthetic elastomers and copolymers.

67303**MECHANICAL PROPERTIES OF MATERIALS**

6cp

prerequisite: 67201 Materials Science
corequisite: 33172 Science Mathematics 2
subject coordinator: Dr M Wilson

Analysis of stress and strain. Mohr's circle. The mechanical behaviour of materials and flow theories. Elasticity and plasticity. Criteria for yielding and fracture. Time dependent deformation, rheological models and internal friction. Creep and stress relaxation in materials. Introduction to fracture mechanics. Fatigue in materials and the application of fracture mechanics in the design against fatigue failure. Standard mechanical tests and the determination of materials property data.

67401**MATERIALS SCIENCE 3**

3cp

prerequisite: 67301 Materials Science 2
subject coordinator: Professor J Unsworth

Magnetic properties: fundamental, diamagnetism, paramagnetism and ferromagnetism, magnetisation and hysteresis, domain theory, magnetic materials, anisotropy, magnetostriction, soft and hard magnets and their application. Optical properties: light and related phenomena – polarisation, reflection, refraction, isotropic-anisotropic media, sources of colour – absorption and transmission, dispersion. Raman spectroscopy. Application – X-rays, luminescence – fluorescence and phosphorescence, lasers. Introduction to electron optics. Resonance: NMR – principles, experimental methods, diffusion in solids, deformation in metals. ESR – principles, experimental methods – applications in metals, ionic crystals, semiconductors and ferromagnetics.

67402**POLYMERS 2**

4cp

prerequisite: 67302 Polymers 1
subject coordinator: to be advised

The mechanisms, kinetics and statistics of polymerisation reactions. Copolymerisation reactions. Polymerisation conditions. The solution properties of polymers. Polymer fractionation and characterisation. Molecular weights and their determination. Fillers, plasticisers and other additives. New high-performance polymers.

67403**CERAMICS 1**

4cp

prerequisite: 67201 Materials Science 1
subject coordinator: Dr A Ray

Construction and interpretation of binary and ternary phase diagrams and their applications. Structure and classification of ceramic materials with special emphasis on clay minerals. Phase transformations in silica and alumina silicate systems. Raw materials, pressing, extrusion and slip casting of clay products. Clay, heavy clay and whiteware manufacturing methodologies, cation exchange and properties of clay based ceramics. Structure and chemistry of cements and concretes. Introduction to refractories and ceramic microstructures. Industrial excursions.

67404**PHYSICAL METALLURGY 1**

4cp

prerequisites: 67201 Materials Science 1, 67301 Materials Science 2, 65031 Thermodynamics, 67202 Introduction to Crystallography
subject coordinator: Dr W Yeung

The application of thermodynamic principles to phase equilibrium and transformations in metal alloy systems. The fundamentals of nucleation and solidification of metals and their alloys. Theories of diffusion in metals. Commercial alloys and industrial heat treatment processes. The preparation and examination of metallic macrostructures and microstructures.

67405**PHYSICAL METALLURGY 2**

4cp

prerequisite: 67303 Mechanical Properties of Materials

corequisite: 67404 Physical Metallurgy 1
subject coordinator: Dr M Wilson

An analysis of metal strengthening processes in terms of modern dislocation theories. The principles and application of metal forming processes. Metal finishing processes. Industrial excursion and technical inspections.

67406**INSTRUMENTATION FOR MATERIALS SCIENTISTS**

2cp

prerequisite: 68201 Physics 2
subject coordinator: Professor J Unsworth

DC and AC circuits, materials for transducers and transducers for materials, recorders, amplifiers, CRO and meters, specification, signal/noise ratio, feedback bandwidth, Op-Amps, comparators, lock in amplifiers, signal generators, A/D conversion, ICs signal processing, controllers, interfacing instruments.

67501**CERAMICS 2**

4cp

prerequisites: 67403 Ceramics 1, 65031 Thermodynamics
subject coordinator: Dr A Ray

Structure, properties and manufacture of commercial glasses. Phase transformations and nucleation in glass systems and their applications in glass ceramics. Chemical and physical strengthening of glasses and glass ceramics. Glass fibres and their applications in optical communication. Industrial excursions.

67502**POLYMERS 3**

4cp

*prerequisite: 67302 Polymers 1**subject coordinator: to be advised*

The mechanical properties and testing of polymers. Viscoelasticity and creep.

Polymer rheology, processing and fabrication. The chemical, physical and engineering properties of rubber and elastomers. Optical properties of polymers, birefringence and photoelasticity. Textiles, fibres and new polymers.

Paints, coatings, adhesives. Industrial excursions.

67503**CERAMICS 3**

4cp

prerequisites: 67301 Materials Science 2, 67303 Mechanical Properties of Materials, 67403 Ceramics 1

subject coordinator: Dr B Ben-Nissan

Structural imperfections and defect mechanisms. Kroger-Vink notations, diffusion in ceramics and solid-state electrolytes. Solid reactions, sintering theories, densification and grain growth. Advanced production methods. Solid solutions and molecular engineering in ceramics with oxides, nitrides and carbides. Mechanical properties and designing with brittle materials. Reliability and probability analysis in ceramics. Thermal magnetic and electrical ceramic properties and production methodologies. Toughening mechanisms and introduction to ceramic composites. Industrial excursions.

67504**PHYSICAL METALLURGY 3**

4cp

prerequisites: 67404 Physical Metallurgy 1, 67303 Mechanical Properties of Materials
subject coordinator: Dr M Wilson

The principles and application of foundry technology, welding technology and powder metallurgy. An introduction to the theory and application of non-destructive testing techniques

applied to the examination of metal components and structures. Industrial excursions and technical inspections.

67505**PROJECT P/T**

8cp

Materials Science project over two semesters.

67551**MATERIALS CHARACTERISATION**

4cp

prerequisites: 67303 Mechanical Properties of Materials, 67401 Materials Science 3, 60301 Treatment of Scientific Data, 67406 Instrumentation for Materials Scientists
corequisites: 67504 Physical Metallurgy 3, 67552 Polymers 3 (Hons), 67503 Ceramics 3 (Hons)

Analysis of materials properties with the aid of advanced analytical methods including microscopy, spectroscopy, radiation, thermal, mechanical, electrical and magnetic techniques. Emphasis is given to the selection of examination techniques for the evaluation of specific materials properties. Excursions to research laboratories involving specialist materials testing techniques.

67552**POLYMERS 3 (HONOURS)**

4cp

prerequisites: 67302 Polymers 1, 67402 Polymers 2, 67303 Mechanical Properties of Materials

The rheology of polymer melts. Processing, fabrication and design in polymer technology. The chemical, physical and engineering properties of natural rubber and synthetic elastomers. Mechanical properties of polymers – stress relaxation, creep, time-temperature superposition, WLF equation. Failure analysis. Dynamic mechanical thermal analysis. Electrical properties of polymers – dielectric properties, intrinsically conducting polymers. Industrial visits.

67553**CERAMICS 3 (HONOURS)**

4cp

prerequisites: 67401 Materials Science 3, 67303 Mechanical Properties of Materials, 67403 Ceramics 1

corequisite: 67501 Ceramics 2

Structural imperfections and defect mechanisms using Kroger-Vink notations. Diffusion in ceramics, solid reactions, sintering theories, densification and grain growth. In addition to current production methods, modern production techniques such as nano particle powder technology, sol-gel developed thin and thick films, and ceramic membrane technology will be covered. Molecular engineering in ceramics through better chemistry for multicomponent and multilayer ceramics and interface interactions will be emphasised.

Mechanical properties will precede the design with brittle materials, fatigue life prediction in ceramics, reliability and probability analysis in ceramics engineering and manufacture.

Micromechanical models and their application to ceramics design, toughening mechanisms, ceramic matrix and cermet composites and near net shape ceramic production methods will also be covered.

Production and properties of thermal, magnetic, electrical and opto electronic ceramic materials, sensor technology piezoelectric and pyroelectric ceramics.

67554**PHYSICAL METALLURGY (HONOURS)**

4cp

prerequisites: 67404 Physical Metallurgy 1, 67405 Physical Metallurgy 2
corequisite: 68071 Applied Physics (Materials)

The application of metallurgical principles and theoretical concepts to the present and developing metals processing technologies, including foundry technology, welding technology, powder metallurgical techniques and surface finishing. The theory and application of

non-destructive testing techniques applied to the examination of metal components and structures. Industrial excursions and technical inspections.

67601**MATERIALS DEGRADATION**

2cp

prerequisites: 67403 Ceramics 1, 67402 Polymers 2

subject coordinator: Dr A Ray

The environmental degradation of ceramics, plastics and rubber. Techniques employed for the measurement of degradation of non-metallic materials.

67602**SURFACE PROPERTIES OF MATERIALS**

4cp

prerequisites: 65031 Thermodynamics, 67402 Polymers 2, 67405 Physical Metallurgy 2, 67403 Ceramics 1

subject coordinator: Dr M Stevens

Basic surface properties, thermodynamics of surfaces, electrical double layer theories, absorption/desorption phenomena, surface active agents. Applications in adhesion, catalysis, lubrication and wear characteristics.

67603**DESIGN AND MATERIALS SELECTION**

2cp

prerequisites: 67405 Physical Metallurgy 2, 67403 Ceramics 1, 67402 Polymers 2

subject coordinator: Dr B Ben-Nissan

This subject is an examination of the decision-making processes which an engineer or technologist employs to originate, evolve and proportion a device, a machine component or a structural system. Material selection and specification, a critical factor in this process, is examined in regard to material characteristics, in-service performance, aesthetic and economic factors, and other matters that must be considered in the design process. Various case histories are studied.

67604**COMPOSITES**

2cp

prerequisites: 67405 Physical Metallurgy 2, 67504 Physical Metallurgy 3, 67402

Polymers 2, 67502 Polymers 3,

67501 Ceramics 2, 67503 Ceramics 3

corequisite: 67602 Surface Properties of Materials

subject coordinator: Mr G Heness

Mechanical properties, fracture mechanics and failure analysis of polymer, metallic and ceramic matrix composites. Properties of fibres, weaves, fabrics and pregs, their manufacturing and processing requirements. Properties of advanced materials and composites and their selection. Advanced polymers, copolymers and polymeric matrix composites. Design and properties of high temperature metal alloys and metal matrix composites, manufacturing methodologies and behaviour. Toughening of mechanisms in ceramic matrix composites and manufacturing with advanced ceramics.

67651**ADVANCED MATERIALS**

4cp

prerequisites: 67504 Physical Metallurgy 3, 67552 Polymers 3 (Hons), 67553 Ceramics 3

(Hons), 67551 Materials Characterisation

corequisite: 67604 Composites

The application of modern theories concerning the structure and properties of materials based upon thermodynamic concepts and the quantum and electromagnetic theories of matter. An integrated treatment will be supported by application examples that will emphasise an interdisciplinary approach to the development of specialist materials such as electroactive composites, semiconductors, superconductors, biomaterials, high performance fibres and composites, and optical fibres.

67858**HONOURS PROJECT**

24cp; 2 semesters

prerequisites: Honours Stages 5 and 6

Defining and planning a research project. Research aims and relationship to available time and resources. Reviewing previous research work and critical assessment of methodology and results. Appropriate research methods, data collection, data manipulation, logical development of detailed complex arguments. Research ethics. Structure and presentation of research finds. Preparation of articles for publication in journals and conferences.

67995**INDUSTRIAL TRAINING (HONOURS)**

prerequisites: Honours Stages 5 and 6

A minimum of one semester working as a member of a group involved in professional practice in materials science. The student will be placed in a challenging position requiring initiative, scientific judgement and team work.

67996**INDUSTRIAL TRAINING 1 (MATERIALS SCIENCE)****67997****INDUSTRIAL TRAINING 2 (MATERIALS SCIENCE)****67998****INDUSTRIAL TRAINING (MATERIALS SCIENCE) P/T****68011****ENGINEERING PHYSICS (MECHANICAL)**

3cp; 3hpw

subject coordinator: Associate Professor P Logan

A foundation physics course for mechanical engineering students. It covers the fundamentals of thermal physics, wave motion including sound and light, and electricity and magnetism.

68012**ELECTRICAL ENGINEERING 1
(MECHANICAL)**

3cp; 3hpw

prerequisites: 68011 Engineering Physics (Mechanical), 33121 Engineering Mathematics 1

Covers the basic theory of electricity and magnetism and provides an introduction to the theoretical and practical aspects of electrical machines. The syllabus includes DC circuits transients, AC circuits, magnetic fields, electromagnetic induction, magnetic materials, magnetic circuits, DC machines, multiphase circuits, transformers, induction motors and synchronous machines.

68021**ENGINEERING PHYSICS (CIVIL)**

6cp; 6hpw

corequisites: 33120 Engineering Mathematics 1, 43511 Statics

subject coordinator: Associate Professor P Logan

This is a foundation physics subject for Civil Engineering students. It provides an understanding of fundamental concepts in dynamics, electromagnetism, optics and thermal properties of matter. Students are introduced to the basic techniques of measurement.

68031**ENGINEERING PHYSICS 1
(ELECTRICAL)**

6cp; 6hpw

corequisite: 33120 Engineering Mathematics 1

subject coordinator: Associate Professor P Logan

A foundation physics subject for electrical engineering students. It covers the fundamentals of dynamics and statics, fluid mechanics, and thermal physics. Students are introduced to the basic techniques of measurement.

68032**ENGINEERING PHYSICS 2
(ELECTRICAL)**

3cp; 3hpw

prerequisites: 33120 Engineering Mathematics 1, 68031 Engineering Physics 1 (Electrical)

subject coordinator: Associate Professor P Logan

This is a foundation physics subject for electrical engineering students. It covers the fundamentals of waves and optics, atomic and nuclear physics, and includes an introduction to magnetism.

68033**ENGINEERING PHYSICS 3
(ELECTRICAL)**

3cp; 3hpw

prerequisites: 68032 Engineering Physics 2 (Electrical), 67023 Materials Technology (recommended)

Dielectric materials: fundamentals; classification of dielectrics; practical applications; relationship between atomic and bulk dielectric properties; dielectric breakdown.

Magnetic materials: classification of materials by magnetic properties; bulk magnetic properties and their measurement; magnetic materials for practical applications. Conduction modes in metals, dielectrics and semi-conductors. Superconductivity (briefly).

68034**ELECTRICAL POWER GENERATION**

3cp; 3hpw

prerequisite: 68031 Engineering Physics 1 (Electrical)

A course on energy and power for electrical engineering students. It covers the laws of thermodynamics: T-S diagrams; different thermodynamic cycles including the Otto; Diesel and steam engines; refrigeration cycles, thermal generation technology; nuclear reactors; nuclear fusion; MHD; solar energy; alternative energy including wind, hydro, waves, tidal and geothermal; the distribution and storage of energy

including pumped storage and batteries; the efficient use of energy; pollution; the economics, politics and planning of energy production and use.

68035

COMMUNICATION PHYSICS

3cp; 3hpw

subject coordinator: Professor A Moon

Basic aspects of electromagnetic wave propagation and attenuation in specific media. Real boundary problems, distributed source and multiwavelength effects: involving interference, diffraction, reflection, and image formation and processing. Waveguides and optical fibres. Sources and detectors of radiation. Electro-optic, acousto-optic and integrated optoelectronics.

68041

PHYSICS 1 (LIFE SCIENCES)

6cp; 6hpw

subject coordinator: Associate Professor P Logan

General introduction to mechanics, wave motion, optics, thermal physics, properties of matter and modern physics.

68071

APPLIED PHYSICS (MATERIALS)

4cp; 4hpw

prerequisite: 68201 Physics 2

This subject is specifically designed for materials science students. It covers interference and diffraction, lasers, optical fibres, thick lenses, lens aberrations, photometry, the basic principles of photography, image analysis, polarisation, vacuum systems, deposition techniques, thin films, glow discharges, ion beams, thermal sensors and important diagnostic techniques such as ultrasonics and radioisotopes.

68101

PHYSICS 1

6cp; 6hpw

corequisites: 33170 Basic Science Mathematics or 33171 Science Mathematics I

subject coordinator: Associate Professor P Logan

Introduction to the fundamental laws of mechanics, thermal physics, wave motion and optics.

68201

PHYSICS 2

6cp; 6hpw

prerequisite: 68101 Physics I

corequisite: 33171 Science Mathematics I

subject coordinator: Associate Professor P Logan

Introduction to electrostatics, electromagnetism and circuit analysis, properties of matter and optics. For Chemistry and Geology students, atomic and nuclear physics instead of gravitation and additional optics.

68301

PHYSICS 3

3cp; 3hpw

prerequisites: 68201 Physics 2, 33171 Science Mathematics I

Classical physics: law of universal gravitation; Doppler effect; introduction to statistical analysis. 20th-century physics: discovery of charged particles, concept of quantisation; nature of the atom; Rutherford experiment; Bohr theory; extension of Bohr theory; atomic structure. Special Theory of Relativity. X-rays nature and diffraction. Nature of nucleus; radioactivity, particle detectors. Introduction to elementary particles.

68302**APPLIED OPTICS***3cp; 3hpw**prerequisite: 68201 Physics 2**corequisites: 33172 Science Mathematics 2, 33173 Science Mathematics 3**subject coordinator: Associate Professor P Logan*

Polarisation; refraction at a plane and curved surfaces; thin lenses, thick lenses; colour and dispersion of light; the effects of stops; photometry; lens aberrations and lens design; intensification and enhancement; absorption, scattering and spectroscopy.

68303**ELECTROTECHNOLOGY***3cp; 3hpw**prerequisite: 68201 Physics 2**corequisites: 33172 Science Mathematics 2, 33173 Science Mathematics 3**subject coordinator: Mrs S Hogg*

Basic electrostatics, magnetism and electromagnetism. Magnetic materials. Integral form of Maxwell's equations. Alternating currents using complex impedance. Electrical measurements and machinery, transformers, three-phase. AC/DC generators and motors.

68304**ELECTRONICS 1***6cp; 6hpw**prerequisites: 68201 Physics 2, 33172 Science Mathematics 2*

Review of AC and DC circuit theory, semiconductor theory, diodes and bipolar transistors, basic transistor circuits, introduction to digital electronics, logic gates, latches and counters, JFET and JFET amplifiers, frequency characteristics and feedback in amplifiers, operational amplifiers, oscillators and power electronics.

68401**QUANTUM PHYSICS 1***3cp; 3hpw**prerequisites: 68301 Physics 3, 33172 Science Mathematics 2, 33173 Science Mathematics 3**subject coordinator: Dr R Woolcott*

Brief historical introduction, the Schrodinger equation. Time-independent solutions for harmonic oscillator, infinite and finite square wells, hydrogen atom, potential steps and barriers. Angular momentum. Orthonormality, interpretation of solutions.

68402**APPLIED MECHANICS***3cp; 3hpw**prerequisites: 68201 Physics 2, 33221 Engineering Mathematics 2A**subject coordinator: Dr G Anstis*

Particle kinetics in various coordinate systems. Vibrations: free, forced and damped vibration of single and coupled oscillators. Energy methods for particles and for rigid body systems. Angular momentum in two and three dimensions. Introduction to fluid mechanics; flow of ideal incompressible and compressible fluids. Flow of real fluids; Navier Stokes equation. Similitude. Applications.

68403**THERMODYNAMICS AND ENERGY***3cp; 3hpw**prerequisite: 68201 Physics 2**subject coordinator: Associate Professor P Logan*

Applications of basic ideas of thermodynamics to the analysis of power generation, refrigeration, heat pumps. Methods of power production: hydrocarbons, alternative energy, energy storage and transportation, solar energy. Temperature measurement; thermocouple, optical pyrometer, resistance thermometry.

68404**ELECTRONICS 2***3cp; 3hpw**prerequisite: 68304 Electronics 1*

Revision of logic gates, Boolean algebra, Karnaugh maps. Decoding and multiplexers. Flip-flops, structure of counting circuits, digital data storage, registers and memory, RAM, ROM, PROM, parallel-serial conversion, arithmetic circuits, D-A/A-D conversion.

68405**VACUUM AND THIN FILM PHYSICS***3cp; 3hpw**prerequisite: 68201 Physics 2**subject coordinator: Dr L Kirkup*

Vacuum systems; pumps, system operation and design, gauges, leak detection and mass spectrometry. Thin film deposition techniques. Glow discharge sputtering, ion beams. Surface processing. Cryogenics.

68406**COMPUTATIONAL PHYSICS***4cp; 4hpw*

prerequisites: 60301 Treatment of Scientific Data, 31871 Computing for Science, 68201 Physics 2, 33221 Engineering Mathematics 2A
subject coordinator: Dr M Braun

Introduction to digital techniques in applied physics; data analysis, numerical modelling. Techniques for writing and testing large programs. Use of computer packages.

68501**NUCLEAR PHYSICS***3cp; 3hpw**prerequisite: 68401 Quantum Physics 1**subject coordinator: Dr R Woolcott*

Core: basic properties of nucleus, scattering theory, nuclear forces, nuclear models, nuclear reactions, passage of energetic particles through matter, nuclear instrumentation. Lobe: fundamental particles, quarks and leptons, 'standard theory', grand unified theories, other current theories. Pass students take the core and a brief summary

of the lobe plus extra laboratory work. Honours students take the core and the lobe in more detail.

68502**FIELD THEORY***3cp; 3hpw*

prerequisites: 33330 Physical Mathematics, 68303 Electrotechnology

subject coordinator: Dr G Anstis

Solution of electrostatic and magnetostatic problems using Laplace and Poisson equations. Fields in rectangular trough, around a split cylinder. Dielectric sphere in a field. Separation of variables in rectangular, cylindrical and spherical coordinates. Maxwell's equations in integral and differential form. Derivation. Power flow, Poynting vector. Boundary conditions on EBDH Wave equation in free space. Plane wave solutions. Skin effect. Reflection of interfaces. Vector magnetic potential and current distribution. Electric dipole radiation. Waveguides. TE and TM modes.

68503**MATERIALS PHYSICS***3cp; 3hpw*

prerequisites: 68301 Physics 3, 68303 Electrotechnology

Dielectric properties: atomic theory, polarising ability, relaxation, ferroelectrics, piezoelectronics, breakdown. Magnetic properties: moments in atoms, ions, metals, ferrites and garnets, ferromagnetism. B-H loop, anisotropy, domains. Superconductivity: characteristics, flux trapping, type I and II applications.

68504**MICROPROCESSORS IN INSTRUMENTATION***3cp; 3hpw*

prerequisites: 31871 Computing for Science, 68304 Electronics 1

Computer architecture; machine language, computer interfacing; applications of microcomputers in instrumentation, the FORTH language.

68505**SOLID-STATE PHYSICS***3cp; 3hpw**prerequisite: 68401 Quantum Physics 1**subject coordinator: Dr J Bell*

Electrons in solids; free electrons, ICAO, band theory, nearly free electron, tight binding. Insulators, metals and semiconductors: electrical and optical properties of semiconductors. Lattice vibrations; phonons, specific heat, thermal conductivity and expansion.

68508**PROJECT A***6cp; 2 semesters*

A pass project in Applied Physics.

68516**TECHNIQUES OF MATERIALS ANALYSIS***6cp; 3hpw**prerequisites: 67202 Introduction to Crystallography, 68301 Physics 3, 69302 Applied Optics**subject coordinator: Dr D Green*

X-ray generation, absorption and scattering; space group theory; crystal diffraction theory; application to structure analysis; defects and deformations in crystal, accurate cell dimensions. Quantitative XRF and XRD.

Electron microscopy; electron optics, transmission electron microscopy and scanning electron microscopy. Image formation and contrast mechanisms. Electron diffraction. X-ray microprobe analysis.

68553**COMPUTER MODELLING OF PHYSICAL SYSTEMS***3cp; 3hpw**prerequisites: 68406 Computational Physics, 68505 Solid-state Physics, 68502 Field Theory, 68601 Quantum Physics 2*

Particle methods in modelling. Monte Carlo techniques. Numerical solution of ordinary and partial differential equations that arise in the modelling of physical systems.

68556**ADVANCED X-RAY TECHNIQUES***3cp; 3hpw**prerequisites: 68301 Physics 3, 67202**Introduction to Crystallography, 33330 Physical Mathematics**subject coordinator: Professor A Moon*

Review of X-ray and neutron scattering theory, coherent and incoherent scattering, intensity calculations for various diffraction systems. Thermal scattering and extinction. Crystal structure refinement and quantitative analysis, Laue symmetry and diffraction pattern calculations. Powder diffractometry, convolution and Fourier transform, mathematical analysis of instrumental diffraction profiles, diffraction line profile analysis of crystallite size, strain and defective structures.

68557**ADVANCED ELECTRON MICROSCOPY TECHNIQUES***3cp; 3hpw**prerequisites: 68301 Physics 3, 68302 Applied Optics, 33330 Physical Mathematics**subject coordinator: Professor A Moon*

Image formation in an electron microscope. Diffraction theories. Contrast mechanisms. The transmission and scanning electron microscope. Microprobe and nanoprobe analysis.

68601**QUANTUM PHYSICS 2***3cp; 3hpw**prerequisite: 68401 Quantum Physics 1**corequisite: 33330 Physical Mathematics**subject coordinator: Dr G Anstis*

Quantum mechanics; time-independent perturbation theory, variational principle, applications. Rotational and vibrational spectra of molecules.

Multielectron atoms. Hartree approximation. Interpretation of quantum theory. Statistical mechanics and transport phenomena; probability calculations. Isolated systems, fixed-temperature systems, resulting distributions, partition function. Application to paramagnetic solid, ideal gases and

other systems. Maxwell velocity distribution. Electro-chemical potential. Fermi and Bose distribution functions. Irreversible thermodynamics of linear processes.

68602

PHYSICAL OPTICS

3cp; 3hpw

prerequisites: 68502 *Field Theory*, 68302 *Applied Optics*

subject coordinator: Professor A Moon

Classical physical optics; dispersion, Fresnel equations; polarisation; interference and interferometry; diffraction, the use of Fourier transforms in diffraction; spatial filtering; laser cavities and amplification; coherence, holography, fibre optics.

68603

APPLIED THERMODYNAMICS

3cp; 3hpw

prerequisites: 68403 *Thermodynamics and Energy*, 33221 *Engineering Mathematics 2A*

Thermodynamic functions and their applications. Analysis of reactions, phase changes. Non-equilibrium thermodynamics; thermoelectric effect. Low temperature physics. The third law: production of low temperatures. Introduction to kinetic theory; mean free path, calculation of thermal conductivity, resistivity etc.

68604

PRINCIPLES OF INSTRUMENTATION

3cp; 3hpw

prerequisite: 68406 *Computational Physics*
corequisite: 33330 *Physical Mathematics*

Characteristics of measurement; the role of electronics in instrumentation; signal conditioning; performance characteristics of instruments; noise and its reduction; analysis of signals and instruments.

68605

TRANSDUCERS AND DEVICES

3cp; 3hpw;

prerequisite: 68304 *Electronics 1*, 68505 *Solid-state Physics*

Device physics. Transducers; p-n junction: field effect transistor; microwave devices. Applications: pressure, flow, vibration, acceleration, strain, position, angle. Optical detection: photonic, thermal, wave-interaction (heterodyne). IR, optical, noise, figure of merit, signal and background noise limitations.

68608

PROJECT B

3cp

An extension of 68508 Project A which is a pass project in Applied Physics.

68652

DEVICE PHYSICS

6cp; 6hpw

prerequisites: 68505 *Solid State Physics*, 68602 *Physical Optics*, 68404 *Electronics 2*

subject coordinator: Professor G Smith

Electronics; p-n junction diodes, npn and pnp transistors, field effect transistors. Photonics; detectors and sources of radiation spectral properties, laser diodes, LED, photodiodes, heterodyne systems, signal and background noise, detectability, thermal noise, bit error rate. Anisotropic media, acousto- and electro-optics. Optical modulation. Integrated optoelectronics. Transducers: piezoelectric devices for velocity, acceleration, strain sensors, position and angle sensors including laser gyroscope.

68655

ADVANCED SOLID-STATE PHYSICS

4cp; 3hpw

prerequisites: 68505 *Solid-state Physics*, 33330 *Physical Mathematics*

Band structure of solids: tight-binding method, nearly free electron model; computational techniques. Electron dynamics in electric and magnetic fields; low dimensional systems. Lattice

dynamics: phonons, Umklapp processes, harmonic and anharmonic potentials, solutions. Amorphous materials, structure, electronic structure, specific heat, tunnelling processes. Other topics: superconductivity; percolation; phase transitions.

68711**PHYSICS 1 S**

8cp

for Computing sub-major students

Details are as for 68041.

68712**ENGINEERING PHYSICS (CIVIL) S**

8cp

for Computing sub-major students

Details are as for 68021.

68713**PHYSICS FOR ELECTRONICS S**

8cp; 6hpw

subject coordinator: Associate Professor P Logan

A foundation course for the sub-major in electronics. It covers basic mechanics, wave motion and optics: electrostatics, electromagnetism and circuit analysis. An option, recommended in special cases only, is to replace the wave motion and optics with further mechanics including rotational motion.

68714**ELECTRICITY AND MAGNETISM S**

4cp; 3hpw

prerequisite: 68101 Physics I

Introduction to electrostatics, electromagnetism and circuit analysis.

68721**PHYSICS 2 S**

8cp

for Computing sub-major students

Details are as for 68201.

68731**PHYSICS 3 S**

4cp

for Computing sub-major students

Details are as for 68301.

68732**APPLIED OPTICS S**

4cp

for Computing sub-major students

Details are as for 68302.

68733**ELECTROTECHNOLOGY S**

4cp

for Computing sub-major students

Details are as for 68303.

68734**ELECTRONICS 1 S**

8cp

for Computing sub-major students

Details are as for 68304.

68741**QUANTUM PHYSICS 1 S**

4cp

for Computing sub-major students

Details are as for 68401.

68742**APPLIED MECHANICS S**

4cp

for Computing sub-major students

Details are as for 68402.

68743**THERMODYNAMICS AND ENERGY S**

4cp

for Computing sub-major students

Details are as for 68403.

68744**ELECTRONICS 2 S**

4cp

for Computing sub-major students

Details are as for 68404.

68751**NUCLEAR PHYSICS S**

4cp

for Computing sub-major students

Details are as for 68501.

68753**MATERIALS PHYSICS S**

4cp

for Computing sub-major students

Details are as for 68503.

68754**MICROPROCESSORS IN
INSTRUMENTATION S**

4cp

for Computing sub-major students

Details are as for 68504.

68755**SOLID-STATE PHYSICS S**

4cp

for Computing sub-major students

Details are as for 68505.

68761**QUANTUM PHYSICS 2 S**

4cp

for Computing sub-major students

Details are as for 68601.

68763**APPLIED THERMODYNAMICS S**

4cp

for Computing sub-major students

Details are as for 68603.

68764**PRINCIPLES OF
INSTRUMENTATION S**

4cp

for Computing sub-major students

Details are as for 68604.

68858**PROJECT (HONOURS)**

24cp; 2 semesters

*prerequisite: 68997 Industrial Training 2
(Physics)*

The project is carried out over two semesters under the supervision of a member of academic staff of the Department of Applied Physics and, if appropriate, an external supervisor. At the end of the first semester the student's work will be assessed on the basis of a short report. Towards the end of the project the student is required to present a talk to a meeting of academic staff. The final report will represent not only the results of the student's work but also an understanding of their significance, an appreciation of other relevant work in the area of the project and an understanding of the underlying physics of the methods employed.

68943**APPROVED EXTERNAL SUBJECT**

3cp

68946**APPROVED EXTERNAL SUBJECT**

6cp

68995**INDUSTRIAL TRAINING (APPLIED
PHYSICS HONOURS)**

15hpw

prerequisite: preliminary selection into the Honours course in Applied Physics, knowledge of workshop practice and an appreciation of laboratory safety principles

Students will work for a period of one semester (at least 18 weeks) on a project or projects which involve the application of physical principles to

technological problems of some economic importance. The project will be carried out under the direction of an industrial and an academic supervisor.

68996

INDUSTRIAL TRAINING 1 (PHYSICS)

68997

INDUSTRIAL TRAINING 2 (PHYSICS)

91201

HORTICULTURAL EXPERIMENTATION

3cp; 3hpw

Deals with the principles of biological experimentation, as applied to horticulture. These include uses of simple mathematical functions; experimental design and analysis; the use of statistics; and applications in practical situations such as testing growth media, pesticides, or plant performance.

91204

SOILS AND GROWTH MEDIA

6cp; 6hpw

prerequisites: 65012 Chemistry 1 (Life Sciences), 91311 Biology 1 or equivalent

Physical and chemical properties of soils and horticultural potting mixtures; methods of analysis; supply of nutrients, water, air, ions; management of soils and potting mixes. Problems with soils and mixes; pH, drainage, irrigation and salinity. Natural Australian soil ecosystems; growth media, formulation and use; media used in hydroponics.

91205

PLANT BREEDING AND GENETICS

6cp; 6hpw

prerequisite: 91314 Microbiology 1

Biochemical and cellular processes including molecular genetics and control of genetic activity in cells, and environmental influences amongst individuals and populations. The

program introduces students to cloning, somatic cell genetics and hybridisation. The work will also include the control of cell activity by DNA and protein synthesis, and hormonal control of plant processes. The importance of cytoplasmic inheritance will be introduced as will the genetic manipulation of the plant genome. Traditional methods of plant breeding, and production of pure seed and stocks will also be covered.

91206

PLANT PRODUCTION

6cp; 6hpw

prerequisite: 91312 Biology 2

Cultivation of both exotic and native plants of value in urban horticulture. Skills necessary for the cultivation, selection and modification of stocks for particular situations are developed. The principles of plant physiology, water use, irrigation and associated problems within nurseries and intensive cultivation systems are covered.

91207

PLANTS IN THE LANDSCAPE

8cp; 6hpw

prerequisite: 91206 Plant Production

This subject is designed to develop the student's understanding of the uses of plant materials (especially woody plants) in the landscape as part of the function of open space management. The subject considers the benefits of plants, techniques for selecting appropriate plants of good quality for particular purposes and sites, methods of establishing these plants and management techniques necessary to maintain plant health, including the diagnosis and management of plant problems. Integral to this subject are site visits to open space developments around Sydney and discussions with the managers of these areas.

91208**PLANT PROTECTION***6cp; 6hpw**prerequisites: 91211 Horticultural Botany, 91314 Microbiology I*

The concept of disease in plants, and the classification of plant diseases is introduced. The main groups of plant pathogens and pests, their transmission and management are studied. Visits to the Plant Disease Diagnostic Laboratory, Plant Quarantine Station, NSW Plant Pathology Herbarium and related laboratories are arranged. A collection, preservation and identification of plant pathogens is a component of the subject.

91210**LANDSCAPE HORTICULTURE***3cp; 3hpw*

Introduces students to landscape studies by considering the significance and interrelationships of landscape, horticulture and human societies in the past, present and future. The subject considers the impact of humans on the landscape, the history of people/plant/landscape interactions, including the history of gardens, and the process of landscape design in relation to current practice in Australia.

91211**HORTICULTURAL BOTANY***3cp; 3hpw**prerequisite: 91311 Biology I*

A number of biological concepts underlining plant culture are considered, including Angiosperm and Gymnosperm morphology and anatomy, and the adaptations to diverse environmental conditions. Special reference is made to the Australian flora.

91215**HORTICULTURAL RESEARCH PROJECT***8cp; 6hpw**corequisite: 91224 Horticultural Production Management or 91225 Open Space Management*

Designed to enhance the student's scientific and professional skills by developing the student's ability to carry out horticultural research in an independent manner. The student is required to formulate a research or development project topic, to plan the necessary research work within an appropriate time-scale, to carry out the work, to analyse appropriately and critically the data or information obtained, to reach conclusions relating the data (or information) to the project topic, and to present the findings of the project in a formal written report and a seminar to other students and staff. The secondary aim of the subject is to develop the student's skills in searching for and obtaining employment through participation in a class dealing with employment and career development.

91218**AUSTRALIAN PLANTS***6cp; 6hpw**prerequisite: 91360 Quantitative Ecology*

This subject broadens the understanding of the origin, evolution and classification of the Australian flora. The potential of native plants for horticultural exploitation e.g. cut flowers, essential oils, source of foods and pharmaceuticals is considered. One-day excursions to national parks, botanic gardens and wildflower farms and a three-day excursion to Canberra and the National Botanic Gardens, are included. The subject includes a plant collection demonstrating various applications.

91224**HORTICULTURAL PRODUCTION MANAGEMENT***4cp; 3hpw**prerequisites: 91229 Horticultural Financial Management, 91206 Plant Production*

Through this subject, the student is expected to develop an understanding of the technical aspects of nursery management and plant production. Cost/benefit analysis will be made of the daily operations of commercial enterprises ranging from plants produced in tissue culture to open area growth of flowers, to the intensive controlled growth of potted plants in greenhouses. Also covered will be the technical aspects of personnel management, and seasonal and budgetary factors involved. Cost/benefit analysis of physical, biological and human resources will be considered. Long-term and construction design of plant production units will be discussed.

91225**OPEN SPACE MANAGEMENT***4cp; 3hpw**prerequisites: 91229 Horticultural Financial Management, 91207 Plants in the Landscape*

Designed to develop the student's understanding of the operation and management of open space amenity areas, such as landscaped parks and gardens, bushland and reserves, and urban streets. Several case studies in open space management are examined and the importance of obtaining accurate information for decision making is highlighted. The subject considers management functions including planning in relation to long-term and short-term goals, organising resources, staff recruitment and development, directing staff and evaluating the achievement of goals.

91229**HORTICULTURAL FINANCIAL MANAGEMENT***4cp; 3hpw*

This subject is normally taken in Stage 5 of the course. The principles and practices of business management in a horticultural enterprise are introduced. The subject includes an introduction to accounting methods, balance sheets, stock control, management and legal issues.

91236**PLANT TISSUE CULTURE***4cp; 3hpw**prerequisites: 91211 Horticultural Botany, 91208 Plant Protection*

An introduction to plant cell and tissue culture, and the application of these techniques to cloning, somatic embryogenesis, somaclonal variation, anther and pollen culture, disease indexing and pathogen elimination. The program includes media preparation, nutrient and growth substance requirements; transplanting hardening-off stages of in vitro grown plants. Students are also introduced to experiments involving plant tissue culture technology. Special emphasis is given to Australian indigenous and rare flora.

91242**HORTICULTURAL PROCEDURES F/T***12cp; 6hpw, 2 semesters*

Introduction to urban horticulture, indicating its historical and cultural significance. Major world climate zones and the species and typical structural forms of vegetation. Plant features utilised in ornamental horticulture for a variety of amenity and aesthetic purposes. Annual, perennial, herbaceous, woody, exotic and native plant species for specific purposes. Plant nomenclature, and identification of selected groups; techniques of propagation from seeds, spores, cuttings. Budding, grafting and pruning techniques. Applications of a range of construction

materials and equipment to open area establishment and planting; simple surveying and levelling techniques and introduction to recording and monitoring programs. The role of selected woody ornamentals, bulbs, and soft-wooded perennials in their natural ecosystems, and in the artificial environments of urban landscapes. The distribution of native vegetation in the Australian environment, and the choice of plants, exotic and native, for particular places and uses. Methods of plant identification. The asexual propagation of the plant material including breeding, aerial layering, semi-hardwood cuttings, grafting, introduction of leaf cuttings, tissue culture, and cultivation of plants in controlled nursery environments. An introduction to the problems presented by different horticultural sites, and techniques of landscape construction, including drainage, postings, retention banks, and access ways. Classes for the full-time Horticultural Procedures subject are undertaken at the Ryde College of TAFE over two semesters. TAFE commencement dates for this subject will be earlier than the UTS commencement each semester. All necessary information will be given to commencing students at UTS enrolment.

91244

HORTICULTURAL PROCEDURES P/T

*12cp; 3hpw, 4 semesters
equivalent to 91242*

Classes for the part-time Horticultural Procedures subject are undertaken at the Ryde College of TAFE over two years. TAFE commencement dates for this subject will be earlier than the UTS commencement each semester. All necessary information will be given to commencing students at UTS enrolment.

91311

BIOLOGY 1

6cp; 6hpw

This subject, together with 91312 Biology 2, constitutes a foundation course in biological sciences in the Faculty.

Theme: diversity of living organisms and their interaction with one another

and the environment. Characteristics of living things; cellular basis of life; principles of classification; characteristics of kingdoms of living organisms and their sub-groups; genetics, evolution and natural selection; ecological principles, energy flow, nutrient cycles, community and ecosystems.

91312

BIOLOGY 2

6cp; 6hpw

prerequisite: 91311 Biology 1 or equivalent

Theme: interrelationship between structure and function in living systems at two levels of organisation: cellular and organismic. Cell structure and physiology: molecular architecture of cells; cellular reactions and metabolism; molecular basis of heredity and information transfer. Animal physiology – mechanisms of movement, gas exchange and circulation, nutrition and digestion, osmoregulation and excretion among animal groups. Plant physiology – anatomy and physiology of flowering plants, nutrition, photosynthesis, transport. Physiological adaptations of Australian native species of animals and plants to the specific environments.

91313

BIOCHEMISTRY 1

6cp; 6hpw

prerequisites: 91311 Biology 1, 65022 Chemistry 2 (LS)

Bioenergetics and physical biochemistry: energy flow and transformation, laws of thermodynamics, free energy considerations in equilibrium and steady-state situations; electrolyte behaviour, pH and proton equilibria; colligative properties, osmotic pressure; chemical kinetics, catalysis and enzyme action. Structure and function of biological molecules emphasising structural, energy providing and informational characteristics: carbohydrates, lipids, amino acids, peptides, proteins (including enzymes), nucleosides, nucleotides, nucleic acids. Replication and repair of DNA; recombinant DNA. Protein

synthesis. Basic concepts of metabolic pathways; energetics of metabolism.

91314

MICROBIOLOGY 1

6cp; 6hpw

prerequisite: 91312 Biology 2

An introduction to the structure, function and taxonomy of the bacteria, fungi, protozoa and viruses. A survey of selected topics including microscopy; elementary immunology; chemotherapy; microbial ecology; sterilisation and disinfection and microbiological techniques.

91315

BIOMONITORING

3cp; 3hpw

prerequisites: 91312 Biology 2, 91317 Human Biology

corequisite: 91314 Microbiology 1

The dynamics of natural and disturbed aquatic and terrestrial ecosystems; effects of industrial pollution on these ecosystems are investigated. Effects of pollution include chemical changes such as pH fluctuations, increases in concentrations of heavy metals and organic chemicals such as pesticides and detergents; biological contaminants resulting from sewage, garbage and changes in the balance of the natural microorganisms biota. Sampling procedures; estimates of biomass and productivity; methods of data analysis. This subject includes field excursions.

91316

BIOINSTRUMENTATION

6cp; 3hpw

prerequisite: 68041 Physics 1 (LS)

Extension of physics knowledge to concepts of electricity emphasising electronic instrumentation as used in field, clinical and other biological applications.

Such knowledge is essential to acquire competence in the practice of medical laboratories and environmental studies.

91317

HUMAN BIOLOGY

6cp; 6hpw

corequisite: 91312 Biology 2

Basic gross anatomy and detailed study of microscopic structure of the human body. The structure and function of tissues and organs are related to a model of control mechanism in order to emphasise the process of homeostasis. Whenever possible, an attempt is made to integrate morphological, physiological and biochemical details in each of the functional units in the human body.

91319

CONCEPTS IN BIOCHEMISTRY

8cp; 6hpw

prerequisites: 91311 Biology 1 or equivalent, 65022 Chemistry 2 (Life Sciences)

This subject is available only to students not enrolled in the undergraduate degrees in Biomedical Science, Biotechnology or Environmental Biology.

An introduction to the major areas of biochemistry. Bioenergetics, biochemical equilibria and steady state, basic enzyme kinetics, solution properties of biomolecules. Structure and function of biological molecules emphasising structural, energy-providing and informational characteristics: carbohydrates, amino acids, proteins, lipids, nucleotides, nucleic acids. Replication and repair of DNA, recombinant DNA, RNA and protein synthesis. Basic concepts of metabolic pathways.

91320

BIOCHEMISTRY 2

6cp; 6hpw

prerequisite: 91313 Biochemistry 1

Principles of catalysis. Purification properties and nomenclature of enzymes. Vitamins and enzyme cofactors. Localisation of enzymes. Regulation of enzyme action at cellular and molecular levels. Cellular role of ATP. Oxidative phosphorylation and the mitochondrion. The electron transport chain.

Glucose catabolism and anabolism. The glycolytic sequence. The pentose phosphate pathway. The citric acid cycle. Fatty acid synthesis. Oxidation of fatty acids. Membrane models. Breakdown of proteins and metabolism of amino acids. One-carbon metabolism. Synthesis and degradation of nucleotides.

91321

BIOCHEMISTRY 3

8cp; 6hpw

prerequisite: 91320 Biochemistry 2

Structure of biological membranes and implications for metabolite transport; the cell surface and recognition of extracellular modulators of cell function. Adaptive processes and enzyme regulation in metabolic control; biochemical devices for the amplification of metabolic response. Biosynthesis, secretion and action of hormones; detailed biochemistry of selected hormones. Vitamins and trace metals in nutrition and their involvement in enzyme action as coenzymes, activators and regulators. Biochemistry of connective tissue and bone; calcium homeostasis. Specialised metabolism of nervous tissue; generation and transmission of the nerve impulse. Muscle proteins and the biochemistry of muscle contraction.

91322

BIOCHEMISTRY 4

8cp; 6hpw

prerequisite: 91320 Biochemistry 2

Biochemical pharmacology and toxicology: modes of action of widely-used drugs including anti-depressants, addictive drugs, narcotics, analgesics, anaesthetics and anti-inflammatory drugs. The toxicity and metabolism of foreign compounds and their elimination from the body. Biomedical Science: biochemical aspects of disease states, cancer and carcinogenesis, rheumatoid arthritis and other inflammatory diseases, inherited metabolic diseases, mental disorders, alcoholism.

91326

ANALYTICAL BIOCHEMISTRY

6cp; 6hpw

prerequisite: 91313 Biochemistry 1

Modern analytical methods in biochemistry with emphasis on instrumentation and underlying principles. Qualitative biochemical analysis. Spectroscopic methods (spectrophotometry, spectrofluorometry, flame emission and absorption photometry, magnetic resonance methods). Separation methods (chromatography, electrophoresis, centrifugation). Electrochemical methods (potentiometry and ion electrodes, polarography). Introduction to radiochemistry. Errors in analysis. Immunoassay methods. Implications of biochemical equilibria in analysis. Molecular biology techniques.

91330

MICROBIOLOGY 2

6cp; 6hpw

prerequisite: 91314 Microbiology 1

Microbial physiology and basic applied microbiology. Bacterial physiology – nutrition, energetics; biosynthesis and growth. Mechanisms and use of growth and physiological reactions in diagnostic and applied microbiology. Features of, and factors influencing, the microbial flora of habitats such as the higher animal body, soils, water supply and disposal systems and foods. The survival, growth and death of such flora; methods for identification and quantitation. Introduction to bacterial genetic systems and processes. Anti-microbial substances in the environmental, hospital and laboratory environments.

91331

MICROBIOLOGY 3

8cp; 6hpw

prerequisite: 91330 Microbiology 2

Public health microbiology. Basic epidemiological principles; mathematical formulation of epidemics; sociological aspects. The public health laboratory

environment; food, water and airborne diseases; exotic and notifiable diseases; zoonoses. Epidemiological tracing methods; biotyping; serotyping; bacteriophage typing; bacteriocin (BLIS) typing; molecular typing. Control measures; hygiene; sanitation; disinfection; sterilisation; vaccines, vaccination procedures and vaccination programs.

91334

MOLECULAR BIOLOGY 1

4cp; 3hpw

prerequisites: 91314 Microbiology 1, 91313 Biochemistry 1

corequisites: 91330 Microbiology 2 and/or 91320 Biochemistry 2

Introduction to the basis of present-day molecular biology. Key concepts and procedures in bacterial and bacteriophage genetics, including mutation, recombination and mechanisms of genetic exchange, utilising plasmids, transposons and viruses. Introduction to the principles and procedures underlying DNA manipulation methods in the molecular biology laboratory, including the molecular cloning, selection and analysis of recombinant DNA.

91335

MOLECULAR BIOLOGY 2

8cp; 6hpw

prerequisite: 91334 Molecular Biology 1

Structure and organisation of the eukaryotic genome. Control of genome expression by regulation of RNA synthesis, processing and translation. Development and differentiation. Techniques and application of hybridisation, sequencing, polymerase chain reactions and Western blotting. Preparation of DNA libraries. Clinical applications of molecular biology in inherited disease detection and infectious disease diagnosis.

91337

VIROLOGY

4cp; 3hpw

prerequisite: 91330 Microbiology 2

Tissue culture practices. Introductory virology; nature of viruses, viral multiplication; classification; identification. Diagnostic virology, involving isolation and serology of viruses of clinical significance. Chemotherapy and interference principles. Epidemiological principles and advanced case studies, vaccine programs and control of viral and bacterial diseases.

91341

BLOOD BANK

4cp; 3hpw

prerequisites: 91354 Anatomical Pathology, 91355 Haematology 1, 91351 Immunology 1

Human blood groups. Principles of donor blood compatibility and antigen/antibody reactions. Detection and identification of serum antibodies. Blood products. The safety of the blood supply and minimisation of transmission of infectious diseases. Investigation of transfusion reactions. Haemolytic disease of the newborn. Platelet immunohaematology.

91342

CLINICAL BIOCHEMISTRY 1

4cp; 3hpw

prerequisite: 91320 Biochemistry 2

Principles of clinical biochemistry. Laboratory hazards and quality control including appropriate statistics as used in clinical biochemical laboratories. Introduction to calculations and analyses of clinically important substances. Pre-analytical procedures. Qualitative analysis as exemplified by urine analysis. Quantitative analysis as exemplified by inorganic phosphorus analysis. Spectroscopic identification of normal and abnormal haemoglobin pigments. Blood sugar estimations and basis of abnormalities of carbohydrate metabolism. Principles of clinical enzymology with particular reference to the

methodology. Principle of automation involving discrete and continuous flow methods.

91343

CLINICAL BIOCHEMISTRY 2

4cp; 3hpw

prerequisite: 91342 Clinical Biochemistry 1

Measurements of homeostasis and its malfunction. Liver and kidney function and disorders. Regulation of electrolyte, water and acid-base balance. Serum protein patterns in health and disease. Abnormalities of lipid metabolism. Radio immunoassay, hormone evaluation with special emphasis on thyroid function, isoenzymes, malabsorption syndromes, vitamin levels in clinical investigation.

91347

TOXIC MATERIALS IN THE ENVIRONMENT

4cp; 3hpw

prerequisites: completion of Stages 1–4

Pathways of toxic substances in the environment. Transfer mechanisms between the different environment compartments. Bio-accumulation and bio-transformation. Environmental legislation: the NSW Environmental Acts and their associated regulations; comparison of the Federal Acts with those from other States; significance of socioeconomic factors on decision making in environmental impact assessment; objectives, contents and procedures for the preparation of environmental impact statements.

91350

PRINCIPLES OF PHARMACOLOGY AND TOXICOLOGY

4cp; 3hpw

prerequisites: 91317 Human Biology, 91313 Biochemistry 1

General principles governing drug action. Drug-receptor interactions. Dose-response measurements in pharmacology and toxicology. Effects of drugs and toxic substances on the cardiovascular

system, the central nervous system, the respiratory system. Effects of drugs and toxic substances on metabolic and excretory function. Carcinogens and teratogens. Specific classes of toxic substances.

91351

IMMUNOLOGY 1

3cp; 3hpw

prerequisites: 91354 Anatomical Pathology, and either 91314 Microbiology 1 or 91313 Biochemistry 1

This is a core subject for the Biomedical Sciences and Biotechnology courses that is designed to introduce the basic concepts of immunology. The subject is structured so that it follows the course of an immune response, from initial non-specific reactions to the development of adaptive responses and immunological memory. Emphasis is given to the basic concepts that underlie the recognition of foreignness and the response to infection. The practical sessions introduce students to a variety of cellular and serological techniques that are the cornerstones of immunological analysis. In addition, special interactive teaching sessions are used to explore contemporary topics in immunology.

91354

ANATOMICAL PATHOLOGY

6cp; 6hpw

prerequisites: 91312 Biology 2, 91317 Human Biology, 65022 Chemistry 2 (LS)

This subject provides a basic knowledge of disease processes, the body's responses to them, the preparation and staining of mammalian tissues for microscopic examination of organ structure, and light microscopic appearance of diseased tissues.

The subject also teaches the chemistry of biological dyes and their uses in the laboratory to highlight normal tissue structures and demonstrate pathological tissue changes.

On completing the subject the student should have a general understanding of disease processes, their morphological appearance and the laboratory techniques used to interpret structural tissue changes that occur in disease. The student should also be able to identify a variety of diseases from histological sections under the light microscope, as well as perform standard laboratory staining procedures on tissue sections.

91355

HAEMATOLOGY 1

3cp; 3hpw

prerequisites: 91354 Anatomical Pathology, and either 91314 Microbiology 1 or 91313 Biochemistry 1

Structure, function and morphology of normal blood and bone marrow. Haemostasis and haematopoiesis. Automated laboratory equipment used in haematology. Introduction to haematological disease and the significance of haematological changes in disease.

91358

HAEMATOLOGY 2

8cp; 6hpw

prerequisite: 91355 Haematology 1

Disease processes related to hereditary, acquired, benign and malignant disorders of haematological systems. Correlation of physiological processes, pathological states and diagnostic tools in haematology. Light microscopic morphological examination of peripheral blood and bone marrow in disease and correlation of these findings with indices and cell counts obtained by automated laboratory equipment. Procedures for detection and precise diagnosis of anaemias, haemostatic disorders, haemoglobin disorders and haematological malignancies. Introduction to cytogenetics; prenatal diagnosis of genetic disease; genetic counselling and cancer cytogenetics.

91359

IMMUNOLOGY 2

8cp; 6hpw

prerequisite: 91351 Immunology 1

Provides current concepts of modern immunology to students who have some basic understanding of the subject, and an appreciation of the wide spectrum of applied immunology in medicine, research and industry. Specialised areas of immunology covered include genetics of antibody diversity; structure of antibodies, T-cell receptor and MHC molecules; cytokines; monoclonal antibodies; clinical immunology and techniques applicable in both diagnostic and research laboratories including enzyme-linked immunoassays; cell separations and flow cytometry.

91360

QUANTITATIVE ECOLOGY

6cp; 6hpw

prerequisites: 91312 Biology 2, 91317 Human Biology, 91395 Biocomputing, 33105 Introductory Biometrics or 91201 Horticultural Experimentation

Measurement and analysis as part of the resource management process. Techniques of estimating population size and density of sedentary organisms; sampling methods, assessment and data analysis in aquatic and terrestrial systems. Techniques for sampling multispecies communities and mobile organisms. Estimations of biomass and productivity. Principles of identification and categorisation of key groups of indicator organisms in aquatic and terrestrial systems, including major groups of plants, invertebrates and microbial groups. The design and use of keys. Collection, preservation and identification of specimens from the field. This subject will include field excursions to develop skills of field identification of organisms and measurement techniques, both aquatic and terrestrial.

91362**PLANT ECOPHYSIOLOGY***6cp; 6hpw**prerequisite: 91360 Quantitative Ecology*

Principles of plant classification with reference to Australian groups; introductory geology, soil formation, soil structure, classification and analysis; anatomical and other responses of plants to environmental stress; carbon metabolism and factors affecting growth and development; nitrogen fixation and nutrient cycling; the role of plants in the biosphere. This subject will include field excursions.

91363**ANIMAL ECOPHYSIOLOGY***6cp; 6hpw**prerequisite: 91360 Quantitative Ecology*

Basic concepts in ecophysiology; limiting factors, lethal limits, acclimation. Patterns of physiological responses to natural and selected man-made stressors. Coordination of physiological processes with environmental factors; neuro-endocrine control of life cycles and physiological responses, stress syndrome. Population changes; basic animal population dynamics, structure, growth and regulation of populations. This subject includes a field excursion.

91364**AQUATIC ECOLOGY***8cp; 6hpw**prerequisites: 91362 Plant Ecophysiology, 91363 Animal Ecophysiology*

Australian water resources and the hydrological cycle. Structural components and functional processes of aquatic ecosystems; physical, chemical and biological features; energy flows and nutrient cycles. Distinctive features of lakes, rivers and streams, estuaries, coastal lagoons and the sea. Assessment and monitoring of water pollution problems; water quality and biological surveillance. Management of polluted and disturbed aquatic habitats. Management of water supply reservoirs. This

subject will involve a number of field excursions including an excursion in February preceding enrolment.

91365**TERRESTRIAL ECOLOGY***8cp; 6hpw**prerequisites: 91362 Plant Ecophysiology, 91363 Animal Ecophysiology*

Ecosystem concepts and their application to ecological management; ecosystem dynamics; major world ecosystems and associated non-biotic mechanisms; major Australian terrestrial ecosystems and their management. Fire: its ecological impacts and management. Case studies in applied ecology. Use will also be made of reports of statutory authorities, management plans and environmental impact assessments. This subject will include field excursions including an excursion in February preceding enrolment.

91366**PEST CONTROL AND TOXICOLOGY***8cp; 6hpw**prerequisite: 91360 Quantitative Ecology*

Biological and chemical principles of pest control: the safe use of pesticides. Methods of toxicological testing for pesticides, heavy metals and other hazardous chemicals, in air, soil and water, using biological assays of animals and plants.

91367**APPLIED ECOLOGY***8cp; 6hpw**prerequisites: 91364 Aquatic Ecology, 91365 Terrestrial Ecology*

The lecture/seminar component will deal with experimental design for ecological investigations, with applications in environmental management; the significance of socioeconomic factors on decision making in environmental matters, and the role of the professional environmental scientist. A major part of this subject will be devoted to a research project, normally carried out in small groups. An individual detailed report on the project will be submitted by each

student. This subject is normally to be taken in the last semester of the undergraduate work, since it draws on the expertise derived from all other subjects in the course. There is a field excursion.

91368

BIOPROCESSING

8cp; 6hpw

prerequisite: 91330 Microbiology 2

Fermentation technology; processes of formation and extraction of useful products of microbial, animal and plant cells; the microbiological, physiological and biochemical bases of industrially useful fermentations in the food, beverage, pharmaceutical and other relevant industries; unit operations and processing procedures in industrial fermentations. Computer interfacing and control procedures for fermentation systems. Economic and other factors impinging on the operation of fermentation industries. Industrial visits and a literature project are undertaken in this subject.

91369

APPLIED AND ENVIRONMENTAL MICROBIOLOGY

8cp; 6hpw

prerequisite: 91330 Microbiology 2

Foods and waters as microbial ecosystems. Factors affecting their contamination by micro-organisms of spoilage and public health significance. Indicator organisms and the microbiological monitoring of foods and waters. Quality control in food production and water management. Waste treatment processes for industrial and domestic wastes. Bioremediation of contaminated aquatic and terrestrial eco-systems.

Industrial visits are an important component of this subject.

91370

FIELD STUDIES: SEMI-ARID ECOLOGY

8cp; 6hpw (run over 10–14 day excursion to far-western NSW in July every third year, alternating with 91371 i.e. a major field elective every 18 months)

This and other electives are normally taken in senior stages of the degree course. It can thus be assumed that students will have a thorough knowledge of basic ecology (see also elective field study subjects 91371 and 91375). The aim of the subject is to broaden students' understanding of environmental biology and its management applications by demonstration and experimentation outside the Sydney Basin. The importance of water and water management, rangeland management and national parks management of dry areas will be included, along with ecological studies of factors determining the composition and structure of semi-arid vegetation. Assessment will involve submission of a log book/journal and a project report or presentation, to be completed after the field excursion.

91371

FIELD STUDIES: MOUNTAIN ECOLOGY

8cp; 6hpw (run over 10-day excursion to south-eastern NSW in December every third year, alternating with 91370 i.e. a major field elective every 18 months)

This and other electives are normally taken in senior stages of the degree course. It can thus be assumed that students will have a thorough knowledge of basic ecology (see also elective field study subjects 91370 and 91375.) The aim of the subject is to broaden the student's understanding of environmental biology and its management applications by demonstration and experimentation outside the Sydney Basin. The student will be introduced by demonstration and experimentation to the ecology of tall forests and mountain areas, the management of mountain forests, the impacts of forestry

operations, and the management of national parks and wilderness areas. Assessment will involve submission of a log book/journal, and a project report or presentation, to be completed after the field excursion.

91372

CLINICAL BACTERIOLOGY AND PARASITOLOGY

12cp; 9hpw

prerequisite: 91331 Microbiology 3

Quantitative methods, reliability studies, automation, data processing and numerical analysis in clinical microbiology. Pathogenic microorganisms: their handling (including safety requirements), cultivation, isolation and relationship to the indigenous flora of man and animals. A detailed study of staphylococci, streptococci, corynebacteria, mycobacteria, neisseria, enteric bacteria, pasteurellae, pseudomonads and spirochaetas. Antibiotics and antibiotic sensitivity testing. Pathogens of veterinary significance. Parasites (protozoa and helminths) of medical and veterinary importance; methods for handling specimens and laboratory diagnosis. Molecular techniques for diagnosis and identification.

91373

APPLIED MYCOLOGY

3cp; 3hpw

corequisite: 91330 Microbiology 2

Introduction to fungal structure and function. Fungal classification. Fungi in bioprocessing, clinical disease, and biodegradation.

91374

TISSUE CULTURE

4cp; 3hpw

prerequisite: 91351 Immunology 1

Theoretical and practical aspects of the cultivation of animal cells and tissues in vitro. Basic principles of culture; establishment of cell lines; adherent and suspension cultures; harvesting and propagation; organ cultures; storage of

cultures; cell fusion; use of cultures to produce and test for specific products; culture dynamics; flow cytometry; mutation and transformation in vitro.

91375

FIELD STUDIES: MARINE SCIENCES

4cp; 3hpw (run over 6-day excursion to Jervis Bay or similar south coast area of NSW, currently offered twice each year in Jan/Feb and July)

This and other electives are normally taken in senior stages of the degree course. It can thus be assumed that students will have a thorough knowledge of basic ecology (see also elective field study subjects 91370 and 91371). The aim of the subject is to broaden the student's understanding of environmental biology and its management applications by demonstration and experimentation outside the Sydney Basin. The student will be introduced by demonstration and experimentation to a variety of marine, estuarine, and littoral ecosystems, and the management principles and practices in each zone.

This excursion is seen as part of the interinstitutional field studies series of the Australian Marine Sciences Consortium (AMSC) which includes 20 member universities in Australia and New Zealand, the Australian Institute of Marine Science, the Australian Defence Force Academy, and the Royal Australian Naval College. Instructors in a range of relevant disciplines come from member institutions, and investigations include chemical, biological, geological and physical oceanography, in addition to the biology of fishes, benthic fauna, plants and sediments.

In accordance with the guidelines for AMSC excursions, UTS supervisors will assess a report submitted on the final day of the field trip.

91376**ENVIRONMENTAL MEASUREMENT***3cp; 3hpw**prerequisites: 91312 Biology 2, 33105 Introductory Biometrics, 91395 Biocomputing*

Measurement and analysis as part of the resource management process. Techniques of estimating population size and density of sedentary organisms; sampling methods, assessments and data analysis in aquatic and terrestrial systems. Techniques for sampling multispecies communities and mobile organisms. Estimations of biomass and productivity. This subject involves an excursion to develop skills of field identification of organisms and measurement techniques, aquatic and terrestrial.

91377**CYTOPATHOLOGY***16cp; 6hpw, for 2 semesters**prerequisites: 91354 Anatomical Pathology, 91355 Haematology I*

Instruction in the interpretation and diagnosis, at the light microscope level, of cell samples from a variety of anatomical sites. Morphologic features of cells in normal states, effects of inflammation, physiologic patterns, hormonal effects, changes due to specific organisms and viruses, premalignant and malignant conditions and the effects of treatments on cell morphology and smear patterns. Throughout the first semester the emphasis is on samples from the female genital tract. The second semester provides instruction on cell samples from the respiratory tract, alimentary tract, urinary tract, serous cavities, central nervous system, breast and thyroid with emphasis on fine needle aspiration samples. Principles and procedures of specimen collection, preparation and staining, reporting methodology and laboratory procedures are covered. Epidemiologic and aetiologic factors in premalignant and malignant diseases and special procedures which complement cytopathologic diagnosis are included.

91379**ENVIRONMENTAL SCIENCE FOR ENGINEERS***4cp; 3hpw**equivalent to 91380*

This is an introductory biological science elective subject available only to students who are currently enrolled in an undergraduate degree with the Faculty of Engineering. Content is as for 91380 Concepts in Environmental Science.

91380**CONCEPTS IN ENVIRONMENTAL SCIENCE***3cp; 3hpw*

This subject is available only to students who are not currently enrolled in an undergraduate degree within the biological and biomedical sciences or Faculty of Engineering.

This subject provides an introduction to major principles of biological science, particularly in the field of ecology. The biosphere – a complexly balanced system involving the cycling of materials and continuous flow of energy; and the increased impacts on the biosphere of science, technology, industrialisation and population pressures.

91382**INTRODUCTION TO BIOLOGICAL FLUIDS***3cp; 2hpw**prerequisites: 65401 Analytical Chemistry I, 65557 Forensic Toxicology I**corequisite: 65657 Forensic Toxicology 2*
subject coordinator: Associate Professor A Dawson

This is an introductory subject on the chemistry and biochemistry of biological fluids. Topics will include DNA profiling, blood analysis/grouping, examination of fluids such as sweat, semen, saliva.

91383**CLINICAL MYCOLOGY***4cp; 3hpw**prerequisite: 91330 Microbiology 2 restricted to those students who have not previously completed 91373 Applied Mycology*

This is an elective subject which has the same content as 91373 but with an added assignment requirement. Each student will undertake a literature project related to his/her clinical mycology.

91388**CONCEPTS IN BIOLOGY***6cp; 6hpw*

This is an elective subject available to students from Physical Sciences and from other faculties. The subject is designed as a one-semester introductory course in biology, suitable as an elective subject for students in Physical Sciences, providing an introduction to the major principles of biological science, and the importance of this branch of science in a world of advanced technology. Life exists in general on three planes of organisation: cell, organism and population. Life is self-perpetuating, diverse and evolving. The biosphere represents a complexly balanced system involving a cycling of materials and a continuous flow of energy. Science, technology, industrialisation and population pressures are all having increasing impacts on the biosphere.

91395**BIOCOMPUTING***3cp; 3hpw**prerequisite: 33103 Statistics for Life Sciences or 91201 Horticultural Experimentation*

Introduction to computers and programs in the biological sciences. Analysis of the operation of computer systems with emphasis on principles of hardware architecture, operating systems, editors and file management. Comparison of various types of computers, IBM PC, Macintosh, mainframe, and various

software packages available for the biological and biomedical sciences.

91396**ADVANCED BIOCOMPUTING***4cp; 3hpw**prerequisite: 91395 Biocomputing*

Computer programming techniques with emphasis on structured programming using Pascal. Problem analysis and development of solution structures. Writing and verifying programs.

91398**SPECIAL READING ASSIGNMENT – LIFE SCIENCES***4cp*

To be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff regarding individual supervision and, in addition, requires special permission of the Associate Dean.

91399**INDIVIDUAL PROJECT – LIFE SCIENCES***8cp*

To be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff regarding individual supervision and, in addition, requires special permission of the Associate Dean.

91601**ANATOMY AND PHYSIOLOGY 1***6cp; 6hpw*

This subject is designed to develop an understanding of the structure and function of the human body from a biomedical perspective. It also encompasses the fundamental physical and chemical principles required for the understanding of physiological processes.

91602**ANATOMY AND PHYSIOLOGY 2***6cp; 6hpw**prerequisite: 91601 Anatomy and Physiology 1*

This subject continues the study of the major body systems and further develops knowledge of the structure and function of the human body by introducing the concept of biochemical regulatory processes important in health.

91603**ANATOMY AND PHYSIOLOGY 3***4cp; 4hpw**prerequisite: 91602 Anatomy and Physiology 2*

This subject is designed to complete the survey of the major body systems and further develop knowledge of the structure and function of the human body by introducing the concept of the immune system and neuro-endocrine control system important in health. This subject underpins the student's understanding of those systems that are considered, on the basis of current research, as major contributors to the therapeutic 'acupuncture effect'.

91604**INTRODUCTORY PHARMACOLOGY AND MICROBIOLOGY***4cp; 4hpw**prerequisite: 91603 Anatomy and Physiology 3*

This subject provides the Acupuncture student with an insight into the action of therapeutic chemicals and their toxicity. It enables the future practitioner to understand why certain drugs have been prescribed and to recognise when the patient's signs and symptoms are due to medication rather than to the central disorder.

91605**PATHOPHYSIOLOGY***4cp; 4hpw**prerequisites: 91603 Anatomy and Physiology 3 and 91604 Introductory Pharmacology and Microbiology*

This subject is designed to develop an understanding of the physiological and pathological responses of the human body to a variety of adaptive and maladaptive conditions. The student will gain an understanding of how the responses of cells, tissues and organ systems are affected by various stimuli and how such effects influence overall body function.

91607**RESEARCH METHODS 1***4cp; 4hpw*

This subject is an introduction to the scientific method and its importance to the acupuncture profession. It deals with basic research issues: theories and models; independent, dependent and confounding variables; and the influence of the placebo effect. It also examines the philosophical basis of positivist, empiricist and analytical approaches to scientific endeavours.

91608**RESEARCH METHODS 2***4cp; 4hpw**prerequisite: 91607 Research Methods 1*

This subject builds on material provided in the Research Methods 1. It enables the student to have a solid grasp of the research process in health sciences and encourages research into acupuncture. As such, it is an important foundation for students in undertaking an Independent Research Project.

91997**PROFESSIONAL EXPERIENCE
(BIOL/BIOM) F/T**

Part-time students employed full time in an area relevant to their course, should enrol in this subject in **every** semester for which they are employed.

Note: While such enrolment will be listed on the academic record to indicate employment while studying Professional Experience subjects do not incur a HECS liability.

91999**PROFESSIONAL EXPERIENCE
(BIOL/BIOM) P/T**

All full-time students employed part time in an area relevant to their course should enrol in this subject in **every** semester for which they are employed.

Note: While such enrolment will be listed on your academic record to indicate your employment while studying Professional Experience subjects do not incur a HECS liability.

99501**INTRODUCTION TO
ACUPUNCTURE, CHANNEL, POINT
AND ORGAN PHYSIOLOGY**

5cp; 5hpw

corequisite: 99502 Theoretical and Philosophical Foundations of Traditional Acupuncture

An introduction to the basic theoretical concepts of traditional acupuncture that provides an overview of the program and helps to bridge the gulf between the Biomedical and the traditional Chinese approach to health. The subject offers foundation knowledge and skills for the practice of acupuncture. It provides the traditional physiology of the 12 organs and 14 major channels. Point function is considered in preparation for the material in Point Location 1, providing an overall view of the organ/channel functions and their relationship to health.

99502**THEORETICAL AND
PHILOSOPHICAL FOUNDATIONS OF
TRADITIONAL ACUPUNCTURE**

6cp; 6hpw

The theoretical and philosophical components of the subject have a continuing and progressive application in all aspects of acupuncture. This subject provides a broad foundation for the traditional Chinese medical view of health, disease aetiology and diagnostic systems, and principles of treatment which will be built upon throughout the training program. Pulse diagnosis, one of the cornerstones of the traditional Chinese diagnostic system, is included in this subject.

99503**CLINICAL THEORY, PRACTICE
AND OBSERVATION OF CLINICAL
ACUPUNCTURE AND CLINIC –
LEVEL 1**

3cp; Workshop and clinical observation sessions: 2hpw; Clinical Assistant Level 1: 15 hours

corequisite: 99501 Introduction to Acupuncture, Channel, Point and Organ Physiology

Approximately 20 per cent of the undergraduate training program is devoted to gaining clinical experience in preparation for becoming a qualified acupuncture practitioner. This module acquaints the student with essential skills and requirements for patient care in the practice of acupuncture. It then places the student in a working clinic as an assistant with duties appropriate to his/her level of training.

99504**THE PHYSIOLOGY OF ENERGY AND
ITS PATHWAYS**

3cp; 3hpw

prerequisites: 99501 Introduction to Acupuncture, Channel, Point and Organ Physiology, 99502 Theoretical and Philosophical Foundations of Traditional Acupuncture

This subject extends the students' knowledge of the *jing luo* (channel) system in relation to the clinical practice

of acupuncture. It also provides an understanding, not only of how to balance energy, but also of the mechanisms of energy production and methods of assisting this system of production – important aspects of preventative therapy.

99505

POINT LOCATION 1 AND ACUPRESSURE WORKSHOPS

5cp; 5hpw

prerequisites: all units of Stage 1
corequisite: 99504 The Physiology of Energy and its Pathways

This subject deals with the location, depth, action, special precautions and contra-indications, from both an anatomical and traditional acupuncture viewpoint, of the major acupuncture points that will be used in clinical practice. This module complements the knowledge of point function provided in Introduction to Acupuncture, Channel, Point and Organ Physiology and The Physiology of Energy and its Pathways. Practical experience is provided by the introduction of acupressure and non-invasive treatment techniques.

99506

NEEDLE AND MOXIBUSTION TECHNIQUES AND CLINIC – LEVEL 2

3cp; Workshops: 2hpw; Clinical Assistant Level 2: 15 hours

prerequisites: all units of Stage 1
corequisites: 91602 Anatomy and Physiology 2 and 99504 The Physiology of Energy and its Pathways

Practicums in the basic therapeutic skills of needle insertion and manipulation, moxibustion and allied therapeutic techniques that are essential skills for an acupuncture practitioner. Clinical training is provided through the clinical program of the College of Acupuncture.

99508

CHINESE DIAGNOSTIC SYSTEM AND ADVANCED PULSE DIAGNOSIS

6cp; 6hpw

prerequisites: 99501 Introduction to Acupuncture, Channel, Point and Organ Physiology, 99502 Theoretical and Philosophical Foundations of Traditional Acupuncture
corequisite: 99509 Special Points and Systems

This subject provides a deeper understanding of the objectives, applications and therapeutic conclusions inherent in the traditional Chinese diagnostic system. It provides practical workshops in advanced pulse diagnosis which complement the theoretical work being offered in Special Points and Systems.

99509

SPECIAL POINTS AND SYSTEMS

5cp; 5hpw

prerequisites: 99501 Introduction to Acupuncture, Channel, Point and Organ Physiology, 99502 Theoretical and Philosophical Foundations of Traditional Acupuncture
corequisites: 99508 Chinese Diagnostic System and Advanced Pulse Diagnosis, 99510 Introduction to Chinese Massage, Point Location 2 and Clinic – Level 3

This subject examines the functions of categories of acupuncture points and the use of these points in various theoretical perspectives. In particular the six division, triple heater and four radical theories are studied in the context of disease progression through body levels. The eight extra and antique point systems provide additional perspectives from which to view health, illness and the flow of *qi*.

99510**INTRODUCTION TO CHINESE MASSAGE (TUINA), POINT LOCATION 2 AND CLINIC – LEVEL 3**

5cp; Workshops: 4hpw; Clinical Assistant Level 3: 20 hours

prerequisites: all units of Stage 2

corequisites: 91603 Anatomy and Physiology 3, 99508 Chinese Diagnostic System and Advanced Pulse Diagnosis, 99509 Special Points and Systems

Introduction to Chinese Massage (tuina): This module combines the acupressure techniques with general Chinese massage (*tuina*) techniques. It enables the student to assist the practitioner in the clinical situation where specific massage is required after the removal of needles to increase the effectiveness of acupuncture treatment.

Point Location 2: This module revises work undertaken in Point Location 1 and complements the knowledge of point function provided in Special Points and Systems. Clinical training is continued through the clinical program of the College of Acupuncture.

99511**HISTORICAL AND ADVANCED THEORETICAL FOUNDATIONS OF ACUPUNCTURE**

6cp; 6hpw

prerequisites: 99508 Chinese Diagnostic System and Advanced Pulse Diagnosis, 99509 Special Points and Systems

corequisite: 99512 Advanced Chinese Diagnosis

This subject studies the theoretical structure of Traditional Chinese Medicine and its influence upon the holistic approach to healing and preventative therapy. It focuses on the classical literature of Chinese Medicine and some of the more complex theories arising from it.

99512**ADVANCED CHINESE DIAGNOSIS**

7cp; 7hpw

prerequisite: 99508 Chinese Diagnostic System and Advanced Pulse Diagnosis

corequisite: 99511 Historical and Advanced Theoretical Foundations of Acupuncture

This subject contributes a large component of the essential skills and knowledge that are required for traditional Chinese diagnosis. The lectures and workshops underpin not only the clinical experiences of the student, but also the differentiation of disease states when biomedical and Chinese medical systems are integrated.

99513**POINT LOCATION 3 AND CLINIC – LEVEL 4**

4cp; Workshops: 2hpw; Clinical Assistant Level 4: 35 hours

prerequisites: all units of Stage 3

corequisites: 91604 Introductory Pharmacology and Microbiology, 99511 Historical and Advanced Theoretical Foundations of Acupuncture, 99512 Advanced Chinese Diagnosis

This module revisits and extends the students' knowledge of acupuncture point location as well as complementing the knowledge of point function provided in the subject Advanced Chinese Diagnosis. Clinical training is continued through the clinical program of the College of Acupuncture.

99514**MICROSYSTEMS AND SPECIAL METHODS OF TREATMENT**

5cp; 5hpw

prerequisite: 99512 Advanced Chinese Diagnosis
corequisite: 99516 Advanced Needle Technique with Ex-channel Point Location and Clinic – Level 5

The theoretical information provided by the subject is applied and practised in the subject workshops on Advanced Needle Technique with Ex-channel Point Location. Much of the information contained in these units is applicable to the treatment of sports injuries, pain

control and paralysis. A preparatory research proposal is undertaken at this stage as a forerunner to the Independent Research Project.

99515

ADVANCED CHINESE MASSAGE (TUINA)

3cp; 3hpw

prerequisite: 99510 Introduction to Chinese Massage, Point Location 2 and Clinic – Level 3

The subject combines the acupressure, massage and movement techniques of Chinese massage into an integrated treatment approach. This provides the student with a therapeutic approach which can be applied as an alternative or in addition to acupuncture.

99516

ADVANCED NEEDLE TECHNIQUE AND EX-CHANNEL POINT LOCATION AND CLINIC – LEVEL 5

5cp; Workshops: 4hpw; Clinical Assistant Level 5: 35 hours

prerequisites: all units of Stage 4

corequisites: 91605 Pathophysiology, 99514 Microsystems and Special Methods of Treatment, 99518 Clinical Features of Disease

This subject provides practical experience in the application of information provided in the subject Microsystems and Special Methods of Treatment and serves to integrate theory and manual skills. A fully qualified acupuncture practitioner is expected to have a thorough understanding of the microsystems that are used to reinforce the efficacy of traditional acupuncture, or when the normal application of needles is not indicated. Clinical training is continued through the clinical program of the College of Acupuncture.

99517

INDEPENDENT RESEARCH PROJECT WORKSHOPS

3cp; 2hpw

prerequisite: 91608 Research Methods 2

These workshops are designed to assist the student to bridge the gap between reflection on desirable areas of research

and the submission of concrete proposals. The workshops provide an atmosphere that encourages discussion and the development of specific aims and objectives. Supervisors will guide the student through the development of his/her research to its completion.

99518

CLINICAL FEATURES OF DISEASE

4cp; 4hpw

corequisite: 91605 Pathophysiology

This subject builds on the theoretical material offered in Pathophysiology. It also develops the student's ability to differentiate, in an acupuncture clinical setting, those conditions that should be referred to a medical practitioner or other health care professional.

99519

ADVANCED ACUPUNCTURE PRINCIPLES

4cp; 4hpw

prerequisites: all units of Stage 5

This subject ensures the integration of all theoretical aspects of training in clinical application. Before students enter the internship program in the outpatient clinic of the College of Acupuncture, they must satisfy the College of their ability to provide safe, responsible health care under the supervision of qualified practitioners.

99520

DISEASE STATES 1 AND 2

8cp; 8hpw

prerequisites: all units of Stage 5

corequisites: 99519 Advanced Acupuncture Principles, 99521 Combined Acupuncture Therapy and Diagnostic Practice

This subject moves the emphasis from the 'learning' of acupuncture to the clinical practice of acupuncture. After determining that acupuncture is appropriate to the patient's condition, the student must then differentiate the pattern of disharmony as identified in Traditional Chinese Medicine, decide on the treatment principle and devise a course of treatment.

Disease States 1: paralysis (*wei* syndrome); neurological disorders; lumbar and back pain; disorders of neck and shoulders; disorders of elbow, wrist and hand; disorders of the leg, knee and foot; arthritis and rheumatism (*bi* syndrome); sports enhancement, scar treatment, analgesia and anaesthesia.

Disease States 2: gastro-intestinal tract; cardiovascular disorders; hypertension; renal and urinary disorders; disorders of the male reproductive system; headache; addictions, emergency acupuncture; gynaecology; obstetrics; paediatrics; weight management; cosmetic acupuncture.

99521

COMBINED ACUPUNCTURE THERAPY AND DIAGNOSTIC PRACTICE

5cp; 5hpw

*prerequisites: all units of Stage 5
corequisites: 99519 Advanced Acupuncture Principles, 99520 Disease States 1 and 2*

In the fourth year of training the student will be responsible for patient care, treatment and clinical management under the supervision of a practitioner. This subject prepares the student for this increased degree of clinical responsibility, as well as integrating material and skills previously studied.

99522

CLINICAL THEORY (OUTPATIENT CLINIC) AND CLINIC – LEVEL 6

*4cp; Workshops and planning sessions: 2hpw;
Clinical Assistant Level 6: 35 hours*

*prerequisites: all units of Stage 5
corequisites: 99519 Advanced Acupuncture Principles, 99520 Disease States 1 and 2, 99521 Combined Acupuncture Therapy and Diagnostic Practice*

This module builds on the first three years of theoretical, practical and clinical training and acquaints the student with skills and duties required by a 'student-practitioner' working in the University's outpatient clinic. Clinical training is continued through the clinical program of the College of Acupuncture.

99523

DISEASE STATES 3

4cp; 4hpw

prerequisites: 99519 Advanced Acupuncture Principles, 99521 Combined Acupuncture Therapy and Diagnostic Practice

This subject develops wider skills in patient/practitioner communication and examines the following conditions: eye disorders; ear, nose and throat disorders; skin disorders; neurological disorders; gastro-intestinal disorders; hepatic and related disorders; respiratory disorders; psychological disorders; major and minor infectious diseases; prevention and treatment of recurring conditions including allergies; and the enhancement of the immune system.

99524

SPECIALIST TOPICS (INTERMODAL AND PROFESSIONAL)

4cp; 4hpw

prerequisites: 99519 Advanced Acupuncture Principles, 99521 Combined Acupuncture Therapy and Diagnostic Practice

This subject acquaints the student with the current requirements of private acupuncture practice and additional areas of clinical practice. Workshops are provided in: electro-acupuncture, laser-acupuncture, current research, bioethics and professional issues. This subject also encourages students to see themselves as part of the health care profession. Inter-modality exchange is encouraged by lectures from visiting specialists in areas such as osteopathy, physiotherapy and veterinary acupuncture.

99525

SUPERVISED PRACTICE (OUTPATIENT CLINIC)

12cp; 2 semesters; 250 hours of supervised clinical practice and completion of 20 case histories

prerequisites: satisfactory completion of all Stage 1–6 course components

The student experiences the full range of practitioner responsibilities under the supervision of a staff member. This area

of training is accomplished in the out-patient clinics of the College of Acupuncture which provide low cost acupuncture services to the general public.

99526

INDEPENDENT RESEARCH PROJECT

13cp; 2 semesters

prerequisites: 91608 Research Methods 2, 99517 Independent Research Project Workshops

This is an area of self-directed study. The research project provides the student with the opportunity to extend knowledge and establish a foundation for the development of future research and research reporting skills.

99527

HOSPITAL TRAINING IN CHINA

1 month of hospital internship at Guangzhou College of Traditional Chinese Medicine, People's Republic of China

6cp

prerequisite: completion of coursework for the Bachelor of Health Science in Acupuncture

To experience first-hand the full acceptance of acupuncture within the cultural and medical framework of China increases the self-confidence of the student. After an initial introduction and briefing period, students enter the affiliated hospital system of the College of Acupuncture under the direction of the doctor in charge of the acupuncture out-patients' department.

99528

AN INTRODUCTION TO TAI QI CHUAN

The exercise system of Traditional Chinese Medicine

3cp; 3hpw

Tai Qi Chuan is one of the physical therapies of Traditional Chinese Medicine. This elective subject introduces basic forms of these rhythmic exercises which aim to increase health and well-being. Together *qi gong* and *tai qi*

subjects provide a traditional method for maintaining health.

99529

A SYSTEMS VIEW OF LIFE

The New Physics and Traditional Chinese Medicine

3cp; 3hpw

Concepts of Traditional Chinese Medicine that stem from a holistic world view differ from the fragmented and mechanistic view that has dominated European thought for the past 300 years. This elective subject offers an encompassing conceptual model for all sciences and a bridge between differing world views.

99530

PHILOSOPHY, RELIGION AND CULTURE

Their impact on health in a modern European society and China

3cp; 3hpw

prerequisite: 99502 Theoretical and Philosophical Foundations of Traditional Acupuncture

This elective subject widens the future practitioners' concepts of health and health care attitudes among their own cultural group and that of other cultural groups. Two societies are examined: multicultural Australia and modern China.

99531

THE SUBTLE DIMENSIONS OF HEALING

Music, colour and aroma

3cp; 3hpw

In the ancient texts acupuncture therapy was linked with a range of other factors bearing on health care, such as music and aroma. This elective introduces some of these areas which can subsequently be explored as personal interest determines. It contributes to professional competency by extending the student's ability to identify and work with interrelated dimensions of the healing process.

99532**SOCIAL CRISIS**

Evaluating community resources and their role in acupuncture health care

3cp; 3hpw

prerequisite: 92167 Foundations of Helping and Caring

This elective subject is designed to make the acupuncture student aware of the implications of various types of crisis situations they may encounter in practice, and the impact such events may have on patients and their families. This subject identifies community resources and informs the student of what happens after referral.

99533**ACUPUNCTURE HEALTH POLITICS IN AUSTRALIA**

Their impact on professional development

3cp; 3hpw

As part of the elective program this subject widens understanding of attitudes and health care politics among various professional groups, including acupuncturists. Acupuncture has formed a part of the wide consumer and health care challenge to orthodox medicine, both in Australia and overseas, and future practitioners should understand the issues and the role of the acupuncture profession in this process.

99535**NUTRITION IN A TRADITIONAL CHINESE MEDICAL CONTEXT**

3cp; 3hpw

This elective subject is designed to assist in the clinical practice of acupuncture in the Australian social setting by equipping the future practitioner with the necessary skills to advise patients on the appropriate use of vitamins, minerals,

foods and diets. It builds on the concepts of food therapy that are a basic aspect of the concordances of Traditional Chinese Medicine.

99536**FIRST AID**

St John's Ambulance course or approved training organisation

no cp

It is required that all students hold a current senior certificate in first aid, or equivalent qualification, before undertaking an internship in a clinic of the College of Acupuncture as a 'student-practitioner'.

99543**QI GONG: ITS USE IN ACUPUNCTURE**

The system of breathing exercises of Traditional Chinese Medicine

3cp; 3hpw

Qi gong is an ancient aspect of health care in traditional Chinese medicine that is re-emerging in China as a major part of the practitioner's own health care regime. This elective subject introduces *qi gong* breathing and concentration which calms the mind and aids in the restoration of health. The use of *qi gong* by the practitioner is also reputed to increase the effectiveness of *tuina* (Chinese massage).

POSTGRADUATE COURSES

GENERAL INFORMATION

The Faculty offers both PhD and Master's programs by research and thesis. There are also a number of Master's by coursework, Graduate Diplomas and Graduate Certificate programs. Brief outlines of the programs are provided below. Prospective students should discuss possible topics of research with the Head of the appropriate Department in the first instance. For further formal information, they should consult the Postgraduate Studies information booklet and individual brochures.

EXTERNAL SUPERVISION

The research programs may be carried out on either a full-time or part-time basis and it is permissible for part-time students to undertake a portion of their research at a site external to UTS, provided an appropriate external supervisor can be appointed. Students applying for the part-time study mode with external supervision are required to show, prior to enrolment, that appropriate supervision, research support and facilities are available. These requirements are in addition to the normal requirement of internal supervision of an agreed research topic.

FEES AND HIGHER EDUCATION CONTRIBUTION SCHEME

Higher Education Contribution Scheme (HECS) will normally apply to all students enrolled in postgraduate courses. At the discretion of the Vice-Chancellor, HECS scholarships have, in recent years, been granted to students enrolled in research degrees. All enrolled students are required to pay the compulsory University Union and Students' Association charges on enrolment.

POSTGRADUATE SCHOLARSHIPS

A number of scholarships are available to postgraduate students undertaking Master's and Doctoral programs both by coursework and research. The Department of Employment, Education

and Training (DEET) currently funds research, coursework and overseas research postgraduate awards. Information regarding eligibility criteria and how to apply for these scholarships is available from the Postgraduate Studies and Scholarships Office, City campus of UTS. Closing dates for these scholarships have, in recent years, been in late September/October of the year prior to award.

GRADUATE CERTIFICATE COURSES

The Faculty offers the following Graduate Certificate programs :

Graduate Certificates in Biomedical Technology

- Computer Data Acquisition in the Life Sciences
- Data Processing and Management in the Life Sciences
- Electronics and Computing in the Life Sciences
- Human Biology
- Medical Instrumentation and Measurement
- Physics in Medicine

*Graduate Certificates in Coastal Resource Management*¹

- Coastal Resource Management
- Coastal Zone Law and Economics

*Graduate Certificate in Environmental Engineering and Management*¹

*Graduate Certificates in Environmental Toxicology and Ecotoxicology*²

- Principles of Environmental Toxicology
- Ecotoxicology

Graduate Certificates in Occupational Health and Safety

- Occupational Health and Safety
- Occupational Health and Safety Management

¹ Interdisciplinary course run by the Faculty of Science in collaboration with the Faculties of Engineering, Business, Law and Legal Practice, and Design, Architecture and Building.

² In collaboration with the NSW Environment Protection Authority.

Graduate Certificate courses will normally consist of two or three subjects offered over one semester for up to nine hours per week. Offered at the post-graduate level, they allow professionals to undertake a specific group of work-related subjects in order to enhance their knowledge in the rapidly expanding fields of science and technology.

ATTENDANCE

Each certificate course normally involves nine hours of attendance at UTS per week – one afternoon and two evenings – over one semester.

COURSE FEES

Course fees will apply for all Graduate Certificate courses. Postgraduate students are also required to pay the student services charge on enrolment. The Graduate Certificate fee-paying courses are designed for students who do not wish to undertake a Master's degree and/or have been unable to gain entry into the Master's degree program. Students who have completed a Graduate Certificate and have achieved a high level of academic performance in the course may apply for entry to an appropriate Master's degree program. Such application will be considered subject to vacancies.

Graduate Certificates in Biomedical Technology

Course Coordinator: Associate Professor L K Holley

Graduate Certificates in Biomedical Technology are specifically designed as intensive training programs for professionals working in the areas of medical instrumentation and clinical measurement.

ADMISSION REQUIREMENTS

These courses are offered to graduates from the physical or biological sciences, engineering or medicine, with appropriate prerequisites. Graduate Certificate courses in Biomedical Technology will be offered in either Autumn or Spring semester and some will be offered in alternate years only.

1. Computer Data Acquisition in the Life Sciences

This certificate is designed to give comprehensive theoretical and practical education in computer hardware and software used in the area of clinical and physiological data acquisition. The program will provide the participant with knowledge and tools to set up and operate the digital acquisition and processing section of a data acquisition laboratory in a physiological setting.

Available in Spring semester – 1995 and odd years

- 91463 Hardware for Clinical Data Acquisition and Control (6cp)
- 91464 Laboratory Biocomputing (5cp)
- 91465 Advanced Programming – Life Sciences (5cp)

2. Data Processing and Management in the Life Sciences

This certificate is designed to provide students with an extensive range of mathematical, statistical, signal processing and image processing skills. These are directly applicable to the analysis of biological systems, diagnostic images, physiological signals and related areas of data processing and analysis in the life sciences.

Available in Autumn semester every year

- 91462 Digital Processing of Signals and Images in Medicine (5cp)
- 91461 Physiological Modelling (5cp)
- 91433 Biostatistics (6cp)

3. Electronics and Computing in the Life Sciences

This certificate is designed to give a foundation education in analogue and digital electronics, accompanied by a suitable treatment of mathematical concepts, and in computer programming as applied to the life sciences. It is suitable for health professionals wishing to enter biomedical instrumentation, clinical measurement and other related fields.

Available in Autumn semester every year

- 91405 Bioelectronics (6cp)
- 91408 Principles of Biocomputing (5cp)
- 91436 Advanced Mathematics in the Life Sciences (5cp)

4. Human Biology

This certificate is designed to give a foundation education in biological processes, and, in particular, the various physiological processes of the human body. It is suitable for scientists and engineers in the areas of biomedical engineering, medical physics or related fields, who wish to branch into biological applications.

Available in Autumn semester every year

- 91493 Biosystems (6cp)
- 91421 Principles of Human Biology (10cp)

5. Medical Instrumentation and Measurement

This certificate is designed to give comprehensive theoretical and practical education in the techniques of monitoring and measuring physiological parameters. Advanced instrumentation techniques, sensors and transducers used in physiological monitoring are taught in this course. The physical principles used to explain the operation and interaction

of the physiological behaviour and the measurement techniques are also covered.

Available in Spring semester – 1996 and even years

- 91437 Advanced Bioinstrumentation (5cp)
- 91438 Biosensors and Transducers (5cp)
- 91439 Physiological Measurement (6cp)

6. Physics in Medicine

This course is designed for professionals in the area of medical physics, radiation protection, organ imaging and other related fields. Extensive theoretical and practical work is carried out in the hospital setting and at the Australian Nuclear Science and Technology Organisation.

Available in Spring semester – 1996 and even years

- 91434 Radiation Protection (5cp)
- 91403 Medical Imaging (6cp)
- 91404 Physics in Medicine (5cp)

Graduate Certificates in Coastal Resource Management

1. Coastal Resource Management

This course is designed to introduce graduates to general concepts and technical and scientific aspects of coastal resource management. The course would be particularly suitable for graduates without a scientific background in their undergraduate degree course e.g. graduates from business or law courses. Science graduates may also be interested to extend their range of expertise, in the context of coastal resource management. This certificate course comprises 12 credit points of part-time study and will be offered in Autumn semester. The subjects undertaken by individual candidates will be drawn from those offered in the first stage of the part-time Master's program, the combination of subjects being determined by a candidate's needs and academic background.

2. Principles of Coastal Zone Law and Economics

This course introduces graduates to the concepts and basic tenets of economics and environmental law as they relate to coastal resource management, and at the same time introduces students to research design and methods. While the last of these helps to bring together the various disciplinary approaches found in an integrated resource management team, it has particular relevance to cost-benefit analysis. In linking these three subjects, an attempt is made to provide future coastal resource managers with the ability to develop achievable and affordable solutions to real problems within an appropriate legal framework. The course would be particularly suitable for graduates in science and engineering who wish to broaden their knowledge of these fields. It would also be suitable for graduates in business and law who wish to extend their expertise in the context of coastal resource management.

This certificate course comprises 12 credit points of part-time study and will be offered in Spring semester. The subjects will be those offered in the second stage of the part-time Master's program.

Graduate Certificate in Environmental Engineering and Management

Environmental engineering and management are high on the political agenda. They also have a high professional priority. The Code of Ethics of the Institution of Engineers, Australia reminds its members that their responsibility '... for the welfare, health and safety of the community shall at all times come before their responsibility to the profession, to sectional or private interest or to other Engineers'. This responsibility applies equally to scientists, town planners and other professionals working in this field. They have a compelling duty to ensure that the adverse effects of development on the total environment are minimised.

This course of four subjects deals with the broad aspects of environmental management relevant to practising professionals in engineering, science, planning, architecture, law, surveying, health and building. Completing the course will develop a background and competency in environmental management.

More specifically, it will develop an awareness of ecological process; a sensitivity to the possible impacts of planned actions on environment, an understanding of the issues related to monitoring and to reducing the impacts of those actions; and professional skills to work as part of an integrated team responsible for environmental planning and management.

DURATION OF COURSE AND ATTENDANCE PATTERNS

This course is offered on a block-release pattern of study. The normal attendance pattern is based on two subjects per semester requiring a minimum of two semesters to complete the course.

The block-release pattern of study currently consists of three sessions per semester. Each session involves three days of full-time attendance covering two subjects per semester.

ADMISSION REQUIREMENTS

The normal educational qualification for admission is a Bachelor's degree in engineering, science, design, architecture, building, surveying or planning. Equivalent qualifications will be considered on their merits.

Provisional admission for graduates from disciplines other than those above will be available provided their education contained an adequate introduction to mathematics and physical sciences. Each application in these categories will be used as a selection criterion if acceptable applications outnumber available places.

Articulation with Master's program: a multidisciplinary Master's degree program for environmental professionals is under active consideration. It is likely that completion of the Graduate Certificate will provide 'advanced standing' in such Master's programs at UTS.

COURSE STRUCTURE

Autumn semester

- 49122 Introduction to Environmental Engineering and Management (6cp)
49121 Environmental Assessment and Planning (6cp)

Spring semester

- 49123 Waste Minimisation and Advances in Pollution Control (6cp)
49124 Urban Water Quality Management (6cp)

Academic enquiries should be directed to the following persons:

Associate Professor K Brown
Department of Applied Biology,
Room GH2.3b, tel: 330 4042

Dr M Dawson
Department of Chemistry,
Room 4/105, tel: 330 1717

Associate Professor S Vigneswaran
School of Civil Engineering,
Room 2/523, tel: 330 2641

Dr J Broadbent
School of Design,
Room 6/610,
tel: 330 8986

Graduate Certificates in Environmental Toxicology and Ecotoxicology

Graduate Certificates in Environmental Toxicology and Ecotoxicology are designed to provide training in specific areas of environmental toxicology.

ADMISSION REQUIREMENTS

Admission to these courses is open to graduates with degrees in biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent disciplines. The student load per semester is 12 credit points. Two Graduate Certificates are offered, each to be completed as one semester of formal coursework.

1. Principles of Environmental Toxicology

Available in Autumn semester
Course Coordinator: Dr R Lim

This Certificate course is designed to provide a foundation education in environmental toxicology and to familiarise the student with biochemical and environmental effects of the various groups of environmentally hazardous chemicals.

91441 Principles of Toxicology (8cp)
and either

91493 Biosystems (4cp)
or

91474 Statistics in Bioscience (4cp)

2. Ecotoxicology

Available in Spring semester
Course Coordinator: Dr R Lim

This Certificate is designed to provide students with skills in experimental design and analysis in natural environmental systems and a sound understanding of toxicity testing in a wide range of organisms.

91440 Experimental Design and Methods (4cp)

91473 Bioassays/Toxicological Testing (8cp)

Graduate Certificates in Occupational Health and Safety

Two Graduate Certificate programs are offered: one in Occupational Health and Safety, and the other in Occupational Health and Safety Management. These programs involve an appropriate selection of subjects from those offered in the Graduate Diploma program, to be completed in two semesters part-time. These Certificate programs are not government-funded and are accordingly offered only on a full-fee basis.

GRADUATE DIPLOMA COURSES

The Faculty offers the following Graduate Diploma programs :

- Clinical Acupuncture
- Clinical Biochemistry
- Coastal Resource Management¹
- Environmental Toxicology²
- Hydrogeology and Groundwater Management
- Medical Microbiology
- Musculo-skeletal Acupuncture
- Occupational Health and Safety

¹ Interdisciplinary course run by the Faculty of Science in collaboration with the Faculties of Engineering, Business, Law and Legal Practice, and Design, Architecture and Building.

² In collaboration with the NSW Environment Protection Authority.

Graduate Diploma in Clinical Acupuncture

The Graduate Diploma in Clinical Acupuncture has been designed in response to the needs of acupuncturists who have undertaken a considerable degree of training through unaccredited acupuncture programs and who now wish to gain access to University programs. The Graduate Diploma is a 'gateway program' which acknowledges prior learning, consolidates knowledge and builds upon the practitioner's theoretical and experiential base.

COURSE CONTENT

The program focuses upon three major areas – biomedical science, acupuncture theory/practice and acupuncture research. A specially tailored biomedical science upgrade relevant to the specific characteristics of acupuncture practice will be offered.

Subjects relating to the theory and practice of acupuncture will involve the students by drawing upon their clinical experience. In relation to specific topics, students will be asked to refine, extend and share their knowledge by way of seminars and workshops.

Students will also study research methodology as it applies to the health sciences and undertake a specific research project under the supervision of the academic staff of the College of Acupuncture.

ADMISSION REQUIREMENTS

As the Graduate Diploma is a gateway program for practicing acupuncturists, applicants will be either overseas- or Australian-trained practitioners. All applicants are required to have at least two years of professional experience and be able to furnish documentation to verify this fact.

Australian-trained practitioners who apply for the course are expected to have completed the equivalent of three years full-time training that has included an adequate education in the theory/practice of acupuncture and appropriate biomedical science subjects such as anatomy, physiology, microbiology, pharmacology, pathophysiology and differential diagnosis.

Overseas applicants are required to have completed an acupuncture training program equivalent to that which is required of Australian trained applicants.

Australian applicants born and trained overseas are expected to:

- a) have completed a program equivalent to that which is required of Australian trained applicants;
- or
- b) hold a medical degree, recognised in their country of origin but not in Australia, and to have practiced acupuncture as their primary modality for at least three years. An interview will be conducted to assure the College that a reasonable level of acupuncture knowledge has been acquired.

All applicants are required to hold a current First Aid Certificate (St John's Ambulance Level II or equivalent).

All applicants are required to meet the University's requirement for English competency.

The Graduate Diploma in Clinical Acupuncture is not government-funded and is accordingly offered only on a full-fee basis.

COURSE STRUCTURE

There are no majors, sub-majors/minors or electives in this program. The course is one year full-time or two years part-time. Initially the course is being offered only on a part-time basis as indicated in the following course outline.

PART-TIME PROGRAM

Semester 1

- 91609 Biomedical Science Upgrade (8cp)
 99544 Clinical Aspects of Acupuncture 1 (6cp)

Semester 2

- 99545 Clinical Aspects of Acupuncture 2 (6cp)
 91607 Research Methods 1 (4cp)

Semester 3

- 91608 Research Methods 2 (4cp)
 99518 Clinical Features of Disease (4cp)
 99546 Clinical Review (3cp)

Semester 4

- 99547 Clinical Aspects of Acupuncture 3 (6cp)
 99537 Independent Research Project (Postgraduate) (7cp)

Graduate Diploma in Clinical Biochemistry

Course Coordinator: Dr J C Swann

This course offers postgraduate education for entry into or advancement in the profession of clinical biochemistry. The entry requirement is a degree in Science or Medicine with an identifiable component of biochemistry. Students will acquire the theoretical knowledge and practical skills in all areas appropriate to the operations of a modern biochemical diagnostics laboratory.

Although there are no employment requirements for admission to the Graduate Diploma course, entry is subject to quota limits, and preference may be given to applicants currently employed in a clinical biochemistry laboratory or related area.

Students are required to successfully complete a minimum of 64 credit points for award. The course is offered on a part-time basis over four semesters, normally involving attendance at UTS for nine hours each week, and normally timetabled over one afternoon and two evenings. The program of study consists of formal lectures, discussion groups, laboratory sessions, seminars and assignment work. In the early stages of the course, students are introduced to analytical aspects of biochemistry and to fundamental areas of clinical biochemistry. Other subjects include the use of computing in the biological and medical sciences, the statistical analysis of data and experimental design, and either case study analysis or aspects of clinical laboratory management. A number of specialised and contemporary areas of clinical biochemistry are surveyed in the advanced clinical biochemistry subjects, and in the final stage students formulate a proposal for a project that could be researched within a clinical biochemistry environment.

Students who have achieved a high level of performance in the first three stages of this course, and whose employment situation will allow the conducting of a suitable research project,

may apply for transfer to the Master's degree program in Clinical Biochemistry.

PART-TIME PROGRAM

Entry to program in 1995 and odd years¹

Stage 1

Autumn semester

- 91408 Principles of Biocomputing (5cp)
- 91410 Principles of Clinical Biochemistry (5cp)
- 91433 Biostatistics (6cp)

Spring semester

- 91411 Biochemical Pathophysiology (6cp)
- 91424 Clinical Biochemistry – Advanced Aspects B (10cp)

Stage 2

Autumn semester

- 91426 Analytical Techniques in Biochemistry (10cp)
and either
- 91419 Case Studies in Clinical Biochemistry (6cp)
or
- 91417 Clinical Laboratory Management (6cp)

Spring semester

- 91423 Clinical Biochemistry – Advanced Aspects A (10cp)
- 91453 Project Proposal (Clinical Biochemistry) (6cp)

Entry to program in 1996 and even years¹

Stage 1

Autumn semester

- 91410 Principles of Clinical Biochemistry (5cp)
- 91426 Analytical Techniques in Biochemistry (10cp)

Spring semester

- 91411 Biochemical Pathophysiology (6cp)
- 91423 Clinical Biochemistry – Advanced Aspects A (10cp)

Stage 2*Autumn semester*

91408 Principles of Biocomputing (5cp)

91433 Biostatistics (6cp)

*and either*91419 Case Studies in Clinical
Biochemistry (6cp)*or*91417 Clinical Laboratory Management
(6cp)*Spring semester*91424 Clinical Biochemistry –
Advanced Aspects B (10cp)91453 Project Proposal (Clinical
Biochemistry) (6cp)¹ Entrants in odd and even years will undertake
slightly different programs.**Notes**

Subjects will be prescribed in the first semester according to the educational background of the entrant.

Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.

A minimum of 64 credit points must be successfully completed for award of the Graduate Diploma.

Graduate Diploma in Coastal Resource Management

Course Coordinator: Associate Professor
K R Brown

The aims of this course are similar in principle but more limited than those of the Master's degree course. Graduates will have completed all the foundation and intermediate subjects to enable them to become competent practitioners at an appropriate level, but they will not have had the opportunity to carry out an individual research project, or to study the advanced aspects of integrated resource management and recreation and tourism management.

The diploma course comprises 48 credit points and will be offered over four semesters of part-time study or equivalent full-time study.

There will be no automatic entry from the diploma to the Master's program. Selection will be based on the individual performance of the student in the course completed, and the availability of places in the in-load Master's program. Such places may be available from year to year, either because of under-enrolment in the Master's course, or by attrition from it.

If a graduate of the diploma gains entry into the Master's course, he or she will be granted advanced standing for the subjects already completed.

FULL-TIME PROGRAM**Stage 1***Autumn semester*

98711 Coastal Resource Policy (4cp)

plus

Coastal Systems (two to three of
the following)

91493 Biosystems (4cp)

98712 Estuarine and Coastal Chemistry
(4cp)

98713 Hydraulics (4cp)

98714 Introductory Coastal Geology
(4cp)

- 98715 Biological Resources and Assessment (8cp)
 98716 Physical Geology of the Coastal Zone (4cp)

Spring semester

- 91477 Research Design and Methods (4cp)
 91478 Economics of Coastal Resources (4cp)
 91479 Coastal Zone Law (4cp)
 98717 Coastal Resource Planning (8cp)
 98718 Pollution Assessment (4cp)

PART-TIME PROGRAM

Stage 1

Autumn semester

- Principles of Coastal Resource Management
 98711 Coastal Resource Policy (4cp)
plus
 Coastal Systems (two to three of the following)
 91493 Biosystems (4cp)
 98712 Estuarine and Coastal Chemistry (4cp)
 98713 Hydraulics (4cp)
 98714 Introductory Coastal Geology (4cp)

Spring semester

- Principles of Coastal Zone Law and Economics
 91477 Research Design and Methods (4cp)
 91478 Economics of Coastal Resources (4cp)
 91479 Coastal Zone Law (4cp)

Stage 2

Autumn semester

- 98715 Biological Resources and Assessment (8cp)
 98716 Physical Geology of the Coastal Zone (4cp)

Spring semester

- 98717 Coastal Resource Planning (8cp)
 98718 Pollution Assessment (4cp)

Graduate Diploma in Environmental Toxicology

Course Coordinator: Dr R Lim

Course fees will apply. Postgraduate students are also required to pay the student services charge on enrolment.

This course provides postgraduate education and training in the developing science of environmental toxicology. It is a discipline which deals with the toxic effects of chemicals in the environment to organisms, communities and ecosystems. Students will acquire the theoretical knowledge and practical skills required of a practising environmental toxicologist. The Graduate Diploma and Graduate Certificate fee-paying courses are designed for students who do not wish to undertake a Master's degree and/or have been unable to gain entry into the Master's degree program.

Admission to the course is open to graduates with degrees in biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent disciplines. Admission to the course will be limited and the selection process may involve personal interviews. The course can be completed in two years (four semesters) of part-time or one year (two semesters) of full-time attendance. Students are required to successfully complete 48 credit points of formal coursework for award. This program consists of formal lectures, discussion groups, laboratory and field studies, seminars, assignments and formal examinations. The course comprises six subjects.

In the first year of the course students are introduced to concepts in mammalian and environmental toxicology, biostatistics, research design, and principles of laboratory toxicity testing. Subjects covered in the second year are biochemical and analytical toxicology, and approaches and methods in field surveillance, fate and management of toxic substances.

Students who have achieved a high level of performance in the course may apply for transfer to the Master's degree program in Environmental Toxicology. Such application will be considered subject to vacancies. This will require the conduct of a suitable research project and submission of a report based on the project undertaken. Projects may be undertaken with industry or government institutions.

FULL-TIME PROGRAM

Stage 1

Autumn semester

91441 Principles of Toxicology (8cp)

91471 Biochemical and Analytical Toxicology (12cp)

and either

91493 Biosystems (4cp)

or

91474 Statistics in Bioscience (4cp)

Spring semester

91472 Field Surveillance, Fate and Management of Toxic Substances (12cp)

91440 Experimental Design and Methods (4cp)

91473 Bioassays/Toxicological Testing (8cp)

PART-TIME PROGRAM

Stage 1

Autumn semester

91441 Principles of Toxicology (8cp)

and either

91493 Biosystems (4cp)

or

91474 Statistics in Bioscience (4cp)

Spring semester

91440 Experimental Design and Methods (4cp)

91473 Bioassays/Toxicological Testing (8cp)

Stage 2

Autumn semester

91471 Biochemical and Analytical Toxicology (12cp)

Spring semester

91472 Field Surveillance, Fate and Management of Toxic Substances (12cp)

Notes

Subjects will be prescribed in the first semester according to the educational background of the entrant.

Each semester normally consists of approximately nine hours per week over one afternoon and two evenings in the part-time mode.

A minimum of 48 credit points must be successfully completed for award of the Graduate Diploma.

Graduate Diploma in Hydrogeology and Groundwater Management

This course is designed for students working in the area of groundwater resource management.

ADMISSION REQUIREMENTS

Applicants should hold a four-year science degree from UTS or an equivalent qualification. Non-science graduates may be admitted to this course if their qualifications are relevant to hydrogeology and groundwater management. Applicants with other qualifications relevant to groundwater resource development may be accepted for admission, subject to approval by the Faculty Board.

ATTENDANCE

The course is offered on a full-time attendance pattern, although students may extend their enrolment over more than one year.

DURATION

The course requires full-time attendance. It has a pattern similar to the Master of Science in Hydrogeology and Groundwater Management. However, the project work of the Spring semester is shorter and requires completion by the end of the teaching semester.

COURSE STRUCTURE

With the exception of Project (15 credit points) and Computing for Groundwater Specialists, all subjects have a credit point value of five, and require three hours per week per semester.

Autumn semester

- 66014 Hydrogeology
- 49550 Computing for Groundwater Specialists¹
- 49555 Groundwater Modelling
- 66015 Hydrogeochemistry
- 49551 Surface Hydrology and Groundwater
Elective 1
Elective 2

Spring semester

- 66022 Groundwater Science Project (GD) F/T
- or*
- 66024 Groundwater Science Project (GD) P/T

Electives

As for Master of Science

¹ This is a non-credit subject available to students whose computing background requires strengthening.

Graduate Diploma in Medical Microbiology

Course Coordinator: Dr I Stevenson

Course fees will apply. Postgraduate students are also required to pay the student services charge on enrolment.

This course offers postgraduate education to graduates in the medical or biological sciences wishing to further a career in medical microbiology or related areas of hospital and medical science, such as diagnostic bacteriology, virology, mycology and parasitology. It is being offered by the Faculty, with support from the Westmead Hospital Centre for Infectious Diseases and Microbiology, and other major Sydney hospitals.

The program can be completed in one-and-a-half years of full-time or in three years of part-time attendance. The formal coursework consists of lectures, tutorials and supervised laboratory work, some of which may be conducted at hospitals or other laboratories in Sydney. Students will undertake assignments and complete formal examinations.

Admission to the course is open to science graduates of approved tertiary institutions where microbiology has been a significant component of the degree, or persons with equivalent qualifications.

PART-TIME PROGRAM

Stage 1

Autumn semester

- 91408 Principles of Biocomputing (5cp)
- 91480 Epidemiology and Disease Control (4cp)
- 91481 Current Topics in Medical Microbiology (3cp)

Spring semester

- 91482 Human Parasitology (5cp)
- 91483 Human Fungal Disease (4cp)
- 91481 Current Topics in Medical Microbiology (3cp)

Stage 2

Autumn semester

- 91485 Human Viral Disease (5cp)
- 91486 Management of the Microbiology Laboratory (4cp)
- 91487 Research Methodology – Medical Microbiology (3cp)

Spring semester

- 91488 Molecular Microbiology – Techniques and Diagnosis (8cp)
- 91490 Research Proposal Design – Medical Microbiology (4cp)

FULL-TIME PROGRAM

Full-time students must complete the requirements of the diploma in one year. The full-time program is simply a combination of the part-time program, taken concurrently. A minimum of 48 credit points must be successfully completed for award of the Graduate Diploma. Upgrade to a Master of Science in Medical Microbiology would be considered on application, following successful completion of the Graduate Diploma.

Graduate Diploma in Musculo-skeletal Acupuncture

The Graduate Diploma in Musculo-skeletal Acupuncture is designed for registered medical practitioners, physiotherapists, chiropractors and osteopaths who have a special interest in the treatment of disorders such as paralysis, spinal and soft tissue pain, arthritis and repetitive strain injury. It also provides for those with an interest in sports medicine and sporting performance enhancement.

COURSE CONTENT

The first half of the course provides the theoretical and philosophical foundations of Traditional Chinese Medicine. These include the physiology of the twelve organs and the fourteen major channels, together with the location and function of points. Special emphasis is given to the organs and channel systems that relate to the treatment of musculo-skeletal disorders and the promotion of general health and wellbeing.

The second half of the course concentrates on providing a full understanding of how musculo-skeletal disorders are diagnosed and treated within the Chinese medical framework. Specialities, including sporting injuries and sporting performance enhancement, are considered and various approaches to treatment evaluated. As a powerful adjunct to traditional acupuncture therapy, training is provided in *tuina* (Chinese massage) and the modern microsystems – ear, head, hand, foot and scalp acupuncture.

ADMISSION REQUIREMENTS

All applicants will be expected to hold an appropriate Australian degree or in the case of chiropractors, osteopaths and physiotherapists, at least a Diploma in their primary professional discipline.

Australian applicants will be required to hold professional registration in their primary modality. They will therefore be a registered: medical practitioner,

physiotherapist, chiropractor or osteopath. There is no requirement for a fixed period of professional experience before course entry. Overseas applicants will be required to hold professional registration in their primary modality in their country of origin.

Applicants who are Australian citizens, born overseas, and who are professionally registered practitioners of the appropriate modalities in their country of origin but are not registered in Australia, will be eligible to enter the course. All applicants will be expected to have competency in English in accord with UTS requirements. This program is not government funded and is accordingly offered only on a full-fee basis.

COURSE STRUCTURE

There are no majors, sub-majors/minors or electives in the program. The course, as indicated in the following program, is initially being offered only on a part-time basis.

PART-TIME PROGRAM

Semester 1

- 99548 Introduction to Traditional Acupuncture Theory (5cp)
- 99549 Point Location (4cp)
- 99550 Research Workshops 1 (3cp)

Semester 2

- 99551 The Chinese Medical Approach to Health and Disease (5cp)
- 99552 The Chinese Model of Qi and its Pathways (4cp)
- 99553 Clinical Practice 1 (3cp)

Semester 3

- 99554 Acupuncture Diagnosis of Musculo-skeletal Disorders (5cp)
- 99555 Therapeutic Techniques and *Tuina* (Chinese massage) (4cp)
- 99556 Research Workshops 2 (3cp)

Semester 4

- 99557 Acupuncture Treatment of Musculo-skeletal Disorders (5cp)
- 99558 Acupuncture Microsystems (4cp)
- 99559 Clinical Practice 2 (3cp)

Graduate Diploma in Occupational Health and Safety

The aim of the course is to provide a graduate program in occupational health and safety which will produce broadly based, practical, occupational health and safety professionals, with the ability to promote and facilitate a preventive approach to occupational health and safety which minimises occupational injuries and diseases.

The behavioural objectives of the course are to enable graduates of the Graduate Diploma in Occupational Health and Safety to:

- influence managers so that occupational health and safety becomes an integral part of day-to-day management;
- manage occupational health and safety services within the context of legislative, regulatory and industrial relations environments;
- recommend practical and appropriate solutions to occupational health and safety problems;
- contribute to improvements in design of plant, processes and equipment, work practices, work organisation and environment, including access for people with disabilities;
- apply their knowledge of the concepts of occupational health and safety to satisfy the needs of people;
- be able to establish systems to recognise, evaluate and control hazards;
- disseminate information and increase awareness of occupational health and safety issues in the workplace;
- understand minimum requirements in order to interpret the intent of legislation and standards;
- be able to collect, analyse and maintain relevant data;
- be able to operate as a sole operator and as a member of a multidisciplinary team;
- coordinate/liase with relevant bodies in occupational health and safety;
- be involved with the rehabilitation of injured workers and the deployment of people with disabilities;
- recognise their own limitations and be aware of and call on other experts when needed;
- recognise the need and be able to maintain the currency of their knowledge.

DURATION

The course is of two years' duration, to be undertaken on a part-time basis, and will require attendance at the University's City campus, Broadway, for eight hours per week. Students will be expected to satisfactorily complete the equivalent of **four two-hour subjects per semester** to complete the course in two years. The subjects will generally be scheduled so that students will attend for four hours on two evenings per week.

ADMISSION REQUIREMENTS

Students in this course could come from a wide variety of educational backgrounds, including the physical sciences, life sciences, health sciences, social science, medicine, engineering, industrial design, architecture, building, commerce, business, law and the humanities. Applicants will in general be required to have a degree in their discipline from a recognised university or college of advanced education in order to satisfy the basic admission requirement.

In this field, however, there are many very experienced people such as occupational health nurses, safety officers and inspectors who for historical reasons do not have a first degree. Applicants in this category are also encouraged to apply. Such applicants would be required to have at least a diploma or certificate in a relevant area together with sound experience in occupational health and safety in a responsible position.

COURSE STRUCTURE

The course has been structured to provide the required basic knowledge and skills for students with different backgrounds. Those students with a technical background are required to do the occupational health subjects in Semesters 2 and 3, whereas those with an essentially non-technical background are required to do the quantitative subjects in these semesters. All other subjects in the course are compulsory.

PART-TIME PROGRAM

Stage 1

Autumn semester

- 69312 Occupational Hazard Analysis (6cp)
 69325 Data Analysis in Occupational Health and Safety (3cp)
 69342 Legal Aspects of Occupational Health and Safety (3cp)

Spring semester

- 69321 Quantitative Assessment and Measurement (3cp)
or
 69322 Occupational Health in the Workplace (3cp)
 69313 Organisational Behaviour and Communication (3cp)
 69323 Human Factors/Ergonomic Design (3cp)
 69331 Building Emergency Control (3cp)

Stage 2

Autumn semester

- 69332 Chemical Safety (OHS) (3cp)
 69333 Construction Safety (3cp)
 69334 Occupational Health Services (3cp)

or

- 69335 People and the Physical Environment (3cp)
 69343 Occupational Health and Safety Management (3cp)

Spring semester

- 69311 Occupational Health and Safety in Society (3cp)
 69324 Biological Hazards and Toxicology (3cp)
 69341 Problem Solving/Risk Management (6cp)

MASTER'S DEGREES (BY COURSEWORK)

The following Master's degrees by coursework are offered:

- Master of Occupational Health and Safety
- Master of Science in Clinical Biochemistry
- Master of Science in Clinical Measurement
- Master of Science in Coastal Resource Management¹
- Master of Science in Environmental Toxicology²
- Master of Science in Hydrogeology and Groundwater Management
- Master of Science in Medical Microbiology
- Master of Science in Medical Physics

¹ Interdisciplinary course run by the Faculty of Science in collaboration with the Faculties of Engineering, Business, Law and Legal Practice, and Design, Architecture and Building.

² In collaboration with the NSW Environment Protection Authority.

ADMISSION REQUIREMENTS AND SELECTION

Candidates may be admitted to the course with either a Bachelor's degree from UTS (or equivalent) or such other general or professional qualifications as will satisfy the Academic Board that the applicant possesses the educational preparation and capacity.

REQUIREMENTS FOR SUBJECT ASSESSMENT AND STUDENT PROGRESSION

Students enrolled for a Master's degree (by coursework) shall have each subject assessed according to the normal Rules of this University. However, there is no allowance for conceded pass.

Students who fail in any two subjects, or any one subject twice, or who fail to submit a Project Report at the specified time, will be seen as making unsatisfactory progress and will have their registration discontinued. Students may

appeal against such discontinuation of registration under Rule 3.4.12 (see the *UTS Student Information Guide*).

CONTINUING UTS STUDENTS

Master's degree (by coursework) students who have previously been enrolled in undergraduate UTS courses in the Faculty shall not enrol in postgraduate subjects which are equivalent to subjects previously undertaken towards an undergraduate degree.

Master of Occupational Health and Safety

Course Coordinator: Dr D Cobbin

This course involves all the coursework requirements of the Graduate Diploma, plus an additional year part-time to undertake a substantial research project in an area of particular interest and/or relevance to the student. Students would normally enrol in the first instance for the Graduate Diploma, and would be permitted to transfer to the Master's program only if they have achieved a credit average or better in the coursework. Students may also be required to undertake specific courses nominated by their project supervisor. This would normally include a course in research methodology.

Persons who already have a Graduate Diploma in Occupational Health and Safety or equivalent from this or another university are able to enter the Master's program with advanced standing. They would normally be required to complete one semester of appropriate coursework at credit level or better before undertaking the two-semester research project.

Master of Science in Clinical Biochemistry

Course Coordinator: Dr J C Swann

The course is available to science and medical graduates with a good background in general biochemistry and is designed mainly for those working in clinical laboratories. It extends their knowledge and professional expertise in the discipline of clinical biochemistry and in the efficient operation of a clinical laboratory. The course also provides an opportunity for research training in clinical biochemistry.

Admission to the course will be limited and the selection process may involve personal interviews. Concurrent employment in a clinical biochemistry laboratory or related area is a normal requirement for admission.

The course is offered on a part-time basis over six semesters, normally involving attendance at UTS for nine hours per week. The program of study consists of formal lectures, discussion groups, laboratory sessions, seminars and a supervised research project. In the early stages of the course, students are introduced to analytical aspects of biochemistry and to fundamental areas of clinical biochemistry. Other subjects include the use of computing in the biological and medical sciences, aspects of laboratory management, the statistical analysis of data and experimental design. Later stages of the course focus on more advanced areas of clinical biochemistry and include case study analysis and the development of problem-solving and consulting skills.

The final third of the course is devoted to a research project involving investigatory or developmental work in an appropriate area of clinical biochemistry. Projects are undertaken in cooperation with the employing laboratories and the results of the work are presented in an oral seminar and in a written report prepared in accordance with the formal requirements laid down by the Faculty.

Students who have already demonstrated their competence in any of the foundation subjects may be offered alternative subjects of equivalent weight.

PART-TIME PROGRAM

Entry to program in 1995 and odd years¹

Stage 1

Autumn semester

- 91408 Principles of Biocomputing (5cp)
 91410 Principles of Clinical Biochemistry (5cp)
 91433 Biostatistics (6cp)

Spring semester

- 91411 Biochemical Pathophysiology (6cp)
 91424 Clinical Biochemistry – Advanced Aspects B (10cp)

Stage 2

Autumn semester

- 91419 Case Studies in Clinical Biochemistry (6cp)
 91426 Analytical Techniques in Biochemistry (10cp)

Spring semester

- 91423 Clinical Biochemistry – Advanced Aspects A (10cp)
 91453 Project Proposal (Clinical Biochemistry) (6cp)

Stage 3

Autumn semester

- 91417 Clinical Laboratory Management (6cp)
 91456 Project 1 (Clinical Biochemistry) (10cp)

Spring semester

- 91459 Project 2 (Clinical Biochemistry) (16cp)

Entry to program in 1996 and even years¹

Stage 1

Autumn semester

- 91410 Principles of Clinical Biochemistry (5cp)

- 91426 Analytical Techniques in Biochemistry (10cp)

Spring semester

- 91411 Biochemical Pathophysiology (6cp)
 91423 Clinical Biochemistry – Advanced Aspects A (10cp)

Stage 2

Autumn semester

- 91408 Principles of Biocomputing (5cp)
 91417 Clinical Laboratory Management (6cp)
 91433 Biostatistics (6cp)

Spring semester

- 91424 Clinical Biochemistry – Advanced Aspects B (10cp)
 91453 Project Proposal (Clinical Biochemistry) (6cp)

Stage 3

Autumn semester

- 91419 Case Studies in Clinical Biochemistry (6cp)
 91456 Project 1 (Clinical Biochemistry) (10cp)

Spring semester

- 91459 Project 2 (Clinical Biochemistry) (16cp)

¹ Entrants in odd and even years will undertake some subjects in a different order.

Notes

Subjects will be prescribed in the first semester according to the educational background of the entrant.

Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings. A minimum of 96 credit points must be successfully completed for award of the degree.

For further information contact:
 The Course Coordinator, Clinical Biochemistry, Dr J C Swann, tel: 330 4064
 fax: 330 4003.

Master of Science in Clinical Measurement

Course Coordinator: Associate Professor
L K Holley

The course offers postgraduate education to graduates in physical or biological science wishing to enter careers in clinical measurement, biomedical engineering and related areas of hospital and medical science such as cardiology, respiratory physiology, neurophysiology, biochemistry and orthopaedics. The program can be completed with two years of full-time or three years of part-time attendance. The part-time pattern normally involves nine hours per week for six semesters. In the first semester most students undertake two appropriate foundation subjects. In the next three semesters six advanced subjects are offered, covering essential knowledge and skills in the area of clinical measurement. The formal coursework consists of lectures, tutorials and supervised laboratory work, some of which may be conducted at teaching hospitals in Sydney. Students will undertake assignments and complete formal examinations. In the final year students undertake a project in an applied field relevant to their interests.

In the full-time attendance pattern students must complete the requirements of the degree in two years. Admission to the course is open to science, engineering and medical graduates of universities and colleges of advanced education, or persons with equivalent qualifications. Basic human anatomy and physiology, or basic electronics and computer programming and mathematics, are normally prerequisites. Foundation subjects are available to those who need extra background in either of these areas.

PART-TIME PROGRAM

Stage 1

Autumn semester

- 91405 Bioelectronics (6cp)
- 91408 Principles of Biocomputing (5cp)
- 91436 Advanced Mathematics in the
Life Sciences (5cp)
- or
- 91493 Biosystems (6cp)

91421 Principles of Human Biology
(10cp)

Spring semester ¹

- 91437 Advanced Bioinstrumentation
(5cp)
- 91438 Biosensors and Transducers (5cp)
- 91439 Physiological Measurement (6cp)

Stage 2

Autumn semester

- 91462 Digital Processing of Signals and
Images in Medicine (5cp)
- 91461 Physiological Modelling (5cp)
- 91433 Biostatistics (6cp)

Spring semester ¹

- 91463 Hardware for Clinical Data
Acquisition and Control (6cp)
- 91464 Laboratory Biocomputing (5cp)
- 91465 Advanced Programming – Life
Sciences (5cp)

Stage 3

Autumn semester

- 91407 Project (Clinical Measurement)
P/T (16cp)

Spring semester

- 91407 Project (Clinical Measurement)
P/T (16cp)

¹ Sets of Spring semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programs.

Notes

Subjects will be prescribed in the first semester according to the educational background of the entrant.

Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.

A minimum of 96 credit points must be successfully completed for award of the degree.

FULL-TIME PROGRAM

Full-time students must complete the requirements of the degree in two years by enrolling in 91406 Project (Clinical Measurement) F/T, in each year. All other subjects are as outlined above for the part-time program.

For further information contact:
The Course Coordinator, Clinical Measurement, Associate Professor L K Holley, tel: 330 4152/4044 fax: 330 4003.

Master of Science in Coastal Resource Management

Course Coordinator: Associate Professor K R Brown

The degree in Coastal Resource Management is a joint enterprise of the Faculties of Science, Engineering and Business, in collaboration with the Faculties of Law and Legal Practice, and Design, Architecture and Building. The course can be completed over three years of part-time study, normally involving attendance on one afternoon and two evenings each week. Associated short courses, based on the various subject modules, and a two-year full-time option for the Master's course are available.

The course is part of the UTS Coastal Resource Management Program, the aims of which are to:

- offer interdisciplinary professional courses for work in industry and government;
- conduct the research needed to improve the management of coastal resources;
- collaborate with industry and government in identifying areas of concern;
- provide consultancy and information resources to industry and government;
- help provide effective solutions to the complex problems of this area of study;
- enhance community awareness and education in this area; and
- develop a centre of expertise in the Pacific region.

The course will enable graduates to enter or develop a career in coastal resource management in commerce, industry, consultancy, or with government agencies, as one of the new generation of environmental managers with:

- an understanding of ecological processes;
- an ability to assess the possible impacts of planned actions on coastal and marine environments;
- a willingness and ability to monitor and reduce the impacts of those actions;
- the professional skills to work in integrated teams for environmental problem solving, planning and management; and
- an ability to manage coastal resources in developing and developed environments.

The course includes field work, site inspections, laboratory procedures and a variety of desk studies. In the final semester students will select and undertake an individual research project, in consultation with an appropriate academic supervisor, in their own area of interest and expertise. The project may be completed on campus or in association with an employer agency. The course equips environmental managers who, as part of a team, can take responsibility for decision making and conflict resolution with respect to coastal resources.

Admission to the course is open to graduates in science, engineering, architecture, building, business, law, or equivalent background. Applicants with general or professional qualifications which satisfy the Academic Board of capacity to pursue graduate studies may also qualify for admission. Entrants may be eligible for exemptions from one or more of the foundation subjects, on the basis of prior qualifications.

PART-TIME PROGRAM

Stage I

Autumn semester

- 98711 Coastal Resource Policy (4cp)
plus
Coastal Systems (two to three of the following)
- 91493 Biosystems (4cp)
98712 Estuarine and Coastal Chemistry (4cp)

- 98713 Hydraulics (4cp)
98714 Introductory Coastal Geology (4cp)

Spring semester

- 91477 Research Design and Methods (4cp) (equiv)
91478 Economics of Coastal Resources (4cp)
91479 Coastal Zone Law (4cp)

Stage 2

Autumn semester

- 98715 Biological Resources and Assessment (8cp)
98716 Physical Geology of the Coastal Zone (4cp)

Spring semester

- 98717 Coastal Resource Planning (8cp)
98718 Pollution Assessment (4cp)

Stage 3

Autumn semester

- 98719 Recreation, Tourism and Natural Resource Management (4cp)
98720 Integrated Coastal Resource Management (8cp)

Spring semester

- 98721 Coastal Resource Project (12cp)

FULL-TIME PROGRAM

Stage 1

Autumn semester

- 98711 Coastal Resource Policy (4cp)
98715 Biological Resources and Assessment (8cp)
98716 Physical Geology of the Coastal Zone (4cp)
Coastal Systems (two to three of the following)
91493 Biosystems (4cp)
98712 Estuarine and Coastal Chemistry (4cp)
98713 Hydraulics (4cp)
98714 Introductory Coastal Geology (4cp)

Spring semester

- 91477 Research Design and Methods (4cp)
91478 Economics of Coastal Resources (4cp)

- 91479 Coastal Zone Law (4cp)
98717 Coastal Resource Planning (8cp)
98718 Pollution Assessment (4cp)

Stage 2

Autumn semester

- 98719 Recreation, Tourism and Natural Resource Management (4cp)
98720 Integrated Coastal Resource Management (8cp)
98721 Coastal Resource Project (12cp)

¹ Advanced standing may be given for up to two of these subjects, depending on background.

Notes

Subjects will be prescribed according to the educational background of the entrant.

Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.

A minimum of 96 credit points must be successfully completed for award of the degree.

For further information contact:

The Course Coordinator, Coastal Resource Management, Associate Professor K R Brown, tel: 330 4042/4393
fax: 330 4079.

Master of Science in Environmental Toxicology

Course Coordinator: Dr R Lim

Environmental toxicology is the science which deals with the toxicity of chemicals in the environment to organisms, communities and ecosystems. A wide range of chemicals is in current use and their toxic effects need to be monitored. New chemicals are constantly being introduced and toxicological data are needed to assess potential hazards.

The course provides relevant postgraduate education and training in the developing science of environmental toxicology and is offered in conjunction with the Centre for Ecotoxicology. This Centre is a joint initiative between the New South Wales Environment Protection Authority and the University, and is housed in Dunbar Building, St Leonards campus.

Admission to the course is open to graduates with degrees in the biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent disciplines. Admission to the course will be limited and the selection process may involve personal interviews.

The course is offered on a full-time or part-time basis. The part-time program normally involves attendance for nine hours per week for a total of six semesters. In the first two years there are six formal subjects which cover the essential knowledge and skills for the practising environmental toxicologist. The formal coursework comprises lectures, tutorials, and supervised laboratory and field work. Students will undertake written assignments and formal examinations. The final year involves a project which enables students to apply their knowledge to problems in environmental toxicology through experimental investigation, extensive critical reviews or other suitable activities. Projects may be undertaken in conjunction with industry or government institutions. All students must complete a report based on the project undertaken. The report must be prepared in accordance with

the formal requirements laid down in the UTS Rules.

In the full-time attendance pattern students must complete the requirements of the degree in one and a half years with the project being completed in the final semester.

OBJECTIVES

The objectives of the course are to train scientific personnel to:

- be familiar with the groups of environmentally hazardous chemicals and their biochemical and environmental effects;
- design and implement toxicological tests on a variety of organisms including invertebrates, fish, mammals and terrestrial and aquatic plants;
- analyse and interpret the results of toxicological tests;
- use techniques of analytical chemistry to determine the nature and level of toxic materials in the environment;
- conduct field surveillance for the effects of toxic substances; and
- assess the risk from toxic chemicals and advise on environmentally sound management procedures.

FULL-TIME PROGRAM

Stage 1

Autumn semester

91441 Principles of Toxicology (8cp)

91471 Biochemical and Analytical Toxicology (12cp)
and either

91493 Biosystems¹ (4cp)

or

91474 Statistics in Bioscience¹ (4cp)

*Spring semester*¹

91472 Field Surveillance, Fate and Management of Toxic Substances (12cp)

91440 Experimental Design and Methods (4cp)

91473 Bioassays/Toxicological Testing (8cp)

Stage 2*Autumn semester*

91476 Environmental Toxicology
Project F/T (24cp)

PART-TIME PROGRAM**Stage 1***Autumn semester*

91441 Principles of Toxicology (8cp)
and either

91493 Biosystems¹ (4cp)
or

91474 Statistics in Bioscience¹ (4cp)

*Spring semester*¹

91440 Experimental Design and
Methods (4cp)

91473 Bioassays/Toxicological Testing
(8cp)

Stage 2*Autumn semester*

91471 Biochemical and Analytical
Toxicology (12cp)

*Spring semester*¹

91472 Field Surveillance, Fate and
Management of Toxic Substances
(12cp)

Stage 3*Autumn semester*

91475 Environmental Toxicology
Project P/T (12cp)

Spring semester

91475 Environmental Toxicology
Project P/T (12cp)

¹ Subjects will be prescribed in the first semester according to the educational background of the entrant.

Notes

Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings. A minimum of 72 credit points must be successfully completed for award of the degree.

For further information contact:
The Course Coordinator, Environmental
Toxicology, Dr R P Lim,
tel: 330 4037/4044 fax: 330 4003.

Master of Science in Hydrogeology and Groundwater Management

This course is designed to enable students to develop specialist skills in the area of groundwater management including aspects of geology, hydrology, hydraulics and resource management. This provides a multidisciplinary perspective to issues of groundwater management. For further information see the National Centre for Groundwater Management entry under Centres and Institutes within the Faculty.

ADMISSION REQUIREMENTS

Applicants must hold a four-year Science degree from UTS or an equivalent qualification and should have a minimum of two years' experience in employment related to the course. Applicants are required to submit a covering letter indicating why they wish to undertake the course, together with the names, telephone numbers and addresses of two professional referees.

ATTENDANCE

The course is offered on the basis of full-time attendance extending over one calendar year.

DURATION

The course requires full-time attendance for a series of lectures and laboratory work during Autumn semester and full-time project work during Spring semester. The time required to complete the project will be approximately 30 weeks, requiring students to continue project work until a satisfactory level of achievement has been attained.

COURSE STRUCTURE

With the exception of Project (30 credit points) and Computing for Groundwater Specialists, all subjects have a credit point value of five, and require three hours per week per semester.

Autumn semester

- 66014 Hydrogeology
 49550 Computing for Groundwater Specialists¹
 49555 Groundwater Modelling
 66015 Hydrogeochemistry
 49551 Surface Hydrology and Groundwater
 Elective 1
 Elective 2

Spring semester

- 66021 Groundwater Science Project (M)
 F/T
or
 66023 Groundwater Science Project (M)
 P/T

Electives

- 49554 Groundwater Computing
 66016 Geophysics and Remote Sensing of Groundwater Resources
 66017 Geopollution Management
 66018 Groundwater Geophysics
 66025 Contaminated Site Management
 An approved subject offered elsewhere

¹ This is a non-credit subject available to students whose computing background requires strengthening.

Master of Science in Medical Microbiology

Course Coordinator: Dr Iain Stevenson

The course offers postgraduate education to graduates in the medical or biological sciences wishing to further a career in medical microbiology or related areas of hospital and medical science, such as diagnostic bacteriology, virology, mycology and parasitology. It is being offered by the Faculty, with support from the Westmead Hospital Centre for Infectious Diseases and Microbiology, and other major Sydney hospitals.

The program can be completed in one-and-a-half years of full-time or in three years of part-time attendance. The formal coursework consists of lectures, tutorials and supervised laboratory work, some of which may be conducted at hospitals or other laboratories in Sydney. Students will undertake assignments and complete formal examinations. The final semester for full-time students, or year for part-time students, involves a project in a field relevant to the student's interests.

Admission to the course is open to science graduates of approved tertiary institutions where microbiology has been a significant component of the degree, or persons with equivalent qualifications.

OBJECTIVES

To provide excellent postgraduate education for microbiology professionals.

Graduates of this course will:

- have a wide perspective and current awareness of individual groups of significant micro-organisms in the diagnostic clinical microbiology laboratory;
- be able to attain competence in the application of state-of-the-art diagnostic methods and procedures in their own laboratories;

- appreciate the constraints inherent in many laboratory diagnostic procedures in microbiology;
- be able to assess and apply new and developing methodologies and technologies in the medical microbiology laboratory;
- be able to access current literature and other informational material rapidly and effectively; and
- have the potential to progress to research or research degree studies in microbiology.

PART-TIME PROGRAM

Stage 1

Autumn semester

- 91408 Principles of Biocomputing (5cp)
 91480 Epidemiology and Disease Control (4cp)
 91481 Current Topics in Medical Microbiology (3cp)

Spring semester

- 91482 Human Parasitology (5cp)
 91483 Human Fungal Disease (4cp)
 91481 Current Topics in Medical Microbiology (3cp)

Stage 2

Autumn semester

- 91485 Human Viral Disease (5cp)
 91486 Management of the Microbiology Laboratory (4cp)
 91487 Research Methodology – Medical Microbiology (3cp)

Spring semester

- 91488 Molecular Microbiology – Techniques and Diagnosis (8cp)
 91490 Research Proposal Design – Medical Microbiology (4cp)

Stage 3

Autumn semester

- 91491 Project – Medical Microbiology P/T (2 sem) (12cp)

Spring semester

- 91491 Project – Medical Microbiology P/T (2 sem) (12cp)

FULL-TIME PROGRAM

Full-time students must complete the requirements of the degree in one and a half years. The full-time degree program is simply a combination of the part-time program, taken concurrently, plus the full-time project subject, 91492 Project – Medical Microbiology F/T (1 sem) (24cp).

COURSE FEES

Course fees will apply. Postgraduate students are also required to pay the Student Services charge on enrolment.

Notes

By prior arrangement, students may be able to complete the research project component of the course at their place of employment, which may be outside Sydney or Australia.

A minimum of 72 credit points must be successfully completed for award of the degree.

For further information contact:
 The Course Coordinator, Medical Microbiology, Dr I Stevenson,
 tel: 330 4154 fax: 330 4003.

Master of Science in Medical Physics

Course Coordinator: Associate Professor L K Holley

The course offers postgraduate education to graduates in the physical sciences wishing to enter a career in medical physics or related areas of hospital and medical science, such as nuclear medicine, radiotherapy, radiology or radiation protection. It is offered by the Faculty with support from members of the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM) and major teaching hospitals.

The program can be completed with two years of full-time or three years of part-time attendance. The part-time pattern normally involves nine hours per week for six semesters. In the first semester most students undertake two appropriate foundation subjects. In the next three semesters six advanced subjects are offered, covering essential knowledge and skills in the area of medical physics. The formal coursework consists of lectures, tutorials and supervised laboratory work, some of which may be conducted at teaching hospitals in Sydney. Students will undertake assignments and complete formal examinations. In the final year students undertake a project in an applied field relevant to their interests.

Admission to the course is open to physical science graduates of universities and colleges of advanced education, or persons with equivalent qualifications. Basic human anatomy and physiology, or basic electronics, computer programming and mathematics, are normally prerequisites. Foundation subjects are available to those who need extra background in either of these areas.

OBJECTIVES

The objectives of the course are to provide students with:

- specialist knowledge in the field of medical physics;

- comprehensive theoretical and practical education in computing;
- hardware and software in clinical and physiological data acquisition;
- extensive range of biomathematical, biostatistical, signal processing and image processing skills;
- skills to conduct and report on an extensive research project; and
- ability to work as an independent, analytical professional in the medical physics environment.

PART-TIME PROGRAM

Stage 1

Autumn semester

- 91493 Biosystems (6cp)
91421 Principles of Human Biology (10cp)

Spring semester ¹

- 91434 Radiation Protection (5cp)
91403 Medical Imaging (6cp)
91404 Physics in Medicine (5cp)

Stage 2

Autumn semester

- 91462 Digital Processing of Signals and Images in Medicine (5cp)
91461 Physiological Modelling (5cp)
91433 Biostatistics (6cp)

Spring semester ¹

- 91463 Hardware for Clinical Data Acquisition and Control (6cp)
91464 Laboratory Biocomputing (5cp)
91465 Advanced Programming – Life Sciences (5cp)

Stage 3

Autumn semester

- 91489 Project (Medical Physics) P/T (16cp)

Spring semester

- 91489 Project (Medical Physics) P/T (16cp)

¹ Sets of Spring semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programs.

Notes

Subjects will be prescribed in the first semester according to the educational background of the entrant.

Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.

A minimum of 96 credit points must be successfully completed for award of the degree.

FULL-TIME PROGRAM

Full-time students must complete the requirements of the degree in two years by enrolling in 91484 Project (Medical Physics) F/T in each year. All other subjects are as outlined above for the part-time program.

For further information contact:
The Course Coordinator, Medical Physics, Associate Professor L K Holley,
tel: 330 4152/4044 fax: 330 4003.

POSTGRADUATE DEGREES BY RESEARCH/THESIS

The Master's and PhD programs are designed for graduates who wish to develop a career in the field of biological and biomedical as well as physical sciences by undertaking an appropriate research investigation under professional supervision.

The broad areas of research expertise within the Faculty are:

- Materials technology
- Image processing and analysis
- Regional and resource geology
- Science education
- Cell and molecular biology
- Biomedical science and engineering
- Environmental biology and toxicology
- Groundwater management
- Biomedical technology
- Forensic and analytical chemistry
- Coastal resource management

Applications are invited for these research programs. Please consult with a

potential academic supervisor or appropriate Head of Department before submitting an application.

For further information about the potential supervisors, please telephone the Science Faculty Office on 330 1687.

ADMISSION TO MASTER'S DEGREE (BY THESIS) PROGRAM

An application for admission to a Master's degree program is accepted subject to the availability of facilities and supervision. The course can be completed in two years of full-time study or over a minimum of three years part-time. Study can be carried out by means of a cooperative arrangement with the candidate's employer. Applicants should hold at least a Bachelor's degree from UTS, or equivalent, or other general or professional qualifications as will satisfy the Academic Board that the applicant possesses the educational preparation and capacity to successfully complete the course.

ADMISSION TO PhD PROGRAM

Applications for the PhD program will be accepted at any time and a decision will be advised following consideration by the relevant research degrees committees. Candidates may be admitted to the program with a Bachelor's degree with First or Second Class Honours Division 1 from UTS, or an appropriate Master's degree from UTS, or an equivalent qualification.

POSTGRADUATE SUBJECT DESCRIPTIONS

44152, 44156

GROUNDWATER ENGINEERING PROJECTS (M) F/T, P/T

30cp

These projects will provide students with the opportunity to research specific engineering groundwater resource or contamination problems. The depth and extent of research will vary with credit points required. Projects include one or more of the following: modelling, laboratory experiments, field work related to hydrogeology and groundwater management, contaminant transport and processes, waste disposal and groundwater impact.

44153, 44157

GROUNDWATER ENGINEERING PROJECTS (GD) F/T, P/T

15cp

As above but at a reduced scale.

49121

ENVIRONMENTAL ASSESSMENT AND PLANNING

6cp; 3hpw

Conserving resources and meeting essential needs; industry, urban, energy futures – the need to reorientate technology; ecology and economics. Environmental law: principles; federal, State and local government responsibilities; environmental impact assessment. The concept of licensing requirements, approval procedures. Environmental economics: social benefit/cost analysis for environmental services, resource pricing, risk assessment; land-use planning. Project planning – environmental aspects.

49122

INTRODUCTION TO ENVIRONMENTAL ENGINEERING AND MANAGEMENT

6cp; 3hpw

Ecological systems and processes; basic ecological principles; bio-geochemical cycles; development of ecosystems; interaction between physical ecosystems; global environment issues such as greenhouse effect, ozone depletion and acid rain. Human impact on ecosystems: population growth; terrestrial ecosystems (forest and agricultural land); aquatic ecosystems (lake, river and ocean). Biodiversity; importance of sustainable development. An overview of major environmental problems; their effect and remedies. Air pollution, noise pollution, water pollution, soil pollution, solid and hazardous wastes. Case studies.

49123

WASTE MINIMISATION AND ADVANCES IN POLLUTION CONTROL

6cp; 3hpw

Environmental auditing of the product life cycle; leading-edge technologies of waste minimisation and pollution control, raw materials extraction and refinement; product development, design and manufacture; product use; product reuse/recycling; solid/hazardous wastes; liquid wastes. Effective management of the product life cycle; institutional barriers to improving the technologies of waste minimisation and pollution control; reviews of advanced technology and management practices adopted in domestic waste pollution control; economic considerations. Case studies: pulp and paper industry, metal plating industry, food and dairy industry, household waste, waste recycling in buildings.

49124 **URBAN WATER QUALITY MANAGEMENT**

6cp; 3hpw

Characteristics of Australian urban water systems: natural features and human infrastructure; benefits and uses of water systems. The sources and nature of major categories of pollutants generated from agricultural, urban and industrial sources; groundwater pollution; beach and coastal pollution; the ecological and public health impacts of pollutants causing siltation. Criteria and designs of monitoring programs; sampling procedures; methods of data analysis; description and modelling of pollution processes. Remedies: regulation of point sources; stormwater and sewer flow controls; groundwater controls etc. Standards, pollution laws, regulatory bodies and responsible organisations (with particular emphasis on New South Wales). Water and wastewater treatment processes.

49550 **COMPUTING FOR GROUNDWATER SPECIALISTS**

3hpw

Note: this subject does not carry academic credit

Provides the computing background needed for students with varying degrees of computer literacy. Topics covered include introduction to FORTRAN programming, mainframe, microcomputer operation systems, databases, spreadsheets, word processing, statistical and graphical packages with applications relating to groundwater processes.

49551 **SURFACE HYDROLOGY AND GROUNDWATER**

5cp; 3hpw

Provides the interface process link between surface hydrology and groundwater. Topics include hydrological cycle, water and energy balances and circulation, precipitation, interception,

infiltration, storm runoff, hydrograph analysis, evaporation and transpiration, surface and groundwater interactions, land use effects, artificial recharge.

49554 **GROUNDWATER COMPUTING**

5cp; 3hpw

Provides a strong computing basis for groundwater management, especially in the area of statistics and graphics as applied to groundwater problems involving computing. Introduction to FORTRAN programming, mainframe, microcomputer operation systems, databases, spreadsheets, word processing, elements of geostatistics and graphical packages with applications related to groundwater processes, groundwater computing project.

49555 **GROUNDWATER MODELLING**

5cp; 3hpw

Provides the computer-modelling tools required for groundwater resource management. Topics include groundwater modelling of porous media, fractured rock and low permeability materials. Analogue, numerical analytical models. Matrix structure and inverse methods, stochastic modelling and characterisation of variability. Modelling multiphase fluids and regional groundwater flow. Applications to borefield management, salt water intrusion, mine dewatering, geotechnical problems.

66014 **HYDROGEOLOGY**

5cp; 3hpw

Provides a knowledge of geological occurrence and hydraulics of groundwater flow, exploration techniques, extraction engineering and field management.

66015**HYDROGEOCHEMISTRY***5cp; 3hpw*

Covers the chemical basis for understanding how the chemistry of groundwater evolves both naturally and in the case of contamination. Both practical field measurement and computer modelling will be covered.

66016**GEOPHYSICS AND REMOTE SENSING OF GROUNDWATER RESOURCES***5cp; 3hpw*

A theoretical and practical examination of the geophysical and remote sensing techniques applicable to groundwater resources evaluation and other environmental problems.

66017**GEPOLLUTION MANAGEMENT***5cp; 3hpw*

The relationship between groundwater contamination and water quality, together with appropriate waste management and disposal methods for minimal environmental impact. Contaminated land issues are also addressed.

66018**GROUNDWATER GEOPHYSICS***5cp; 3hpw*

This subject presents an advanced application of geophysical techniques for groundwater research and resource management, and includes contamination assessment and monitoring.

66021, 66023**GROUNDWATER SCIENCE PROJECTS (M) F/T, P/T***30cp*

These projects will provide students with the opportunity to research specific hydrogeology groundwater resource or

contamination problems. The depth and extent of research will vary with credit points required. Topics include investigation consisting of one or more of: modelling, laboratory experiments, field work related to hydrogeology and groundwater management, contaminant transport and processes, waste disposal and groundwater impact.

66022, 66024**GROUNDWATER SCIENCE PROJECTS (GD) F/T, P/T***15cp*

As above but at a reduced scale.

66025**CONTAMINATED SITE MANAGEMENT***5cp; 3hpw*

To develop an understanding of the methodology and technology used in the assessment and remediation of contaminated sites.

The subject content includes: regulatory requirements, site assessment methodology, physical, chemical and biological properties and behaviour of contaminants, health issues, risk assessment, site assessment technology, remediation techniques and operation.

69311**OCCUPATIONAL HEALTH AND SAFETY IN SOCIETY***3cp; 2hpw*

This subject will cover the psychological, political and sociological dimensions of occupational health and safety, and present them within the context of the overall social system. It will highlight the complexity and diversity of working environments, and the importance of the human agency in constructing and changing them. It will also explore the strategies available to create safer and healthier working situations.

69312**OCCUPATIONAL HAZARD ANALYSIS***6cp; 4hpw*

This subject will deal with the identification of the major categories of both safety and health hazards, the analytical techniques and management programs appropriate for dealing with them and the development of policies in occupational health and safety. Models of accident and disease causation, techniques of investigation, emergency hazards and risk assessment will also be covered.

69313**ORGANISATIONAL BEHAVIOUR AND COMMUNICATION***3cp; 2hpw*

This subject examines the behaviour of people in organisations, and the dynamics of interpersonal and intergroup behaviour. Topics include: interpersonal perception, attitudes and values, motivation, communications, group behaviour, conflicts, leadership, organisation change and adaptation.

69321**QUANTITATIVE ASSESSMENT AND MEASUREMENT***3cp; 2hpw*

Rational decision making in any science-based discipline requires quantitative data, and the ability to critically assess their meaning and accuracy. This subject will deal with the basics of measurement, including the differences between accuracy, precision and repeatability; the characteristics of measurement systems; basic units, derived quantities and performance indices, and will also develop confidence in the use of various types of measuring instruments.

69322**OCCUPATIONAL HEALTH IN THE WORKPLACE***3cp; 2hpw*

The aim of this subject is to develop an understanding of the principles associated with the assessment and maintenance of health in the workplace, including stress adaptation and management. It will include coverage of the principles of health assessment, health promotion and education, assessment of work environment, management of illness in the workplace, disability and rehabilitation, and work factors affecting the worker's family.

69323**HUMAN FACTORS/ERGONOMIC DESIGN***3cp; 2hpw*

The role of ergonomics/human factors in the creation of a healthy, safe and productive work environment will be covered, including the principles and techniques used in this discipline. The subject will include the principles of ergonomic design and their application to product and equipment design to combine safety with functionality.

69324**BIOLOGICAL HAZARDS AND TOXICOLOGY***3cp; 2hpw*

This will be an introduction to biological hazards in the workplace, including allergens in airconditioning systems, legionellosis, infecting disorders, food poisoning, and other job associated risks. It will also discuss the principles of environmental and human toxicology, including toxic gases, dusts and chemicals and test methods, hygiene and sanitation.

69325**DATA ANALYSIS IN
OCCUPATIONAL HEALTH AND
SAFETY***3cp; 2hpw*

The collection and organisation of data, and access to and use of databases are important aspects of the effective management of the occupational health and safety function. This subject will develop understanding and proficiency in these areas with special reference to occupational health and safety and workers' compensation information systems and reference material databases.

69331**BUILDING EMERGENCY CONTROL***3cp; 2hpw*

This subject will develop students' awareness of the various types of emergencies and an understanding of their respective scenarios and possible outcomes. This will provide the basis for the development of management policies and training programs which will ensure safety commensurate with acceptable levels of risk.

69332**CHEMICAL SAFETY (OHS)***3cp; 2hpw*

This subject will deal with the hazardous effects of chemicals on people and the methods of handling and storing chemicals to minimise risks to health and safety.

69333**CONSTRUCTION SAFETY***3cp; 2hpw*

The construction industry continues to be one of the major areas of work-related injury. This subject will discuss all aspects of construction safety, from the design phase of a construction project through to the identification, analysis and management of the specific hazards on a construction site.

69334**OCCUPATIONAL HEALTH
SERVICES***3cp; 2hpw*

This subject will cover the principles underlying the establishment and functioning of an effective occupational health service within an organisation including its role in assessment of the workplace, health assessment, the management of illness and injury and rehabilitation of injured workers.

69335**PEOPLE AND THE PHYSICAL
ENVIRONMENT***3cp; 2hpw*

People have a continuing and dynamic interaction with their physical surroundings, and the processes of this interaction must be understood so that they can be designed for and controlled. The subject will deal with both those interactions which are a part of normal processes, such as noise, vibrations and heat, and those which are random and unplanned events. The first of these can be quantitatively assessed and controlled, whereas the latter requires the application of probability and reliability techniques.

69341**RISK MANAGEMENT***6cp; 4hpw*

This subject introduces the following three aspects of risk, integrating them by use of a case study, supported by audio-visual material and assignments.

1. Risk as an intellectual factor which may be analysed and expressed in numerical terms, generally based on frequency and consequence. Methods of qualifying and quantifying these factors are identified.
2. Risk as a feature of the world of management, commerce and technology. This is illustrated by references to cases in each of those sectors. Risk is examined under a series of headings ranging from risk

forecasting to risk litigation. Ways in which an enterprise can protect itself against the consequences which may follow at each step from accepting risk are also explored.

3. Risk as a personal factor which must be faced individually and by managers, together with suggestions for how risks can best be dealt with.

69342

LEGAL ASPECTS OF OCCUPATIONAL HEALTH AND SAFETY

3cp; 2hpw

Occupational health and safety is covered by a wide range of legislative Acts and regulations, both State and federal. This subject will introduce students to the important aspects of this legislation, its interpretation, and the implications for the organisation and management of the occupational health and safety function.

69343

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

3cp; 2hpw

This subject will bring together the management aspects of occupational health and safety through group exercises and case studies. It will deal with the role of the occupational health and safety manager in industry, motivation for health and safety, industrial relations issues, current concepts in safety and health, data analysis and collection and the use of records, training for occupational health and safety, and economic aspects of losses associated with accidents, injuries and ill health.

69351

OCCUPATIONAL HEALTH AND SAFETY PROJECT

24cp

91403

MEDICAL IMAGING

6cp; 3hpw

Nuclear medicine: radioisotopes, physics, use; instrumentation: gamma camera, rectilinear scanner, PET, SPECT; image quality and artifact. Radiology: generation, detection and properties of X-rays – DSA, CT; magnetic resonance imaging, ultrasound.

91404

PHYSICS IN MEDICINE

5cp; 3hpw

Radiotherapy sources of radiation; radiation beam parameter; measurement of therapy level radiation; simulators; dose distribution, brachytherapy; quality assurance; safety; non-ionising radiation: lasers, UV. Ultrasound: generation, detection and properties of Ultrasound – B and M mode scanning, electronic array scanning.

91405

BIOELECTRONICS

6cp; 3hpw

corequisite: 91436 Advanced Mathematics in the Life Sciences

Basic concepts of electronic measurement techniques, signals, transducers, electronic processing, display; basic electrical concepts and measurements: charge, current voltage and resistance in simple circuits, thevenin equivalence. Frequency dependent circuits: inductors, capacitors, impedance and reactance, RC, RL and RLC circuits, simple filters. Semi-conductors, diodes, FET and junction transistors. Amplifiers:

operational. Digital logic: simple gates and truth tables, flip-flops, counters, registers, monostables, analogue to digital conversion. Data displays and recorders: principles of recorders and oscilloscopes. Power distribution and electrical safety.

91406

PROJECT (CLINICAL MEASUREMENT) F/T

32cp; 4^{1/2}hpw, 4 semesters

corequisites: all foundation subjects

Candidates are required to undertake a project and prepare a report. The project is designed to introduce them to problem solving situations in applied fields relevant to their interests and/or professional experience. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in cooperation with hospital and medical institutions so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Master's degree (by coursework).

91407

PROJECT (CLINICAL MEASUREMENT) P/T

32cp; 9hpw, 2 semesters

prerequisites: all foundation subjects;

Equivalent to 91406

91408

PRINCIPLES OF BIOCMPUTING

5cp; 3hpw

prerequisites: some knowledge of basic mathematics and statistics is assumed

Overview of computer systems and applications: principles of computer hardware, IBM PC series. Principles of operating systems: MS-DOS, UNIX. Principles of third generation languages and structured programming. The Pascal language: commands, input/output, control statements, data types, arrays, data files.

91410

PRINCIPLES OF CLINICAL BIOCHEMISTRY

5cp; 3hpw

Introduction to core concepts in clinical biochemistry and their practical implementation. Laboratory hazards; appropriate statistical methods for quality control of laboratory results, reference ranges and diagnostic sensitivity and specificity. Pre-analytical procedures. Qualitative analysis, as exemplified by urine analysis and the spectroscopic identification of normal and abnormal haemoglobin pigments. Quantitative analysis, as exemplified by inorganic phosphorous analysis. Blood sugar estimations and abnormalities of carbohydrate metabolism. Principles of clinical enzymology with particular reference to the steps required for method optimisation. Principles of automation using discrete and continuous-flow methods. Introduction to the clinical biochemistry literature.

91411

BIOCHEMICAL PATHOPHYSIOLOGY

6cp; 3hpw

prerequisite: 91410 Principles of Clinical Biochemistry

Role of the clinical biochemistry laboratory in patient care, with emphasis on the biochemical indications of underlying pathology. Measurement of homeostasis and its malfunction, as seen in regulation of electrolyte, water and acid-base balance, and liver and kidney function and disorders. Serum protein patterns in health and disease. Abnormalities of lipid metabolism. Radioimmunoassay and related techniques and their role in hormonal evaluation with special emphasis on thyroid function. Isoenzymes; malabsorption syndromes; vitamin levels in clinical investigation.

91412**BIOMEDICAL SCIENCES 1***10cp; 6hpw*

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91413**BIOMEDICAL SCIENCES 2***10cp; 6hpw*

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91414**ANALYTICAL BIOCHEMISTRY PROJECT 1***5cp; 3hpw*

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91415**ANALYTICAL BIOCHEMISTRY PROJECT 2***6cp; 3hpw*

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91417**CLINICAL LABORATORY MANAGEMENT***6cp; 3hpw*

prerequisite: 91423 Clinical Biochemistry – Advanced Aspects A or 91424 Clinical Biochemistry – Advanced Aspects B

Theoretical considerations of planning, staffing, organising and controlling. Problem identification in laboratories; aspects of accounting and finance; use of multiphasic health screening; labour relations; methods evaluation; ethical and legal considerations affecting laboratory personnel.

91419**CASE STUDIES IN CLINICAL BIOCHEMISTRY***6cp; 3hpw*

prerequisite: 91411 Biochemical Pathophysiology

A variety of case studies, each illustrative of a different kind of problem, will be introduced. Real and simulated cases which involve conceptual and practical problems stemming from uncertain or ambivalent analytical procedures, faulty instrument calibration, poor quality control, inappropriate data handling, and unexpected or apparently inexplicable relationships between sets of biochemical data are used. Students work individually or in groups, studying particular cases, leading class discussions, and suggesting alternative technical or management procedures as well as new technological innovations that might be usefully employed in each case.

91421**PRINCIPLES OF HUMAN BIOLOGY***10cp; 6hpw*

prerequisite: knowledge of basic biological concepts is assumed

Basic human organisation – tissues, fluids, skeletal and muscular systems. Biological control systems – essentials of control systems, the nervous and hormonal systems. Integrated structure and function of cardiovascular, lymphatic, respiratory, gastrointestinal, renal and reproductive systems. Introductory human genetics – human variability, basic population genetics, mutations, problems of counselling.

91423**CLINICAL BIOCHEMISTRY – ADVANCED ASPECTS A***10cp; 6hpw*

prerequisite: 91410 Principles of Clinical Biochemistry

Toxicology and drug metabolism; modern methods for the screening, identification and quantitation of drugs

of abuse. Clinical biochemistry of foeto-placental function, gastrointestinal function, the porphyrias and the catecholamines. Principles and practice of instrument evaluation. Advanced techniques in clinical biochemistry; IR spectroscopy, GLC, GC/mass spectrometry, HPLC, ion-selective electrodes.

91424

CLINICAL BIOCHEMISTRY – ADVANCED ASPECTS B

10cp; 6hpw

prerequisite: 91410 Principles of Clinical Biochemistry

Chemical pathology of liver and kidney function; pathophysiological effects of alcohol abuse, viral infection and cholestasis. The endocrine tissues; thyroid, adrenal and gonadal function. Theoretical and practical aspects of immunoassay. Inborn errors of metabolism; screening methods and investigation of the genome. Chemical diagnosis of diabetic states, hypertension and myocardial infarction. Immunological disorders; detection and diagnosis.

91426

ANALYTICAL TECHNIQUES IN BIOCHEMISTRY

10cp; 6hpw

Survey of modern techniques for analysis of biochemical samples, emphasising instrumentation, underlying principles and critical evaluation. Spectroscopic methods: spectrophotometry, spectrofluorimetry, atomic emission and absorption photometry, mass spectrometry, magnetic resonance. Separation methods: chromatography, electrophoresis, centrifugation. Electrochemical methods: potentiometry and ion-selective electrodes, polarography. Immunoassay strategies. Introduction to radiochemical tracers. Molecular biology techniques. Errors in analysis. Implications of biochemical equilibria and kinetics in analysis.

91433

BIOSTATISTICS

6cp; 3hpw

corequisite: 91408 Principles of Biocomputing or equivalent

Review of parametric and non-parametric statistics applied to the clinical field; population distributions, tests of significance, selection of suitable statistical tests, analysis of variance, correlation and regression analysis, experimental design. Use of major computer packages (SPSS, minitab) for statistics.

91434

RADIATION PROTECTION

5cp; 3hpw

Principles and techniques of radiological protection including basic physics; radiation, its sources and properties; radiation units; detection and measurement principles; health physics instruments; radiation dosimetry (ionising and non-ionising); principles of radiation control; radiation protection standards; shielding fundamentals; principles of radioactive waste disposal; safety design of nuclear laboratories; administrative aspects of radiological protection; legal aspects; accelerators and cyclotrons; transport of radioactive materials.

Note: Students may be required to attend lectures at the Australian School of Nuclear Technology, Lucas Heights.

91436

ADVANCED MATHEMATICS IN THE LIFE SCIENCES

5cp; 3hpw

prerequisite: some knowledge of basic mathematics is assumed

Calculus: differentiation, integration, numerical methods of integration. Complex numbers: j operator, summation, multiplication. Linear and vector algebra: matrix operations, inversions, determinants. Differential equations: ordinary and partial, solutions. Transformations: Fourier, Laplace, inverse transformations, DFT, FFT, correlations.

Number theory: binary, octal, decimal, hexadecimal. Boolean algebra.

91437

ADVANCED BIOINSTRUMENTATION

5cp; 3hpw

prerequisite: equivalent to Certificate in Electronics and Computing in Life Sciences and Certificate in Human Biology

Review of impedance concepts, complex number and vector techniques, application to RLC circuits. Analogue filters; steady-state and transient response, anti-aliasing. Operational, instrumentation and biomedical amplifiers, high impedance techniques. Analogue building blocks, active filters, frequency to voltage converters. Review of digital logic concepts and functions: flip-flops, monostables, counters, counting systems, displays. Analogue/digital interconversions, comparison of methods. Electronic noise: sources, avoidance, reduction methods. Electronic construction techniques.

91438

BIOSENSORS AND TRANSDUCERS

5cp; 3hpw

Biocompatibility. Electrodes – ECG, EEG, neurophysiology, pacemakers etc. Pressure – invasive, non-invasive. Light – oxygen monitoring in Hb, CCDs. Displacement, strain, angular measurement. Temperature. Electrochemical electrodes – pH, ion selective. Biosensors. Doppler ultrasound. Hardware and manufacturing.

91439

PHYSIOLOGICAL MEASUREMENT

6cp; 3hpw

Blood flow – ultrasound, radioisotope techniques, electromagnetic effects. Cardiac output – Fick technique, radioisotopes. Neurological and electrophysiological studies – EEG, ECG, heart, nerve and brain stem, evoked potential membrane physiology, electrical propagation. Respiratory measurements/spirometry. Implantable devices –

telemetry of information. Audiometry. Biomagnetic and impedance imaging.

91440

EXPERIMENTAL DESIGN AND METHODS

4cp; 3hpw

equivalent to 98903 Experimental Design and Resources Management, 91477 Research Design and Methods

The focus of this subject is the role and significance of experimental design and analysis in natural environmental systems. The emphasis will be on experimentation, survey techniques, and the construction and interpretation of statistical models.

91441

PRINCIPLES OF TOXICOLOGY

8cp; 6hpw

equivalent to 91448 Introduction to Toxicology

Strand A: Historical development of toxicology and environmental toxicology. The sources and behaviour of the main classes of toxic substances in the environment, their effects on tissues, organs, organisms and ecosystems. Introduction to community ecology and ecological processes. Environmental toxicology and human and occupational health. National and international standards for toxicological testing.

Strand B: The use of mammalian species in toxicity testing. Examination of the effects of the main classes of natural and artificial poisons on specific organ systems of mammals. Care and maintenance of laboratory animals and special problems associated with their use in toxicity testing. Mutagenesis, carcinogenesis and teratogenesis.

91448

INTRODUCTION TO TOXICOLOGY

10cp; 6hpw

Strand A: Historical development of toxicology and environmental toxicology. The sources and behaviour of the main classes of toxic substances in the

environment, their effects on tissues, organs, organisms and ecosystems. Introduction to community ecology and ecological processes. Environmental toxicology and human and occupational health. National and international standards for toxicological testing.

Strand B: The use of mammalian species in toxicity testing. Examination of the effects of the main classes of natural and artificial poisons on specific organ systems of mammals. Care and maintenance of laboratory animals and special problems associated with their use in toxicity testing. Mutagenesis, carcinogenesis and teratogenesis.

91453

PROJECT PROPOSAL (CLINICAL BIOCHEMISTRY)

6cp

prerequisite: completion of three semesters of coursework

Formulation of a proposal for an investigatory or developmental project in clinical biochemistry, suitable for completion over two semesters of part-time project work within the context of 91456 and 91459. The student is required to define the project aims in consultation with an academic supervisor, conduct a preliminary literature review, design the experimental approach and submit them in the form of a written project proposal.

91456

PROJECT 1 (CLINICAL BIOCHEMISTRY)

10cp

prerequisite: 91453 Project Proposal (Clinical Biochemistry)

Students are required to complete 91456 (six hours per week) and 91459 (nine hours per week) project subjects extending over two semesters, based on the project proposal submitted in 91453 or an equivalent written proposal. Projects are generally carried out at the student's place of employment and should relate to current problems or developments in clinical biochemistry in the working

laboratory. Students are expected to translate their project design into action, developing appropriate methodology, collecting data and subjecting it to critical evaluation and scientific presentation. The project will be completed in accordance with the Rules for Master's degree (by coursework) students.

91459

PROJECT 2 (CLINICAL BIOCHEMISTRY)

16cp

prerequisite: 91453 Project Proposal (Clinical Biochemistry)

See subject description for 91456 Project 1 (Clinical Biochemistry).

91461

PHYSIOLOGICAL MODELLING

5cp; 3hpw

prerequisite: 91408 Principles of Biocomputing

An introduction to the analysis of dynamic behaviour in biological and physical systems, with emphasis on the development of suitable mathematical models. General development of models; philosophy, variables, states, signal flows and parameters. Computational block models; simulations using THTSIM. Expression-based modelling languages. Example biological models; compartment models, driven models, nonlinear models. Integration errors. Validation of dynamic models against data.

91462

DIGITAL PROCESSING OF SIGNALS AND IMAGES IN MEDICINE

5cp; 3hpw

Linear systems, Fourier transforms in 1D and 2D; stochastic properties of signals; sampling and quantisation; discrete Fourier transformation, FFT; Z transform; digital filter structures, properties; IIR and FIR filters; image point operations; image filters; image transforms.

91463**HARDWARE FOR CLINICAL DATA ACQUISITION AND CONTROL***6cp; 6hpw*

Typical hardware systems in the Life Sciences. CPU operation, microprocessor operations, memory, I/O interfacing, DMA. Turbo debugger environment. Display hardware, text mode, memory mapping, monochrome, CGA, EGA, VGA. Keyboard operation. Business architecture. Communications hardware. Peripheral systems (real world interfacing), data acquisition and control boards, frame grabbers, CCD/video, controllers, IEEE 488 interface bus, RS232C and centronics connections.

91464**LABORATORY BIOCOMPUTING***5cp; 3hpw*

Intel assembler language. Use of Turbo Assembler debugger. Accessing systems hardware, data acquisition and control cards and interface cards. Interfacing to other languages (e.g. TURBO, Pascal). Use of Interrupts (DOS, BIOS, Hardware and interrupt handlers). When/why use Assembler code. Applications in medicine and biology.

91465**ADVANCED PROGRAMMING – LIFE SCIENCES***5cp; 3hpw*

prerequisites: 91408 Principles of Biocomputing, 91436 Advanced Mathematics in the Life Sciences or equivalent

Interfacing programs with medical and biological applications. Advanced Pascal features, records and sets, dynamic structures, pointers, database structures, interrupt handlers, graphics, port instructions. Clinical interface programming using data acquisition and control boards. Data acquisition programming languages – interface drivers.

91471**BIOCHEMICAL AND ANALYTICAL TOXICOLOGY***12cp; 6hpw*

equivalent to 91444 Analytical Techniques in Toxicology and 91445 Biochemical Toxicology

Biochemical mechanisms involved in entry, transformation and removal of toxic substances in plants, animals and selected micro-organisms. Application of immunological methods in investigating the toxicological responses in various organisms. Introduction to techniques and instrumentation used for toxicological testing of environmental and biological samples.

91472**FIELD SURVEILLANCE, FATE AND MANAGEMENT OF TOXIC SUBSTANCES***12cp; 9hpw*

equivalent to 91443 Environmental Management, 91446 Field Surveillance and Management of Toxic Substances, 91447 Environmental Accumulation and Transformation of Toxic Substances

prerequisites: 91448 Introduction to Toxicology or 91441 Principles of Toxicology, 91433 Biostatistics or 91474 Statistics in Bioscience

Field monitoring for the effects of toxic substances. Use of biological indices to assess impact of toxic substances. Application of bioassay data to natural ecosystems. Pathways of toxic substances in the environment. Transfer mechanisms between different environment compartments. Bio-accumulation and bio-transformation. Environmental legislation: the NSW Environmental Acts and their associated regulations; comparison of the federal Acts with those of the States; significance of socio-economic factors on decision making in environmental matters; cost/benefit analysis and prediction of social impact; environmental impact assessment; objectives, contents and procedures for the preparation of environmental impact statements.

91473**BIOASSAYS/TOXICOLOGICAL TESTING**

8cp; 6hpw

equivalent to 91442 Toxicological Testing/
Bioassays

prerequisites: 91448 Introduction to Toxicology
or 91441 Principles of Toxicology, 91433
Biostatistics or 91474 Statistics in Bioscience

Toxicity tests to determine acute and chronic effects of toxic substances on a wide range of organisms e.g. fish, invertebrates, plants. Analysis and interpretation of results.

91474**STATISTICS IN BIOSCIENCE**

4cp; 3hpw

equivalent to 91433 Biostatistics
corequisite: 91408 Principles of Biocomputing
or equivalent

Review of parametric and non-parametric statistics applied to the clinical field; population distributions, tests of significance, selection of suitable statistical tests, analysis of variance, correlation and regression analysis, experimental design. Use of major computer packages (SPSS, minitab) for statistics.

91475**ENVIRONMENTAL TOXICOLOGY PROJECT P/T**

24cp; 2 semesters

prerequisites: include all foundation subjects
equivalent to 91450 Project (Environmental
Toxicology) P/T and 91460 Project (Environmental
Toxicology) F/T

All Master's candidates must undertake a project and prepare a report. The project is designed to introduce them to problem-solving situations in applied fields relevant to their interests. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in cooperation with employers so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Master's degree (by coursework) students.

91476**ENVIRONMENTAL TOXICOLOGY PROJECT F/T**

24cp; 1 semester

prerequisites: include all foundation subjects,
equivalent to 91450 Project (Environmental
Toxicology) P/T and 91460 Project (Environmental
Toxicology) F/T

All Master's candidates must undertake a project and prepare a report. The project is designed to introduce them to problem-solving situations in applied fields relevant to their interests. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in cooperation with employers so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Master's degree (by coursework) students.

91477**RESEARCH DESIGN AND METHODS**

4cp; 3hpw

prerequisites: all first semester subjects

The focus of this subject is the role and significance of experimental design and analysis in natural coastal systems. The emphasis will be on experimentation, survey techniques, and the construction and interpretation of statistical models.

91478**ECONOMICS OF COASTAL RESOURCES**

4cp; 3hpw

Concentrates on the fundamental economic principles that underlie the allocation of coastal resources. The concept of ecologically sustainable development will be considered within an economic framework, and its significance to coastal resources will be assessed. Case studies and applications of environmental economic techniques to coastal resource management problems will be investigated.

91479**COASTAL ZONE LAW***4cp; 3hpw**prerequisites: completion of first year of studies*

A survey will be made of those areas of law that are designed to control or regulate environmental quality of coastal resources. The subject covers the common law heritage and the major statutory and common law controls over pollution, use of land, terrestrial, aquatic, and heritage resources. The emphasis will be on Australian legislation in comparison with other countries.

91480**EPIDEMIOLOGY AND DISEASE CONTROL***4cp; 3hpw equivalent*

Definition of epidemiological terms. Methods for the theoretical and mathematical formulation of epidemic disease outbreaks. Illustration and discussion of epidemics and outbreaks of infectious disease using specific human and animal case studies.

91481**CURRENT TOPICS IN MEDICAL MICROBIOLOGY***6cp; 3hpw equivalent extending over 2 semesters*

Offered with the Centre for Infectious Disease and Microbiology (CIDM), Westmead Hospital, and some classes/sessions will be held at the hospital. Classes will be presented by staff from UTS, CIDM and invited guest lecturers. In this subject a survey of selected topics in clinical microbiology will be undertaken. The precise mix of topics presented will vary from year to year, but will include a range of current problems or recent developments in diagnostic clinical microbiology.

91482**HUMAN PARASITOLOGY***5cp; 4hpw equivalent*

A review of parasitic protozoa and helminths of medical and veterinary

importance in both Australasia and the South-East Asian region. Standard procedures for specimen handling and laboratory diagnosis. Molecular and other advanced methods of specimen testing.

91483**HUMAN FUNGAL DISEASE***4cp; 3hpw equivalent*

Structure, function and classification of fungi, with special reference to those of human and animal disease significance in Australasia and the South-East Asian region. Growth procedures and laboratory identification of fungal disease agents. Developments in fungal diagnostic procedures.

91484**PROJECT (MEDICAL PHYSICS) F/T***32cp**corequisites: all foundation subjects*

Candidates are required to undertake a project and prepare a report. The project is designed to introduce them to problem-solving situations in applied fields relevant to their interests and/or professional experience. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in cooperation with hospital and medical institutions so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Master's degree (by coursework) students.

91485**HUMAN VIRAL DISEASE***5cp; 4hpw equivalent*

The nature of viruses, multiplication, classification and identification procedures. Tissue culture practice, diagnostic virology and serology. Contribution of molecular methods to viral diagnosis. Selected viral diseases will be considered as individual case studies.

91486**MANAGEMENT OF THE MICROBIOLOGY LABORATORY***4cp; 3hpw*

Organising, operating, staffing and controlling the clinical diagnostic laboratory. Method and equipment evaluation; reporting and accreditation. A perspective on accounting and financial control; legal and ethical considerations and constraints.

91487**RESEARCH METHODOLOGY – MEDICAL MICROBIOLOGY***3cp; 2hpw*

Overview of approaches to research; defining the problem, planning the experimental work; interpretation of laboratory data; critical review of published work.

91488**MOLECULAR MICROBIOLOGY – TECHNIQUES AND DIAGNOSIS**

8cp; 2hpw lectures plus 1 week intensive practical session, during semester break, 6hpw equivalent

Key concepts and procedures in molecular biology, including bacterial and bacteriophage genetics, mutation and DNA exchange. Plasmids, transposons and other mobilisable genetic elements. DNA isolation, manipulation and cloning procedures. Molecular biology applied to the diagnostic laboratory for organism identification and characterisation.

91489**PROJECT (MEDICAL PHYSICS) P/T***32cp; 2 semesters**prerequisites: all foundation subjects*

Equivalent to 91484

91490**RESEARCH PROPOSAL DESIGN – MEDICAL MICROBIOLOGY***4cp; 3hpw equivalent*

This subject complements 91487 and introduces the student to the preparation of internal laboratory reports, funding submissions, research proposals and material for scientific publication. The student will develop a detailed proposal for a research project.

91491**RESEARCH PROJECT – MEDICAL MICROBIOLOGY P/T***24cp; 2 semesters*

An individual research project in an area of individual interest or a work related topic. The project will be developed in advance in consultation with the Course Coordinator and other academic staff involved in the teaching of the Master's degree program. The project may be carried out in the Faculty's laboratories, or externally by arrangement.

91492**RESEARCH PROJECT – MEDICAL MICROBIOLOGY F/T***24cp; 1 semester*

As for 91491 Research Project – Medical Microbiology P/T

91493**BIOSYSTEMS***4cp; 3hpw*

This is an introduction to biological sciences for graduates with little or no prior experience in this discipline. Characteristics of living things; the cell as a unit of life, its structure and function. Continuity of life – genetics of cells, individuals, populations. Evolution; classification of living organisms. Interactions at various levels of organisation in living systems – molecules and cells, organs, organisms, populations and total communities of many species. Animal and plant responses to natural and human-induced stresses in aquatic

and terrestrial environments. Manipulation by humans of plant and animal genetics and environment and its consequences. Experimental aspects of biological sciences.

91498

SPECIAL READING ASSIGNMENT P/G LIFE SCIENCES

6cp

This reading assignment can be undertaken only following negotiation by the student with a full-time member of academic staff to gain agreement to be individually supervised. It also requires special permission of the appropriate Subject Coordinator and Associate Dean.

91499

INDIVIDUAL PROJECT P/G – LIFE SCIENCES

10cp

This individual project can be undertaken only following negotiation by the student with a full-time member of academic staff to gain agreement to be individually supervised. It also requires special permission of the appropriate Subject Coordinator and Associate Dean.

91607

RESEARCH METHODS 1

4cp; 4hpw

Refer to subject description in the section 'Undergraduate Subject Descriptions'.

91608

RESEARCH METHODS 2

4cp; 4hpw

prerequisite: 91607 Research Methods 1
Refer to subject description in the section 'Undergraduate Subject Descriptions'.

91609

BIOMEDICAL SCIENCE UPGRADE

8cp; 4hpw

This subject is designed for practising acupuncturists with a background of training in the biomedical sciences. The aim of the course is to consolidate existing knowledge and extend it in areas particularly relevant to acupuncture such as neuroscience, pathophysiology and microbiology.

98711

COASTAL RESOURCE POLICY

4cp; 3hpw

This introductory subject provides pointers to most aspects of the course, starting with a consideration of the definition of the coastal zone and coastal resources. Discusses regulatory frameworks, in Australia and overseas, and the roles of organisations involved in coastal resource management. The interdisciplinary nature of coastal resources problems, conflicts, and issues will also be considered.

98712

ESTUARINE AND COASTAL CHEMISTRY

4cp; 3hpw

Focuses on basic environmental chemistry of estuarine and ocean waters, and fresh water inputs from river systems. The significance of levels and changes in such parameters as pH, salinity, temperature, dissolved oxygen, stratification, turbidity and the presence of pollutants will be examined.

98713

HYDRAULICS

4cp; 3hpw

An introduction to physical processes in rivers, estuaries and marine waters. Stream flows, mixing patterns, generation processes of water waves and tides, and sediment transport processes will be dealt with. The interactions of these processes with coastal engineering activities will be emphasised.

98714**INTRODUCTORY COASTAL GEOLOGY***4cp; 3hpw*

Deals with geological materials, processes and depositional environments within the coastal zone. Implications of these resources for environmental and management strategy formulation will be explored.

98715**BIOLOGICAL RESOURCES AND ASSESSMENT***8cp; 6hpw*

Freshwater, estuarine and marine biological resources and their exploitation will be examined. Problems of productivity against a background of regulations will be studied, and the major management requirements for ecologically sustainable development of coastal resources will be addressed.

Introduces methodologies of biological surveys, field measurement, sampling, analysis and assessment in coastal systems. The principles of baseline surveys, biomonitoring, and impact assessment in systems such as mangroves, saltmarshes, seagrass beds, estuarine and lagoon waters and sediments, and marine systems will be developed.

98716**PHYSICAL GEOLOGY OF THE COASTAL ZONE***4cp; 3hpw*

corequisites: 98714 Introductory Coastal Geology or 98601 Coastal Geology, 98713 Hydraulics or 98401 Estuarine and Coastal Hydraulics, 98715 Biological Resources and Assessment or 98905 Resource Measurement and Assessment or equivalents

The development of coastal systems through time will be considered. Topographic and bathymetric maps and their interpretation will be introduced. The nature and dynamics of sandy barrier coasts, coral reefs, cliff-dominated erosive coasts, and aggregates of min-

eral resources and their exploitation will be examined. Geological implications in coastal zone management and planning will be considered.

98717**COASTAL RESOURCE PLANNING***8cp; 6hpw*

prerequisite: 91479 Coastal Zone Law or 98701 Law and Coastal Resources

The aims of planning will be analysed: functional, economic, social, environmental, and aesthetic. The planning process in theory will be explored, and the reality of planning processes will be compared and contrasted with the theoretical models. Case studies from Australian coastal areas and overseas examples will be used.

An overview will be given of the nature and sources of problems in coastal resource management. The complementary roles of technical and regulatory approaches will be compared. The balance of development and conservation will be explored with respect to policies relating to: public land; urban and industrial development; dunes, beaches, and mineral sands; estuaries, ports and marina developments; fisheries resources and products; hazard and risk assessment; and total catchment management.

98718**POLLUTION ASSESSMENT***4cp; 3hpw*

Concentrates on the sources, impacts, and control of pollutants on coastal systems. The ecological characteristics of natural and disturbed habitats will be compared. The ecological and public health impacts of pollution will be considered. The objectives, approaches, design and evaluation of monitoring programs will be studied, including remote sensing and other techniques. Oil spill fingerprinting and clean-up strategies will be introduced, and the role of regulatory and management agencies considered.

98719**RECREATION, TOURISM AND
NATURAL RESOURCE
MANAGEMENT***4cp; 3hpw**corequisite: 98717 Coastal Resource Planning
or 98906 Coastal Resource Management 2 or
equivalent*

Deals with the human aspects of management for organisations that have some responsibility over coastal resources. It examines both internal matters, such as organisational structure and function, as well as external issues, such as conflict resolution and negotiation with other groups in the community. It recognises that coastal resource management goals can be achieved only by organisations which are themselves effectively managed, and which deal appropriately with external groups that have an impact on the achievement of these goals.

Examines the management issues arising from the use of coastal areas for leisure. The Australian coast, particularly its natural areas, is a significant site for recreation and tourist activities. To ensure that these areas are managed sustainably, it is essential to consider the impacts and implications of this use for the natural coastal systems and to develop techniques that will allow this use to continue.

98720**INTEGRATED COASTAL RESOURCE
MANAGEMENT***8cp; 6hpw**prerequisites: all first and second year subjects*

As Integrated Environmental Assessment (IEA) and Integrated Environmental Management (IEM) require analysis of complex systems which cannot be undertaken from a single disciplinary base, this subject is for advanced students only. It synthesises the multidisciplinary content of the preceding modules through application to specific cases. Students will be required to think holistically; to undertake complex systems analysis; and to select

and apply philosophies, concepts, methodologies and techniques appropriate to the particular problem. An IEA/IEM case study will be completed, with tight budgetary, time and performance requirements.

98721**COASTAL RESOURCE PROJECT***12cp; 8hpw*

Normally in their final semester, students will complete the requirements for the Master's degree by carrying out an individual coastal resource management research project, submitting a report, and giving an oral presentation of the work and its significance. The project may be in the form of laboratory or field investigations, a management review, a case study, or similar undertaking appropriate to the student's individual needs and interests.

99518**CLINICAL FEATURES OF DISEASE***6cp; 4hpw**prerequisite: 91609 Biomedical Science
Upgrade*

This subject builds on the theoretical material offered in the biomedical sciences upgrade. It also develops the student's ability to differentiate, in an acupuncture clinical setting, those conditions that should be referred to a medical practitioner or other health care professional.

99537**INDEPENDENT RESEARCH
PROJECT (POSTGRADUATE)***7cp**prerequisites: 91607 Research Methods 1,
91608 Research Methods 2*

This is an area of self-directed study based on previous training, clinical experience and wide reading in acupuncture and allied subjects. The project provides the student with the opportunity to extend his/her knowledge through undertaking acupuncture research.

99544**CLINICAL ASPECTS OF ACUPUNCTURE 1***6cp; 3hpw*

Graduate students who enrol in this course do so after at least three years of training in traditional Chinese acupuncture. It is assumed that they have mastered the basic concepts of traditional acupuncture and in this, and similar acupuncture subjects, they are asked to demonstrate their competence. The graduate student is therefore encouraged to contribute, as a professional acupuncture practitioner, to discussion through a seminar/workshop environment and to participate in scholarly debate on specified topics.

99545**CLINICAL ASPECTS OF ACUPUNCTURE 2***6cp; 3hpw*

As the student is already familiar with all the basic concepts of traditional acupuncture, this subject focuses upon the analysis of disease states and the critical evaluation of various treatment protocols. Students will present and analyse specified disease states and examine the value of differing approaches to treatment.

99546**CLINICAL REVIEW (CLINICAL PRACTICE)***3cp; 3x2 contact hours – lecture/workshop; 30 clinical hours*

prerequisites: 91609 Biomedical Sciences Upgrade, 99545 Clinical Aspects of Acupuncture 2

corequisite: 99518 Clinical Features of Disease

This subject provides a practical review of competency in the responsible delivery of acupuncture services within a working clinical environment. To achieve this the graduate student assumes an internship role within the University's acupuncture clinic dealing directly with the public as an acupuncture practitioner.

99547**CLINICAL ASPECTS OF ACUPUNCTURE 3***6cp; 3hpw*

prerequisites: 99544 Clinical Aspects of Acupuncture 1, 99545 Clinical Aspects of Acupuncture 2

This is the final subject in a series of three seminar/workshop-based learning environments that explore the major areas of acupuncture therapeutics. It is expected that students will consolidate and extend their knowledge through the quality of individual contributions to the learning experience of the group, the stimulation of open debate, and the exchange of knowledge from various backgrounds and clinical frameworks.

99548**INTRODUCTION TO TRADITIONAL ACUPUNCTURE THEORY***5cp; 3hpw*

This subject is designed to introduce biomedically trained health practitioners to some of the major theoretical foundations of acupuncture. It explains the traditional concept of *qi* (energy) and its interrelationship with the body in health and disease. The focus of the course is the acupuncture treatment of musculo-skeletal disorders and sports injuries and therefore the emphasis of this subject is on the Traditional Chinese Medicine theories that underpin the acupuncture treatment of these disorders.

99549**POINT LOCATION***4cp; 3hpw*

Accurate point location is an essential skill for competent acupuncture practice. Emphasis is given to those points that are of major importance in the delivery of musculo-skeletal acupuncture therapy. Points will be examined in relation to their location, depth, action, special precautions and contra-indications. All classes are provided in a workshop environment.

99550**RESEARCH WORKSHOPS 1***3cp; 2hpw*

A critical examination of current research is an important aspect of all graduate studies. This course provides opportunities for students to evaluate several areas of recent investigation. This work is undertaken in an interactive workshop environment and opportunities are provided for students to develop and design their own research models which can be analysed and discussed in the light of a growing awareness of the neuro-humoral effects of acupuncture therapy.

99551**THE CHINESE MEDICAL APPROACH TO HEALTH AND DISEASE***5cp; 3hpw*

prerequisite: 99548 Introduction to Traditional Acupuncture Theory

This subject provides the student with an understanding of the major causes and types of disease from the traditional Chinese viewpoint. It familiarises the future specialist acupuncture practitioner with the overall objectives of treatment. The student also gains a knowledge of Chinese medical terminology that will assist them in wider reading.

99552**THE CHINESE MODEL OF QI AND ITS PATHWAYS***4cp; 3hpw*

prerequisite: 99548 Introduction to Traditional Acupuncture Theory

The physiology of energy and its pathways extends the students' knowledge of the *jing luo* (channel) system in relation to the practice of musculo-skeletal acupuncture and the enhancement of sporting performance. It not only provides an understanding of how to influence energy but, through an awareness of energy production, enables the practitioner to utilise methods of assisting athletic performance and recovery from injury.

99553**CLINICAL PRACTICE 1***3cp; 3hpw*

prerequisites: 99548 Introduction to Traditional Acupuncture Theory, 99549 Point Location
corequisites: 99551 The Chinese Medical Approach to Health and Disease, 99552 The Chinese Model of Qi and its Pathways

Clinical experience gives an immediacy and a sense of purpose to specialised acupuncture education. It is provided to graduate students within the University's acupuncture clinics. These clinics are open to the public and are staffed by qualified practitioners assisted by students. Before entering the clinical environment students are provided with pre-clinical training to ensure that they are familiar with clinical requirements and regulations. Students will then take up the role of clinical assistant that enables them to gain valuable experience.

99554**ACUPUNCTURE DIAGNOSIS OF MUSCULO-SKELETAL DISORDERS***5cp; 3hpw*

prerequisites: 99551 The Chinese Medical Approach to Health and Disease, 99552 The Chinese Model of Qi and its Pathways

Correct diagnosis is an essential aspect of selecting appropriate treatment. These workshop sessions provide a hands-on approach to the diagnosis of musculo-skeletal disorders according to the principles of Traditional Chinese Medicine. By this stage students will understand the theoretical basis for the correct diagnosis of a number of musculo-skeletal problems. Practice is provided in the traditional Chinese medical assessment of joint and soft tissue disorders, paralysis, sports injuries, rheumatic and arthritic conditions.

99555**THERAPEUTIC TECHNIQUES AND TUINA (CHINESE MASSAGE)***4cp; 3hpw*

This component develops treatment skills by combining and applying the techniques of acupuncture, acupressure and *tuina*. This will enable the student to provide effective and safe therapeutic skills appropriate to their level of training as practitioners in their own clinics or under supervision in the University's outpatient clinics.

99556**RESEARCH WORKSHOPS 2***3cp; 2hpw**prerequisite: 99550 Research Workshops 1*

This subject builds on the work undertaken in Research Workshop 1. The participating student, having acquired an understanding of the special needs of research in acupuncture, and some of the mechanisms implicated in the acupuncture effect, is at this stage required to design a small research proposal into an aspect of acupuncture. It is expected that the proposal will deal with an area of musculo-skeletal therapy or sports medicine that could be a feasible area of research.

99557**ACUPUNCTURE TREATMENT OF MUSCULO-SKELETAL DISORDERS***5cp; 3hpw**prerequisites: 99554 Acupuncture Diagnosis of Musculo-skeletal Disorders, 99555 Therapeutic Techniques and Tuina*

This subject builds on the theoretical foundation of traditional acupuncture and the work undertaken in Acupuncture Diagnosis of Musculo-skeletal Disorders. In that subject the student developed skills in evaluating the condition of the patient by integrating diagnostic information and proposing appropriate approaches to treatment. In this subject the student takes the process to the next stage and applies treatment under the supervision of the lecturer. This complements the role of the graduate student in Clinical Practice 2.

99558**ACUPUNCTURE MICROSYSTEMS***4cp; 3hpw**prerequisite: 99549 Point Location*

The special areas of acupuncture demonstrated and practised in this subject have wide application in the general practice of acupuncture as well as musculo-skeletal areas. Microsystems are generally used to reinforce and enhance the action of body acupuncture but they may also be used as a system on their own, particularly in emergency situations such as the treatment of minor sports injuries. Much of the information contained in this subject is applicable in the areas of sports medicine and pain control.

99559**CLINICAL PRACTICE 2***3cp; 3hpw**prerequisite: 99553 Clinical Practice 1**corequisite: 99557 Acupuncture Treatment of Musculo-skeletal Disorders*

This subject provides practical experience in the responsible delivery of acupuncture services within a working clinical environment. The student has experienced this environment as an assistant to a practitioner during the first part of the program. The graduate student now assumes an internship role within the University's acupuncture clinic as an acupuncturist, specialising in musculo-skeletal acupuncture and acupuncture sports medicine.

The following subjects will be replaced by new ones in 1995:

- 91420 Principles of Bioscience
replaced by 91493 Biosystems
- 98201 Environmental Economics and Ecologically Sustainable Management
replaced by 91478 Economics of Coastal Resources
- 98202 Coastal Planning and Development and
- 98906 Coastal Resource Management 2
replaced by 98717 Coastal Resource Planning

98203 Coastal Management and Administration and	Postgraduate research degree subjects
98204 Coastal Tourism, Recreation and Natural Systems Management replaced by 98719 Recreation, Tourism and Natural Resource Management	65990 MASTER'S THESIS (APPLIED CHEMISTRY) F/T
98401 Estuarine and Coastal Hydraulics replaced by 98713 Hydraulics	65991 MASTER'S THESIS (APPLIED CHEMISTRY) P/T AND EXT
98601 Coastal Geology replaced by 98714 Introductory Coastal Geology	66990 MASTER'S THESIS (APPLIED GEOLOGY) F/T
98602 Coastal Environmental Chemistry replaced by 98712 Estuarine and Coastal Chemistry	66991 MASTER'S THESIS (APPLIED GEOLOGY) P/T AND EXT
98603 Geological Resources and Development in Coastal Regions replaced by 98716 Physical Geology of the Coastal Zone	67990 MASTER'S THESIS (MATERIALS SCIENCE) F/T
98701 Law and Coastal Resources replaced by 91479 Coastal Zone Law	67991 MASTER'S THESIS (MATERIALS SCIENCE) P/T AND EXT
98901 Coastal Resource Management 1 replaced by 98711 Coastal Resource Policy	68990 MASTER'S THESIS (APPLIED PHYSICS) F/T
98902 Biological Systems replaced by 91493 Biosystems	68991 MASTER'S THESIS (APPLIED PHYSICS) P/T AND EXT
98903 Experimental Design and Resources Management replaced by 91477 Research Design and Methods	91777 MASTER'S THESIS (BIOL AND BIOMED) F/T
98904 Coastal Biological Resources and	This research project can be undertaken only following negotiation by the student with a full-time member of academic staff in order to gain agreement to be individually supervised. It also requires special permission of the appropriate Head of Department and Associate Dean.
98905 Resource Measurement and Assessment replaced by 98715 Biological Resources and Assessment	
98907 Pollution Assessment and Monitoring replaced by 98718 Pollution Assessment	
98908 Integrated Environmental Assessment and Management replaced by 98720 Integrated Coastal Resource Management	
98990 Individual Research Project in Coastal Resource Management replaced by 98721 Coastal Resource Project	

91778**MASTER'S THESIS (BIOL AND BIOMED) P/T**

This research project can be undertaken only following negotiation by the student with a full-time member of academic staff in order to gain agreement to be individually supervised. It also requires special permission of the appropriate Head of Department and Associate Dean.

91987**DOCTORAL THESIS (BIOL AND BIOMED) P/T**

This research project can be undertaken only following negotiation by the student with a full-time member of academic staff in order to gain agreement to be individually supervised. It also requires special permission of the appropriate Head of Department and Associate Dean.

91988**DOCTORAL THESIS (BIOL AND BIOMED) F/T**

This research project can be undertaken only following negotiation by the student with a full-time member of academic staff in order to gain agreement to be individually supervised. It also requires special permission of the appropriate Head of Department and Head of School.

Subjects offered for Faculty of Nursing students**91509****PHARMACOLOGY**

*3cp; 3hpw
for Faculty of Nursing students*

Principles of absorption, metabolism, distribution and excretion of drugs and how they relate to onset and duration of action. Mechanisms of action and side effects of therapeutic groups of drugs

that affect organ systems. Principles of anaesthesia and analgesia. Interactions of drugs both beneficial and adverse. Problems of toxicity, tolerance and addiction. Clinical toxicology and antidotal therapy.

91518**PHYSIOLOGICAL FOUNDATIONS OF HEALTH 1**

*6cp; Bioscience component – 4hpw; Physical Science component – 2hpw
for Faculty of Nursing students*

Introduction to anatomy and physiology, levels of organisation, homeostasis. Endocrine system – the major endocrine glands and their hormones, feedback control of hormones, hormone disorders. Integumentary system – skin structure and function, specific and non-specific defence mechanisms, wound healing. Musculoskeletal system – bone structure, organisation of the axial and appendicular skeleton, joints, muscular system, muscle tissues, principal skeletal muscles, muscles and movement. Reproductive systems and development – anatomy of male and female reproductive systems, mitosis and meiosis, formation of gametes and fertilisation, hormones and the female reproductive cycle, pregnancy, an overview of embryonic and foetal development including development of major organ systems. Measurement – scientific notation and basic mathematics. Electricity – static electricity, electric currents, magnetism, applications of electricity in the hospital and electrical safety. Heat and temperature, heat transfer and temperature regulation of the body. The building blocks of life – molecular and ionic compounds. Ions in the body – electrolytes, acids, bases and salts. How atoms join together to form molecules – obeying the rules of valence, polar and non-polar bonds, forces of attraction between molecules. Hydrocarbons and lipids, the structure of lipid bilayers.

91519**PHYSIOLOGICAL FOUNDATIONS OF HEALTH 2**

6cp; Bioscience component – 4hpw; Physical Science component – 2hpw

The nerve cell. The nerve impulse and its propagation. Synaptic transmission. Nervous system organisation – the peripheral and autonomic nervous system. The segmental nature of the spinal cord. Spinal and autonomic reflexes. The cranial nerves. Introduction to main functional areas of the brain. Voluntary movement – the neural pathway. Light and sound. Biologically important families of carbon compounds. Chemical reactions in digestion and excretion. Gastrointestinal system – anatomy and histology of the gastrointestinal tract. Digestion and its control. Absorption of nutrients. The hepatic portal system. The structure of the liver and its role in metabolism. Fluids. Quantities of chemical substance – moles, solutions and their concentrations, osmosis. Fluid balance in the body tissues. Cardiovascular system – structure of blood vessels and their distribution, heart function, blood pressure. The chemical basis for respiration and acid/base balance – chemical equilibrium, with acids and bases, pH and buffers, acidosis and alkalosis. Gases. Respiratory system – gross and fine anatomy, mechanism of breathing, gas exchange and gas transport, role of haemoglobin, oxygen dissociation curves. Renal system – gross anatomy and histology of the kidney. Waste product elimination. Ultrafiltration and urine production. Water and electrolyte balance.

Principles of absorption, metabolism, distribution and excretion of drugs and how they relate to onset and duration of action. Mechanisms of action and side effects of therapeutic groups of drugs that affect organ systems. Principles of anaesthesia and analgesia. Interactions of drugs both beneficial and adverse. Problems of toxicity, tolerance and addiction. Clinical toxicology and antidotal therapy.

91520**PATHOPHYSIOLOGY 1**

6cp; 6hpw

Cellular homeostasis and normal cellular growth and development; diseases of blood; the immune system and its role in resistance to disease; the main groups of micro-organisms which affect humans, their epidemiology and methods of limiting their spread and controlling infection; alterations in nutrition and metabolism.

91521**PATHOPHYSIOLOGY 2**

6cp; 6hpw

The major classes of cardiovascular disorders and their evolution from normal control mechanisms. The major respiratory disease processes and their relationship to normal respiratory function and defence mechanisms. The major renal disorders including acute and chronic renal failure. The major types of fluid and electrolyte disturbances and their contribution to altered homeostasis. Alterations in nervous system function. Basic principles of pharmacology with specific emphasis on drugs used in the treatment of cardiovascular, respiratory, renal and nervous system disorders.

91522**NEUROSCIENCE**

3cp; 3hpw

Congenital neurological disorders associated with prenatal infection (rubella, toxoplasmosis), environmental toxicants (Hg), drugs, alcohol and smoking in pregnancy. Peripheral nerve injury and peripheral neuropathy. Autonomic dysfunction. Spinal cord injury and the Brown-Séquard syndrome. Spinal shock. Spinal cord disease including poliomyelitis, syringomyelia. The reticular activation system and consciousness. Pain pathways, endorphins and enkephalins. Symptoms of brainstem lesions. The significance of the pyramidal and extra-pyramidal

systems in the cortical control of motor function. Control of movement and disturbances of motor function. Head injury, epilepsy, organic brain syndrome (Alzheimer's and degenerative disorders). Multiple sclerosis. Ageing and the nervous system. Electro-myography (EMG), electroencephalography (EEG) and evoked potentials. Imaging techniques including magnetic resonance imaging (MRI), and computerised axial tomography (CAT) scanning and positron emission tomography (PET).

Subjects offered by other faculties

Various general studies elective subjects available from other faculties are listed below. Further details are available from other faculty handbooks, or from the Information Office in each faculty.

21139

BUSINESS ORGANISATION

2cp; 2hpw
by Faculty of Business

Examines the various types of private sector business in Australia and studies the manner in which these businesses are managed. Develops decision-making, problem-solving and planning skills.

21816

PRACTICE MANAGEMENT

3cp; 3hpw
by Faculty of Business

This subject introduces the student to the realities of private practice and the need for proper planning in the management of a small business. Examines issues such as professionalism, location, record keeping, taxation, insurance, advertising, multidiscipline practices and legal requirements.

31870

INTRODUCTION TO MICROCOMPUTERS

2cp; 2hpw
by Faculty of Mathematical and Computing Sciences

Structure and use of computers, including the use of software packages; hard-

ware and software; operating systems (MS-DOS); file management; spreadsheets, word processing and databases.

31871

COMPUTING FOR SCIENCE

3cp; 3hpw
prerequisites: 31870 Introduction to Microcomputers, 33170 Basic Science Mathematics by Faculty of Mathematical and Computing Sciences

Structured programming. Elements of FORTRAN: variables, control structures and formatting. File handling in FORTRAN. Subroutines and functions; array structures; applications to numerical analysis and problems from the physical sciences.

33101

MATHEMATICS 1 (LIFE SCIENCES)

3cp; 3hpw
by Faculty of Mathematical and Computing Sciences

Aspects of measurement; sequences and series; convergence and limits; graphical representation of functions; sigmoid curve; differentiation; integration; elementary differential equations; periodic functions. All topics are illustrated by problems relevant to biology.

33103

STATISTICS FOR LIFE SCIENCES

3cp; 3hpw
by Faculty of Mathematical and Computing Sciences

Descriptive statistics; measures of central tendency and dispersion; probability; discrete distributions including binomial, Poisson; continuous distributions including uniform, Normal; simple random sampling; standard tests of significance and estimation for population means and variances; goodness-of-fit tests.

33105**INTRODUCTORY BIOMETRICS***3cp; 3hpw**prerequisite: 33103 Statistics for Life Sciences by Faculty of Mathematical and Computing Sciences*

Design and analysis of biological experiments; completely randomised design; randomised block design; regression analysis and correlation; multiple and polynomial regression; Latin square design; two factor designs with interaction; analysis of covariance distribution free tests.

33170**BASIC SCIENCE MATHEMATICS***3cp; 3hpw**by Faculty of Mathematical and Computing Sciences*

Basic mathematics for scientists. Quadratic and linear equations. Functions; limits; continuity; derivatives. Trigonometric functions. Introduction to integral calculus.

33171**SCIENCE MATHEMATICS 1***4cp; 4hpw**prerequisite: 33170 Basic Science Mathematics or 70/100 2-unit HSC Mathematics or 100/150 3-unit HSC Mathematics, or permission by Faculty of Mathematical and Computing Sciences*

A subject which develops the essential mathematical tools used in the physical sciences. Determinants and matrices; differentiation; trigonometric functions; implicit differentiation; integration; the natural logarithm and exponentials; inverse trigonometric functions; sequences and series; complex numbers.

33172**SCIENCE MATHEMATICS 2***3cp; 3hpw**prerequisite: 33171 Science Mathematics 1 by Faculty of Mathematical and Computing Sciences*

An introduction to areas of application of differential and integral calculus in

the physical sciences. Applications of differentiation; maximising functions; Newton's method for finding roots. Applications of integration; areas, volumes, mass centres, arc lengths. Techniques for integrating; integration by parts; use of trigonometric identities; partial fractions. Functions of many variables; partial differentiation; chain rule. Variable separable differential equations; applications.

33173**SCIENCE MATHEMATICS 3***3cp; 3hpw**prerequisite: 33171 Science Mathematics 1 corequisite: 33172 Science Mathematics 2 by Faculty of Mathematical and Computing Sciences*

Mathematical techniques for the physical sciences. Matrices; inverse; eigenvalues and eigenvectors. Three-dimensional coordinate geometry; vectors. Hyperbolic and inverse hyperbolic functions. Linear and exact first order differential equations. Infinite sequences and series.

33221**ENGINEERING MATHEMATICS 2A***3cp; 3hpw**prerequisites: 33172 Science Mathematics 2, 33173 Science Mathematics 3 by Faculty of Mathematical and Computing Sciences*

Functions of several variables. Limits and continuity. Partial derivatives. Chain rule. Gradient. Differentials. Maxima and minima. Lagrange multipliers. Least squares. Double integrals in Cartesian coordinates. Repeated integrals. Application to areas and volumes. Jacobians. Use of polar coordinates. Centre of mass and moment of inertia of plates. Triple integrals in Cartesian coordinates. Repeated integrals. Spherical and cylindrical coordinates. Quadric surface. Applications to volume, centre of mass. Moment of inertia, surface area. Differential equations. First order variables separate and linear equations. Higher order linear equations. Homogenous constant coefficient linear

equations. Methods of undetermined coefficients.

33330

PHYSICAL MATHEMATICS

3cp; 3hpw

prerequisite: 33221 Engineering Mathematics 2A

by Faculty of Mathematical and Computing Sciences

Vector calculus: vector fields, line and surface integrals, conservative fields, Green's theorem, divergence and curl, Gauss's theorem and the equation of continuity, Stokes's theorem and circulation. ODEs: series solutions of linear equations with non-constant coefficients, Legendre's and Bessel's equations and functions. Boundary Value Problems: one-dimensional heat and wave equations, separation of variables Fourier sine and cosine series, vibrating circular membrane. Fourier analysis: introduction to Fourier integral, the triangle, sign step, delta and sinc functions.

51368

WRITTEN AND ORAL REPORTING

3cp; 2hpw

by Faculty of Humanities and Social Sciences

The principles and practice of effective written and oral reporting, designed to help students in researching, organising, writing and presenting material appropriate to technical and commercial contexts. Adaptation of material and communication techniques to selected channels of communication. Letters, memoranda, reports, articles, graphs, tables, diagrams. Short talks on technical subjects and introduction to visual aids.

51389

PROFESSIONAL WRITING AND COMMUNICATION

3cp; 2hpw

by Faculty of Humanities and Social Sciences

This is a practical workshop course designed to help students in health sciences improve their skills in written

and speech communication. The course covers the variety of forms of written and oral communication required in health care settings and emphasises specific skills in the writing of essays and reports. Students will also develop their understanding of communication principles and processes.

79990

LEGAL SYSTEM

2cp; 1hpw

subject coordinator: Professor N Carter

by Faculty of Law and Legal Practice

This subject will provide the student of forensic science with an understanding of the law and legal system.

79991

FORENSIC SCIENCE CASE STUDY

8cp; 5hpw

prerequisites: all Stage 6 subjects

subject coordinator: Professor N Carter

by Faculty of Law and Legal Practice

Students will receive training in the preparation of reports and in the presentation of evidence in court. A substantial component of this subject is a Moot Court.

92167

FOUNDATIONS OF HELPING AND CARING

4cp; 4hpw

by Faculty of Nursing

Part 1: Interpersonal and Counselling Skills; Part 2: Theoretical Foundations of Psychological Health; Part 3: Human Responses to Health and Illness

This subject will provide an understanding of Western models of health care with a particular focus on the psychosocial components contributing to health and disease. It facilitates the development of essential interpersonal skills required for the practice of acupuncture and a helping role.

SUBJECT NAMES IN ALPHABETICAL ORDER

Accelerants, Incendiaries and Explosives	65758	Anatomy and Physiology 1	91601
Acupuncture Diagnosis of Musculo-skeletal Disorders	99554	Anatomy and Physiology 2	91602
Acupuncture Health Politics in Australia	99533	Anatomy and Physiology 3	91603
Acupuncture Microsystems	99558	Animal Ecophysiology	91363
Acupuncture Treatment of Musculo-skeletal Disorders	99557	Applied and Environmental Microbiology	91369
Advanced Acupuncture Principles	99519	Applied Clastic Basin Analysis	66653
Advanced Biocomputing	91396	Applied Ecology	91367
Advanced Bioinstrumentation	91437	Applied Mechanics	68402
Advanced Chemistry Project	65507	Applied Mechanics S	68742
Advanced Chinese Diagnosis	99512	Applied Mycology	91373
Advanced Chinese Massage (<i>Tuina</i>)	99515	Applied Optics	68302
Advanced Electron Microscopy Techniques	68557	Applied Optics S	68732
Advanced Engineering Geology	66607	Applied Organic Chemistry 1	65701
Advanced Fossil Fuels	66605	Applied Organic Chemistry 1 (Advanced)	65751
Advanced Geological Mapping	66506	Applied Organic Chemistry 2	65702
Advanced Materials	67651	Applied Organic Chemistry 2 (Advanced)	65752
Advanced Mathematics in the Life Sciences	91436	Applied Physics (Materials)	68071
Advanced Needle Technique and Ex-channel Point Location and Clinic – Level 5	99516	Applied Thermodynamics	68603
Advanced Petrology	66502	Applied Thermodynamics S	68763
Advanced Petrology (Honours)	66552	Approved External Subject	68943
Advanced Programming – Life Sciences	91465	Approved External Subject	68946
Advanced Solid-state Physics	68655	Aquatic Ecology	91364
Advanced Structural Geology	66505	Australian Plants	91218
Advanced Structural Geology (Honours)	66551	Basic Science Mathematics	33170
Advanced X-ray Techniques	68556	Basin Analysis	66405
Analytical Biochemistry	91326	Bioassays/Toxicological Testing	91473
Analytical Biochemistry Project 1	91414	Biochemical and Analytical Toxicology	91471
Analytical Biochemistry Project 2	91415	Biochemical Pathophysiology	91411
Analytical Chemistry 1	65401	Biochemistry 1	91313
Analytical Chemistry 2	65501	Biochemistry 2	91320
Analytical Chemistry 2 (Advanced)	65551	Biochemistry 3	91321
Analytical Techniques in Biochemistry	91426	Biochemistry 4	91322
Anatomical Pathology	91354	Biocomputing	91395
		Bioelectronics	91405
		Bioinstrumentation	91316
		Biological Hazards and Toxicology	69324
		Biological Resources and Assessment	98715
		<i>replaces 98904 Coastal Biological Resources and 98905 Resource Measurement and Assessment</i>	
		Biology 1	91311

Biology 2	91312	Clinical Mycology	91383
Biomedical Science Upgrade	91609	Clinical Practice 1	99553
Biomedical Sciences 1	91412	Clinical Practice 2	99559
Biomedical Sciences 2	91413	Clinical Review (Clinical Practice)	99546
Biomonitoring	91315	Clinical Theory (Outpatient Clinic) and Clinic – Level 6	99522
Bioprocessing	91368	Clinical Theory, Practice and Observation of Clinical Acupuncture and Clinic – Level 1	99503
Biosensors and Transducers	91438	Coastal Resource Planning <i>replaces 98202 Coastal Planning and Development and 98906 Coastal Resource Management 2</i>	98717
Biostatistics	91433	Coastal Resource Policy <i>replaces 98901 Coastal Resource Management 1</i>	98711
Biosystems	91493	Coastal Resource Project <i>replaces 98990 Individual Research Project in Coastal Resource Management</i>	98721
<i>replaces 91420 Principles of Bioscience and 98902 Biological Systems</i>		Coastal Zone Law <i>replaces 98701 Law and Coastal Resources</i>	91479
Blood Bank	91341	Combined Acupuncture Therapy and Diagnostic Practice	99521
Building Emergency Control	69331	Communication Physics	68035
Business Organisation	21139	Composites	67604
Case Studies in Clinical Biochemistry	91419	Computational Physics	68406
Ceramics 1	67403	Computer Modelling of Physical Systems	68553
Ceramics 2	67501	Computing for Groundwater Specialists	49550
Ceramics 3	67503	Computing for Science	31871
Ceramics 3 (Honours)	67553	Concepts in Biochemistry	91319
Chemical Process Control	65502	Concepts in Biology	91388
Chemical Safety	65504	Concepts in Environmental Science	91380
Chemical Safety (OHS)	69332	Conceptual Models of Ore Deposits (Honours)	66652
Chemical Thermodynamics	65404	Construction Safety	69333
Chemistry 1 (Life Sciences)	65012	Contaminated Site Management	66025
Chemistry 1 F/T	65011	Convergent Margin Tectonics (Honours)	66651
Chemistry 1M	65101	Coordination and Organometallic Chemistry	65704
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Chemistry 2 F/T	65021	Corrosion Science	65705
Chemistry 2M	65201	Corrosion Technology	65061
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Clinical Biochemistry – Advanced Aspects A	91423		
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Current Topics in Medical Microbiology	91481	Environmental Toxicology Project F/T	91476
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Device Physics	68652	<i>replaces 98602 Coastal Environmental Chemistry</i>	
Digital Processing of Signals and Images in Medicine	91462	Experimental Design and Methods	91440
Disease States 1 and 2	99520	Exploration and Mining Geology	66601
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Doctoral Thesis (Biol and Biomed) F/T	91988	Exploration Geophysics	66406
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Electrochemistry	65403	First Aid	99536
Electronics 1	68304	Forensic Examination of Physical Evidence 1	65556
Electronics 1 S	68734	Forensic Examination of Physical Evidence 2	65656
Electronics 2	68404	Forensic Examination of Physical Evidence 3	65756
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Engineering Mathematics 2A	33221	Geochemistry	66303
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Horticultural Production Management	91224	Integrated Coastal Resource Management	98720
Horticultural Research Project	91215	<i>replaces 98908 Integrated Environmental Assessment and Management</i>	
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Human Parasitology	91482	Introduction to Environmental Engineering and Management	49122
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<i>replaces 98401 Estuarine and Coastal Hydraulics</i>		Introduction to Toxicology	91448
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<i>replaces 98601 Coastal Geology</i>		Metallurgical Chemistry	
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Legal System	79990	Instrumentation S	68754
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Management of the Microbiology		Methods of Treatment	99514
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Master's Thesis (Applied		Molecular Biology 1	91334
Chemistry) P/T and Ext	65991	Molecular Biology 2	91335
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Geology) F/T	66990	Techniques and Diagnosis	91488
Master's Thesis (Applied		Narcotics and Drugs of Abuse	65757
Geology) P/T and Ext	66991	Needle and Moxibustion	
Master's Thesis (Applied		Techniques and Clinic – Level 2	99506
Physics) F/T	68990	Neuroscience	91522
Master's Thesis (Applied		Nuclear Physics	68501
Physics) P/T and Ext	68991	Nuclear Physics S	68751
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Master's Thesis (Biol and		Occupational Hazard Analysis	69312
Biomed) P/T	91778	Occupational Health and Safety	
Master's Thesis (Materials		in Society	69311
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Materials Science 2	67301	Communication	69313
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<i>replaces 98603 Geological Resources and Development in Coastal Regions</i>		Principles of Instrumentation	68604
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<i>replaces 98903 Experimental</i>		Tectonics	66602
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Resource Management	66404	Management	49124
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Science Mathematics 1	33171	Virology	91337
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UNITS WITHIN THE FACULTY

Much of the Faculty's research is focused in the activities of several research centres, institutes and units. Details of the centres and institutes can be found at a later stage in this handbook. The units in the Faculty are as follows:

Bioscience Unit

The Bioscience Unit was established in 1985 as part of the Department of Biochemistry and Physiology and is currently located on Level 14, Building 1, City campus. Staff are involved in the teaching of anatomy, physiology, pathophysiology and pharmacology within the Bachelor of Nursing course, and the Western Science component of the Bachelor of Health Science in Acupuncture course offered by UTS through its College of Acupuncture which is affiliated with Acupuncture Colleges (Australia). They also participate in teaching certain subjects within the Faculty's environmental toxicology, clinical measurement, biotechnology and biomedical science degrees. The unit contains the Brain Research Group, made up of a nucleus of active researchers with experience across various aspects of basic and applied neuroscience and neuropharmacology. In addition, staff of the unit are actively involved in a wide range of research activities including the control of public health pests, marsupial X-chromosome inactivation, and computer-assisted learning packages in clinical biochemistry.

Immunobiology Unit

The Immunobiology Unit was established in 1989 as a multidisciplinary laboratory undertaking research into basic and applied aspects of the immune system. Its activities are funded almost entirely by external competitive research grants such as those awarded by NHMRC, ARC and various national foundations.

Molecular Parasitology Unit

The Molecular Parasitology Unit was established in 1991 as a laboratory investigating evolution, taxonomy,

differentiation and diagnosis of micro-organisms based on molecular methods. Its research objective is to generate and compare gene sequences. The unit has an international reputation in this area, trains visiting overseas researchers and students, in addition to providing high quality postgraduate training in molecular biology research to local scientists and students. The Unit is multidisciplinary, relying on molecular techniques developed, used and taught in the Department of Microbiology, and mathematical analyses and computing practices undertaken in the Department of Applied Biology.

Neurobiology Unit

The Neurobiology Unit was established in 1973 within the Department of Biochemistry and Physiology. It carries out applied and basic research into the nervous system and the effect of emotional states on the immune system and cancer recurrence. It also trains postgraduate research students. The unit is funded through donations by the community and business sectors.

CENTRES AND INSTITUTES WITHIN THE FACULTY

There are eight centres and institutes within the Faculty, namely, the Centre for Science Communication (funded in part by DEET), the Centre for Materials Technology, the Centre for Ecotoxicology (run jointly with the EPA), the Institute for Coastal Resource Management, the Centre for Biomedical Technology, the Cooperative Research Centre for Cardiac Technology, the National Centre for Groundwater Management (a joint venture with the Faculty of Engineering) and the Cooperative Research Centre for Aquaculture.

Centre for Biomedical Technology

The Centre for Biomedical Technology is a multi-faculty and interdisciplinary research centre with a network of researchers from the Faculties of Science, Engineering, Mathematical and Computing Sciences, Nursing and Business. It integrates the University's

diverse expertise and resources to enhance the scientific and technological base for the biomedical technology industry, government and health care providers. It aims to facilitate and coordinate biomedical technology research, promote continuing education in the field, develop medical devices and provide consultation to the biomedical technology industry. Research programs are in the areas of cardiac electrophysiology and technology, medical imaging, biomathematical modelling, medical instrumentation, diabetes and nursing-technology interface. The Centre is a key participant in the Cooperative Research Centre for Cardiac Technology.

The Centre provides expertise and facilities for postgraduate training and research programs for post doctoral researchers, academic staff and students. Staff conduct teaching in medical physics, bioengineering, biomathematics, clinical measurement and physiology. The Centre offers Graduate Certificates, Master's of Science (by coursework) degrees in Medical Physics and Clinical Measurement, Master's (by thesis) and Doctorate programs.

Centre for Ecotoxicology

This Centre is a joint enterprise of UTS and the NSW EPA, and is located in the St Leonards campus of the University. The aims of the Centre are to promote education, research and information transfer in the field of ecotoxicology. This is a newly emerging discipline that has arisen as a result of the dependence of modern society on the use of chemicals. It is a meeting point of chemistry and biology – the study of the impacts of chemicals and mixed effluents on communities in affected areas.

The Centre coordinates research programs at Honours, Master's and Doctoral levels, and also offers Master's, Graduate Diplomas and Graduate Certificates by coursework in environmental toxicology. Teaching and research supervision involve a collaboration of both the UTS and EPA staff. The research work of the Centre involves

consultation with industry and government in identifying areas in which investigation is needed on the impact of chemicals on native flora and fauna under Australian climatic and other environmental conditions. A foundation of scientific knowledge is required in order to ensure the development of appropriate environmental quality guidelines for this continent.

The University arm also offers an independent investigative and testing service for industry, through the UTS consulting company, Insearch Limited.

Centre for Materials Technology

The Centre for Materials Technology offers expertise, education, instrumentation and innovation in the areas of materials science and engineering. Its aim is to offer to industry and government a collaborative and multidisciplinary approach to research, development, manufacturing and problem solving for the technological and economic benefit of Australian industry.

The main functions of the Centre are to assist staff teams to obtain government and industrial research grants; make facilities and expertise available for industry and government; establish postgraduate research scholarships and research assistantships; coordinate multidisciplinary research investigations; undertake consultancy; assist relevant professional institutes to organise conferences and colloquia; present regular postgraduate and post-certificate courses; present in-house high-tech training courses for industry; present research and development seminars; develop products and devices of high quality; and provide expertise in applications and design using CAD/CAM. The Centre has been most successful in obtaining external funding for research into conducting polymers and applications of piezoelectric devices.

Centre for Science Communication

The aims and objectives of the Centre for Science Communication are to promote science and technology to the general public; organise and develop

undergraduate and postgraduate courses in science communication; organise information programs on science and technology to schools; coordinate research into science communication; and promote UTS as one of Australia's leading technological institutions.

There are several programs under development, including 'Horizons of Science' forums, communication workshops for research workers, public lectures with media briefings and a media and schools resource service. The Centre is located in Building 2, City campus.

Cooperative Research Centre for Aquaculture

The Cooperative Research Centre for Aquaculture commenced operating early in 1994 and includes participants from six universities, including UTS, seven other research institutions and a number of commercial groups. The Federal Government has funded six of the research programs and UTS is involved in two of them, namely the Health Protection and Maintenance Program and the Production Efficiency and Environmental Management Program.

The Directorship of the Cooperative Research Centre is located at the Broadway in the city campus. It is linked with the University through the Office of the Pro-Vice-Chancellor (Research), the Research Office and several units throughout the University, such as the Library, the Public Relations Unit and the School of Computing Sciences.

The Health Protection and Maintenance Program has been funded to support two projects and both project leaders are located in the Dunbar Building at Gore Hill. One of the projects, being carried out by the Department of Microbiology, aims to develop a method for the rapid recognition of bacteria pathogenic to fish by the use of molecular techniques; the other, being carried out by the Department of Pathology and Immunology, will develop vaccines for use against fish pathogens.

The Production Efficiency and Environmental Management Program is a collaborative effort between CSIRO, James Cook University and UTS (Broadway campus), together with several prawn farms. This project focuses on the analysis, management and effluent control of ponds used for the intensive farming of these crustaceans.

Cooperative Research Centre for Cardiac Technology

The Cooperative Research Centre for Cardiac Technology is one of 35 competitive centres funded by the Federal Government and led by the University. Ten organisations are partners in the Centre. They are: Telectronics Pacing Systems, Royal North Shore Hospital, CSIRO, University of New South Wales, Westmead Hospital, St Vincent's Hospital, Associative Measurement, AMRAD, University of Queensland and University of Sydney.

UTS participants in the CRC for Cardiac Technology include members of the Centre for Biomedical Technology (covering the Faculties of Science, Engineering, Mathematical and Computing Sciences and Nursing).

The aim of the Centre is to develop new device-based technologies for the detection and management of coronary disease through the creation of an expanded knowledge base. Activities within the Centre concentrate on the interrelationships between electrophysiological, mechanical and biological changes associated with coronary disease; the development of a scientific base for designing and fabricating a new generation of diagnostic and management devices; and the provision of a new class of programs for training in research.

A novel educational/training stream permeates the research programs; it involves training new generations of scientists and engineers at the interface of academia and industry with opportunities for international exchanges. Links have been arranged with leading cardiac research groups at Duke University, USA, Imperial College, London and the University of Liverpool, UK.

Institute for Coastal Resource Management

The Institute for Coastal Resource Management is an interfaculty network of education, research and consultancy teams within the University. It integrates the University's diverse expertise and resources in several disciplines including environmental sciences (biology, chemistry, geology), environmental law, economic and sustainable development, planning, and management. This combination is unique within Australia for coastal resource management studies. Currently, staff from the Faculty of Science, Graduate School of Business, and the Schools of Civil Engineering, Leisure and Tourism Studies, Law and Building Studies are involved. The Institute is located on the St Leonards campus.

The Institute aims to offer interdisciplinary professional courses and conduct relevant research in the coastal zone for industry, government and the community, identify problem areas and solutions, and enhance the community awareness of the coastal zone and its problems. These developments, solutions and expertise will be exported to neighbouring countries in the Pacific region and other collaborative links will be developed in North America and Europe.

National Centre for Groundwater Management

The National Centre for Groundwater Management is a joint enterprise between the Faculties of Science and Engineering, with the general aims of researching groundwater problems of strategic national importance, coordinating and developing postgraduate courses and continuing education programs, and liaising with industry.

The Centre is recognised by the Federal Government through the Australian Water Research Advisory Corporation (formerly Council) as a National Centre for research and consultancy training in groundwater and environmental applications.

In addition to PhD and MSc (Research) degree programs in groundwater, the Centre offers two courses as a collaborative effort between the Faculty of Science and the Faculty of Engineering, namely, the Master of Science in Hydrogeology and Groundwater Management and the Graduate Diploma in Hydrogeology and Groundwater Management. Further details are given in the section on postgraduate courses.

For enquiries please contact:
Associate Professor Michael Knight
Director, National Centre for
Groundwater Management,
Room 2/429, tel: 330 1984.

COLLEGE OF ACUPUNCTURE

The UTS College of Acupuncture was established in 1994, founded upon the experience and educational expertise of Acupuncture Colleges Australia. In 1995, the College will be incorporated into the Faculty of Science as part of one of its departments. With 25 years' experience, Acupuncture Colleges Australia previously offered diploma and Bachelor's programs accredited by the New South Wales Ministry of Education. The decision to transfer acupuncture education to the University was in accord with the growth in acceptance and use of acupuncture in Australia, and the need to provide a standard of education at a level expected by the community.

The Faculty of Science will be offering a four-year-full-time undergraduate degree in Health Science Acupuncture. Facilities do not yet exist for offering this course on a part-time basis. In addition to the undergraduate degree, the Faculty will also be offering a Graduate Diploma in Musculo-skeletal Acupuncture as well as a Graduate Diploma in Clinical Acupuncture. The Faculty also offers a Master of Science by research and intends to establish a Master's (by coursework) program over the next few years.

In the development of all programs, the Faculty is assisted by advisory committees comprising members of the education, health and acupuncture professions. The courses and specific subjects are also under ongoing review and development to ensure their relevance to acupuncture practice.

The Faculty benefits from close links with the Universities of Traditional Medicine in China and the Acupuncture Unit at the Victoria University of Technology. Through an affiliation with the Guangzhou College of Traditional Chinese Medicine, undergraduate students are offered an optional one-month hospital internship in China which carries credits towards the clinical component of the degree program.

All course enquiries should be directed to: Mr Bob Hayes, at the UTS College of Acupuncture, 4/645 Harris Street, Ultimo 2007, tel: 330 2500

FACULTY BOARD IN SCIENCE¹

EX OFFICIO MEMBERS

Dean of the Faculty
Professor A R Moon (Chair)

Alternate Dean
Associate Professor M D Burchett

Head, School of Biological and Biomedical Sciences
Professor A Johnson

Head, School of Physical Sciences
Associate Professor R W Jones

Head, Department of Applied Biology
Associate Professor K R Brown

Head, Department of Applied Geology
Associate Professor B Franklin

Head, Department of Applied Physics
Professor G Smith

Head, Department of Biochemistry and Physiology
Dr J Swann

Head, Department of Chemistry
Associate Professor G Norton

Head, Department of Materials Science
Dr A Ray

Head, Department of Microbiology
Dr L Gibson

Department of Pathology and Immunology
Professor R L Raison

Professor E Leitch

Professor J Unsworth

NOMINATED MEMBERS

Ms J Forbes
Faculty of Nursing

Associate Professor E Hazel
Centre for Learning and Teaching

Ms S Scholfield
University Library

Dr G H Smith
Faculty of Mathematical and Computing Sciences

Dr B Samali
Faculty of Engineering

ELECTED MEMBERS**School of Biological and Biomedical Sciences****Academic staff**

Dr D Booth
 Associate Professor R T Buckney
 Mrs K Cordatos
 Dr J T Ellis
 Dr A M George
 Associate Professor P F Miller
 Dr G M Nicholson
 Ms A Pulkownik
 Dr I Stevenson
 Dr J Tarran

Support staff

Ms N Richardson

School of Physical Sciences**Academic staff**

Dr J Byrne
 Dr E Frankel
 Dr D C Green
 Dr J Kalman
 Associate Professor P F Logan
 Dr G Skilbeck
 Dr M Stevens
 Dr R L S Woolcott
 Dr W Yeung
 Dr B Young

Support staff

Ms J Hely

STUDENT MEMBERS**School of Biological and Biomedical Sciences**

Mr C Allen
 Ms D Solomon

School of Physical Sciences

Ms J Barczynska
 Ms L Lerotic

APPOINTED MEMBERS

Associate Professor M J Knight
 Dr S Hogg

¹ The Faculty is in the process of a major restructuring which will potentially include changes to the composition of the Faculty Board. Information on membership is correct as at 1 September 1994.

COURSE ADVISORY COMMITTEES¹

The composition of course advisory committees in the Faculty of Science usually contains a majority of members external to the Faculty, normally including the following:

- a Chairperson external to the University who is eminent in the field
- the Dean of the Faculty
- the Head of the relevant Department
- one or more staff members of the Department
- external members from business and/or industry, professional associations and recent graduates of the Faculty

COURSE ADVISORY COMMITTEE FOR COURSES IN BIOLOGICAL AND BIOMEDICAL SCIENCES**Internal members**

Professor A R Moon
 Dean, Faculty of Science
 Associate Professor M D Burchett
 Alternate Dean

Professor A Johnson
 Head, School of Biological and Biomedical Sciences

Associate Professor K R Brown
 Head, Department of Applied Biology

Dr J Swann
 Head, Dept of Biochemistry and Physiology

Dr L Gibson
 Head, Dept of Microbiology

Professor R L Raison
 Head, Dept of Pathology and Immunology

Associate Professor R T Buckney
 Alternate Head, School of Biological and Biomedical Sciences

External members

Professor P Vincent (Chair)
 Director, Kanematsu Laboratories

Dr V P Ackerman
Former Head, Microbiology, RNS
Hospital

Dr J P Isbister
Head, Haematology, RNS Hospital

Dr M Meerkin
Sugerman's Pathology

Associate Professor D Naidoo
Director of Clinical Chemistry, Prince of
Wales Hospital and Prince Henry
Hospital

Dr R Munro
Director of Microbiology, Liverpool
Hospital

Dr J Skerritt
Grain Quality Research Laboratories,
Division of Plant Industry, CSIRO

Dr B Robinson
Head, Molecular Genetics Unit, Kolling
Institute for Medical Research, RNS
Hospital

Dr K Hopper
Research Immunologist

Dr C Bunn
Research Scientist, Biotechnology
Australia Pty Ltd

Dr P Molloy
Principal Research Scientist, CSIRO
Division of Biomolecular Engineering

Dr R Baker
Environmental Consultant

Mr I Smalls
Principal Scientist, Water Resources

Dr M Ahsanullah
Principal Research Scientist, ANSTO

Professor T Chambers
Director, Royal Botanic Gardens

Dr D P Fagan
Manager, Environmental Science Group,
Water Board

Dr G Batley
Senior Principal Research Scientist,
CSIRO Centre for Advanced Analytical
Chemistry

Ms R Mitchell
Principal, Horticulture School of the
Ryde College of TAFE

Dr R Smart
Department of Nuclear Medicine, St
George Hospital

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Ceramics Section, ANSTO

Dr B Window
Senior Principal Research Scientist,
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Exploration Manager, Bridge Oil
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Principal Research Scientist, Division of
Petroleum Resources, CSIRO

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Manager, Technical Services, Boral
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Chief Scientist, Department of the Prime
Minister and Cabinet
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Technical Development Manager,
Australia Consumers Association
Mr B Hutton
Chief Physicist, Dept of Nuclear Medi-
cine, Royal Prince Alfred Hospital
Professor A Samarin, FTS
Consultant

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Associate Professor G P Norton
Head of Department

External members

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Centre for Advanced Analytical Chemis-
try, CSIRO Division of Coal and Energy
Mr G Livanos
Quality Assurance Manager, Sandoz
Pharmaceuticals
Dr R Wells
Director of Research, Australian
Government Analytical Laboratories

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FOR THE DEPARTMENT OF
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Associate Professor R W Jones
Head, School of Physical Sciences
Dr A Ray
Head of Department

External members

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Ceramics Section, ANSTO, Lucas
Heights Research Laboratories
Dr P Bryant
GEC-Marconi Systems
Dr R Grant
Development Chemist, Dow Corning
Mr I Johnson
ICI Marketing Development Manager
Dr D Taylor
Managing Director, Taylor Ceramic
Engineering

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FOR COURSES IN FORENSIC
SCIENCE**

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Associate Professor R W Jones
Head, School of Physical Sciences
Associate Professor G P Norton
Head, Department of Chemistry

Dr M Dawson
Senior Lecturer

External members

Dr H Kobus
Chief Forensic Scientist, Forensic Science
Centre of South Australia

Dr A Ross
Director, National Institute of Forensic
Science

Dr A Cremarty
Director, NSW Health Laboratory,
Lidcombe Hospital

Dr R B Wells
Director of Research, Australian Gov-
ernment Analytical Laboratory, NSW

Dr J Robertson
Head, Forensic Sciences Division,
Australian Federal Police

COURSE ADVISORY COMMITTEE FOR COURSES IN OCCUPATIONAL HEALTH AND SAFETY

Members to be appointed.

¹ The Faculty is in the process of a major restructuring. There is possibility that the number and composition of the Course Advisory Committees may change. Information on membership is correct as at 1 September 1994.

STAFF LIST

The Faculty is in the process of restructuring. As from 1 January 1995, the two Schools will no longer exist and the Heads of School will be replaced by Associate Deans with Faculty-wide portfolios. The following information is correct as at 14 October 1994.

Professor of Physics and Dean of Science
A R Moon, BSc, PhD (Melb), FAIP

Associate Professor and Alternate Dean
M D Burchett, BSc, PhD (Syd) DipEd (NE),
MAIH, MAIBiol

Faculty Administrator
I D A Costabile, BA (SW) (Witwatersrand)

Secretary to the Dean
C A Crane

Administrative Assistants
J Fong, BSSc (Hons) (Hong Kong),
MHKIPM
M A Stevens

School of Physical Sciences

Associate Professor and Head of School
R W Jones, BSc, DipEd (Melb), PhD
(Cantab), CChem, MRACI

Senior Lecturer and Alternate Head of School
S W Hogg, BSc (WAust), MAppSc
(NSWIT), MAIP

Administrative Officer
B J Kitto, BA (Macq)

Secretary to Head of School
P L Kumar

Secretaries
E Couttie
H Dalrymple
S Faifo

Data Entry Operator
J Micheli

Word Processor Operator
V Searle

Technical Manager
B Robens, BSc, PostGradDipHumComm,
MEngSc (UNSW), MgmtCert (AIM),
GIEA, AAIM, MACEA

Senior Technical Officer (Electronics)

T W Carlson

Visual Aids Officer

J Klemes

Scientific Services Officer (Computing)

A T Stafford, MA (Cantab)

Electron Microscope Unit*Lecturer*

M Phillips, BSc (UNSW), PhD (UTS), GAIP

Technical Officer

R Wuhrer, MAppSc (UTS)

X-Ray Unit*Scientific Services Officer*

M Anast, BAppSc (Hons) (NSWIT)

Mechanical Workshop*Officer-in-charge and Senior Technical Officer*

J Campion

Senior Laboratory Craftsperson, Grade 2

J Edgington

Design & Manufacturing Coordinator

R Peters

Support Services Officer – Toolmaker

P J Fanos

Department of Chemistry*Associate Professor and Head of Department*

G P Norton, BSc (Syd), PhD (UNSW), CChem, FRACI

Associate Professor

W Stern, BSc, PhD (UNSW), ASTC, CChem, FRACI

Senior Lecturers

R A Ashby, BSc, PhD (UNSW), CChem, FRACI, MAIP

A T Baker, BSc, PhD (UNSW), CChem, MRACI

J P Byrne, BSc, PhD (Syd)

A J Cameron, MSc, PhD (Syd), CChem, MRACI, AMAusIMM

D M Cobbin, MSc, PhD (Syd), PhD

(Macq), MAPsS

M Dawson, BPharm, PhD (Syd), CChem, MRACI, MPS

J H Sharp, BSc, PhD (UNSW), CChem, MRACI

R J Sleet, MSc, PhD (Syd), CChem, MRACI

*Lecturers*R Armstrong, MSc, DipEd (Syd), DipEdTech (Plym), CChem, MRACI
J R Kalman, BSc, PhD (Syd), CChem, MRACI

H Patney, MSc (Hons) (Punjab), PhD (Flinders), CChem, MRACI

R Ward, BSc (Syd), DipEd (CSU)

B Young, BE, PhD (Cantuar)

Associate Lecturer

L A Evans, BAppSc (Hons) (NSWIT), PhD (Murdoch)

Honorary Associate

R Day, MSc (UNSW), ASTC

Scientific Officer

J Keegan, DipTech (Sc), BAppSc (NSWIT)

Senior Technical Officers

A Barnes

C Carrodus, DipTech (Sc) (NSWIT), BAppSc (UTS), MRACI

J Holmes

L Klemes

B McQuillan

Technical Officers

L Ambrose

D Cohen

M Coulston

S Cunneen

M Daraphet

J M Ehret

J Lah

Laboratory Cleaners

D Blagojevic

N Djordjevic

H Rogers

B Vracarevic

Department of Applied Geology*Associate Professor and Head of Department*

B J Franklin, BSc (Syd), PhD (UNSW), MAIG, FGAA

Professor

E C Leitch, MSc (Auck), PhD (NE), FGS

Associate Professor

B Marshall, BSc (Lond), PhD (Brist), GradDipMgt (CIAE), ARCS, FGS, AMAIMM, MAIG

Senior Lecturers

E Frankel, BSc (Natal), PhD (Syd)

C G Skilbeck, BSc, PhD (Syd)

*Associate Lecturers**(Fractional time)*

T L Allan, BSc (Syd)

K A Dadd, BAppSc (Hons) (NSWIT), PhD (Macq)

T Rannard, BAppSc (UTS)

Honorary Associates

S R Sangameshwar, MSc (Mys), MSc, PhD (Sask), FGSI, MAIMM, MAIG, FGAC

F L Sutherland, MSc (Tas), PhD (J Cook)

Assistant Technical Manager

A Buttenshaw, ChemCert, MetCert (TAFE)

Technical Officers

D Colchester, BSc (Otago), MSc (NSWIT)

A Giles, BAppSc (Hons) (NSWIT)

L M Green, BAppSc (Hons) (NSWIT)

R Hungerford, BAppSc (Hons) (NSWIT)

V Taylor-Perkins

Department of Applied Physics*Professor of Applied Physics and Head of Department*

G B Smith, BSc (NE), PhD (Monash), FAIP

Associate Professors

R W Cheary, BSc, PhD (Aston)

P F Logan, MSc (Syd), PhD (ANU),

GradDipEdStud (ACAE), MInstP

Associate Professor and NSWIT Reader (Fractional Time)

J M Bell, BSc (Syd), PhD (UNSW), MAIP

Senior Lecturers

G R Anstis, BSc (Monash), PhD (Adel), MAIP

M Braun, BSc (Melb), MAppSc (QIT), PhD (Flinders), MACPSEM, MIPSM

S W Hogg, BSc (WAust), MAppSc (NSWIT), MAIP

W Kalceff, BSc (Syd), PhD (UNSW), DipEd (Syd Teach Coll), MAIP

L Kirkup, BSc (Sheff), MSc (Lond), PhD (Pais), MInstP, CPhys, MAIP

K McGuffie, BSc (Edin), PhD (Liverpool), FRMetS, MAGU

Lecturers

D Green, BSc (Qld), PhD (Syd), MAIP

R L S Woolcott, BSc, PhD (Syd), MAIP

Associate Lecturers

S Maheswaran, BSc (Peradeniya), PhD (Simon Fraser)

S Shankar, BSc (MK), MSc (Anna), DipEd (UNSW)

Honorary Associate

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Secretary

E Coultie

Technical Manager

M Rosenbaum

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R Graves

G McCredie

A Wong

Senior Research Assistant

J Barczynska

Research Fellow

P Swift, BSc, PhD (Syd)

Laboratory Attendants

A Harris

N Maharaj

M T Smith

Department of Materials Science*Senior Lecturer and Head of Department*

A S Ray, MSc (Calc), PhD (UNSW)

Professor of Materials Technology

J Unsworth, BSc (Wales), MSc

(Manchester), PhD (Macq), CChem,

CPhys, FAIP, FPRI, SMIEEE

Senior Lecturers

B Ben-Nissan, MSc (ITU), PhD (UNSW), MIM

M G Stevens, MSc, PhD (Syd), MRACI

M Wilson, BSc (N'cle), PhD (UNSW),

MIEAust

Lecturers

G L Heness, BAppSc (NSWIT), MAppSc (UTS)

W Y Yeung, BSc (Eng), PhD (Hong Kong), MIMMA, FRMS (UK)

Associate Lecturers (Fractional time)

C M Dodd, BAppSc (UTS)

M P Watson, BAppSc (UTS)

Honorary Associates

J Bogi, DipTechAppSci, MAppSc (NSWIT)

G M Renwick, BSc (St And), PhD (Monash), MRACI, CChem

Assistant Technical Manager

A Rubel, MSc (MechEng) (Idaho)

Scientific Services Officer

J P Guerbois, DipBuildMatSc (CNAM Paris)

Senior Technical Officers

M Gertner
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Technical Officer

D Knevezic

School of Biological and Biomedical Sciences

Professor and Head of School

A M Johnson, BAppSc (SAIT), MA (Hons) (W'gong), PhD, MEdM (Flin), FASM, FAIBiol

Associate Professor and Alternate Head of School

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Secretary to Head of School

P Carland

Technical and Administrative Manager

D Edwards, E & C Cert

Finance Officer

J Powter

Stores Officer

E Soliman

Student Administration Unit

Acting Student Administrative Officer

D A R Tudge

Computing Services

Technical Officer

A Watts

Electronic Workshop

Manager

J Stafford

Mechanical Workshop

Manager

C Lidster

Apprentice

R Gleeson

Department of Applied Biology

Associate Professor and Head of Department

K R Brown, BSc, PhD (UNSW), MAIBiol

Department Secretary

G Angus

Associate Professors

R T Buckney, BSc (Hons), PhD (Tas), MAIBiol
M D Burchett, BSc, PhD (Syd), DipEd (NE), MAIH, MAIBiol
D Cheng, BSc (Hons), TTC, PhD (Tas), MASL, MAMSA, MFBA, MAIBiol
L K Holley, BAppSc (DDIAE), MAppSc (QIT), PhD (Macq), DipLaw (BAB), MAIP, MACPSEM

Senior Lecturers

C J Clarke, BSc, PhD (Syd) MAIBiol
L F De Filippis, BSc (Hons), PhD (La Trobe), MAIH
R Lim, BSc (Hons), MSc (Mal), PhD (Waterloo), MAIBiol
D A Morrison, BSc, PhD (Syd), MAIBiol

Lecturers

D Booth, BSc (Hons) (Syd), MSc (Queens University), PhD (Oregon State University)
K A Johnson, MSc Agr (Acad Krakow), MAIBiol, MAIAS, MRACI
A Pulkownik, MSc (Syd)
J Renwick, BAppSc (BiomedSc) (NSWIT)
J Tarran, BSc (Hons), DipEd, PhD (UNSW), MAIH

Adjunct Professor

R S Baker, BSc (Hons), PhD (WAust), MAIBiol

Honorary Associates

J Chapman, BSc (Hons) (UNSW), PhD (Syd), DipEnvStud (Macq), MAIBiol
L Thomas, MAppSc (Melb)

Laboratory Managers

G Goldsack, DipMedTech (AIMS), AAIMS, MAIBiol
N Richardson, DipMedTech (SydTech)

Scientific Officer

N L Clark, BAppSc (UTS), GAIP
P Ralph, BAppSc (NSWIT), MAIBiol

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S Fenech, BAppSc (NSWIT)
P Jones, TechCertBiol (SydTech), BAppSc (UTS)

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B Almond, BAppSc (NSWIT)
J Carey, BSc (Macq)
C Chirgwin, BiolTechCert (Syd Tech)
J M MacLeod, AssDipAppSc (Armidale TAFE)

Laboratory Cleaners

M Kurbel

P Hunt

Department of Biochemistry and Physiology*Senior Lecturer and Head of Department*

J C Swann, BSc, PhD (Adel)

*Associate Professor and Head of Bioscience Unit*P F Miller, BSc (Hons), PhD (Man),
DipTerEd (NE), MAIBiol*Secretary – Bioscience Unit*

D Massey

*Associate Professor*A G Dawson, BSc, PhD (Sheff), DipTerEd
(NE)*Senior Lecturers*A R Craig, BSc (Hons), PhD (UNSW),
MAPsS, BMCP

A M George, MSc, PhD (Syd)

A D Kidman, BSc (Syd), MSc (UNSW),
PhD (Hawaii)

G M Nicholson, BSc (Hons), PhD (Syd)

R L Orwell, BSc, PhD (UNSW)

A Piper, BSc (Hons) (Monash), DPhil
(Oxford)M Willow, MSc (Syd), DipEd (KCAE), PhD
(ANU), MB BS (Hons) (UNSW)*Lecturers*

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D Edwards, BSc (UNSW)

B M Harrison, BSc, PhD (Lond)

A M Simpson, BSc (Hons), PhD (Syd)

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M J Wilson, MSc (UNSW)

J R Wyndham, MSc, DipEd (Syd)

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FRCPA, FAACB, FACB*Honorary Associates*

M Christie, BSc (Adel), PhD (Syd)

I Spence, BSc (Syd), PhD (Monash)

*Laboratory Managers*W Booth, BSc (Qld), MAppSc (QUT), PhD
(Syd) – BiochemistryB Peters, BAppSc (NSWIT), MAIBiol –
Bioscience Unit*Technical Officers*

G Grindrod, TechCert Biol (Syd Tech)

J Easton, BAppSc (NSWIT)

C Giannini, BAppSc (UTS)

L Hwang, BSc (UNSW)

D Kelly, PathTechCert (Syd Tech)

H McConkey, ChemCert (Mulheim-
Ruhr)

M Stasos, BSc (UNSW)

Laboratory Cleaner

O Petroff

Neurobiology Unit*Senior Lecturer and Head of Unit*A D Kidman, BSc (Syd), MSc (UNSW),
PhD (Hawaii)*Administrative Officer*

J Harrop

Administrative Assistant

V Usher

Senior Research Officer

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Research Officer

K Cocker, BA (Macq), MA (Syd), MAPsS

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(Melb), FASM, MAIBiol*Senior Lecturers*J T Ellis, BSc (Hons) (Reading), PhD
(Liverpool)I M Stevenson, BSc (Birm), PhD (Edin),
FASM, MAIBiol*Lecturer*B J Bloomfield, ASTC, BSc (UNSW), MSc
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(ANU), FRCPA, FASM*Honorary Associates*G Grohmann, BSc (Hons) (UNSW), PhD
(Syd)D Groot Obbink, BSc (Melb), MSc (W
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FRCPA, DpBact, FASM

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MAIBiol

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V Statzenko, BiolCert (Syd Tech Coll)
Z Podkulska, MSc (UJ Krakow)

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K Luton, BSc (Hons) (JCUNQ)

Laboratory Cleaner

T Chernenko

Molecular Parasitology Unit*Professor and Head of Unit*

A M Johnson, BAppSc (SAIT), MA (Hons)
(W'gong), PhD, MEdM (Flin), FASM,
FAIBiol

Postdoctoral Fellow

A Jeffries, BSc (Hons), PhD (Adel)

Research Assistant

K Luton, BSc (Hons) (JCUNQ)

Department of Pathology and Immunology*Professor and Head of Department*

R L Raison, BSc (Syd), PhD (Monash)

Department Secretary

J Taverner

Associate Professor

K W Broady, BSc (Hons), PhD (UNSW),
MASM

Lecturers

K Cordatos, BSc, DipEd (Syd), CFIAC,
AAIMS, CT (ASC), MEd (NE), MAIBiol
D Raftos, BSc (Hons), PhD (Macq)
T Szynda, BSc (Hons), PhD (Melb), MASEP
N B Woodland, BSc (NE)

Adjunct Professors

J Isbister, BSc (Med) (Hons), MB BS Hons
(UNSW), FRACP, FRCPA
D Ma, MB BS (Hons), MD (UNSW),
FRACP, FRCPA

Honorary Associates

C Geczy, BSc, PhD (UNSW)
B Munro, DipMT (AIMS), FAIMS
K Robinson, BSc (Hons), PhD
(Witwatersrand)

Technical Officers

T Baragith
J Thorpe

Immunobiology Unit*Professor and Head of Unit*

R L Raison, BSc (Syd), PhD (Monash)

Scientific Officer

K Weston, BSc (Hons) (Syd)

Research Assistants

J Hook, BAppSc (UTS)
G Shoebridge, BSc (Hons) (Macq)
C Woodlands, BSc (Hons) (Syd)

Institute for Coastal Resource Management*Associate Professor and Director*

K R Brown, BSc, PhD (UNSW), MAIBiol

Business Manager

J Scarsbrick, BBus (NE)

Project Manager

B Nudd, BSc (NE)

Centre for Ecotoxicology**Joint UTS/Environment Protection Authority (EPA)****EPA staff members***Co-Director*

J Chapman, BSc (Hons) (UNSW), PhD (Syd),
DipEnvStud (Macq), MAIBiol, MASE

Ecotoxicologists

D Heinke, DipElectEng (Yallourn), BE
(Elect) (Melb), MASE
R V Hyne, BSc (WAust), MSc, PhD (N'cle),
MASE
M Julli, BAppSc (NSWIT), MAppSc (UTS),
MASE
R Krassoi, BAppSc (UTS), MASE
T Manning, BSc (Hons) (Syd), MAppSc
(UTS) MRACI, MASE
R Sunderam, BSc (Hons) (Sri Lanka),
MAppSc (UTS), MASE
M Warne, BSc (Hons), (N'cle), PhD
(Griffith), MRACI, MSETAC, MASE

UTS staff members*Co-Director*

M D Burchett, BSc, PhD (Syd), DipEd
(NE), MAIH, MAIBiol

Associate Professors

K R Brown, BSc, PhD (UNSW), MAIBiol

R T Buckney, BSc (Hons), PhD (Tas), MAIBiol
 D Cheng, BSc (Hons), TTC PhD (Tas), MASL, MAMSA, MFBA, MAIBiol
 P F Miller, BSc (Hons), PhD (Man), DipTert Ed (NE), MAIBiol

Senior Lecturers

C J Clarke, BSc, PhD (Syd)
 R Lim, BSc (Hons), MSc (Mal), PhD (Waterloo)
 R L Orwell, BSc, PhD (UNSW)
 A Piper, BSc (Hons) (Monash), PhD (Oxford)
 J H Sharp, BSc, PhD (UNSW), CChem, MRACI

Lecturers

M Dawson, BPharm, PhD (Syd), CChem, MRACI, MPS
 B M Harrison, BSc, PhD (Lond)
 G M Nicholson, BSc (Hons), PhD (Syd)
 A Pulkownik, MSc (Syd)

Laboratory Manager

N Richardson, DipMedTech (Syd Tech Coll)

Scientific Officer

P Ralph, BAppSc (NSWIT)

Senior Technical Officers

P Jones, TechCertBiol (Syd Tech Coll), BAppSc (UTS)

National Centre for Groundwater Management

In conjunction with the Faculty of Engineering

Associate Professor and Centre Director
 M J Knight, BSc, PhD (Melb), FGS, MIE (Aust), MAIMM

Senior Lecturers

W A Milne-Home, BSc (Leicester), MSc (London), PhD (Alberta), CertEngGCH (UNSW)
 N P Merrick, MSc (Syd), GradDipDataProc (NSWIT)

Research Fellow

R G McLaughlan, BSc (Melb), GradDipCivEng, MAppSc, PhD (UNSW)

Administrative Assistant

R Peters, BA (Ramkhamhaeng)

Centre for Science Communication

Consultant

P Pockley, BSc, DipEd (Melb), PhD (Oxford)

Administrator

S Elliott, BSc (Hons) (Macq)

College of Acupuncture

The College of Acupuncture will be incorporated into the Faculty as from 1 January 1995. It is likely that the College will form part of one of the Departments in the Faculty. The following information is correct as at 14 October 1994.

Associate Professor and Head of College

C Rogers, BA (ICOM), DipAc, DSc (CP), LectAc (HKCCA), MACAc, Visiting Professor, Guangzhou University of TCM

Lecturers

M Garvey, BA (Syd), PracDipAc (ACA), CertAdvAc (NCTCM), DipChMass (NC), DipSwedMass (SydCChiro), MLitt (UNE), MACAc
 D Ryan, BPhilos, BTheol (SCC), PracDipAc (ACA), DipHerbMed (DHC), Cert Counselling (SCC), MACAc
 C X Yang, DipAppSc (Biochem) (Swinburne), CertAdvAc (GCTCM), PracDipAc (ACA), MSc (UNSW), MACAc
 C Zaslowski, BAppSc (Phy) (Syd), PracDipAc (ACA), CertAdvAc (GCTCM), DipChHerb (ACOM), MACAc

Specialist Lecturers

G Cassis, BA (ANU), DipAppSc (ACA), DipEd (Syd), MEd (UTS)
 G Bignold, BAppSc (ACA), DipTuina (NSWCNT), DipTherapeuticMass (St George College), DipThaiMass (Wat Suan Chang Mai)
 S Pope, RN, DipAppSc (ACA)

Additional lecturers in specialist subjects and electives as required

Administrative Staff

R Hayes, AdvCertPblcAdmn (SydTech)
 W Yick

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