Science Faculty Handbook 1994

UTS

Science
Faculty Handbook 1994

This handbook should be read in conjunction with the UTS Calendar and Student Information Guide. The University attempts to ensure that the information contained in the handbook is correct as at 22 September 1993. The University reserves the right to vary any matter described in the handbook at any time without notice.

UTS

UNIVERSITY OF TECHNOLOGY, SYDNEY
ADDRESSES AND TELEPHONE NUMBERS

POSTAL ADDRESS

PO Box 123
Broadway
New South Wales 2007 Australia

Telephone – all campuses except School of Legal Practice: (02) 330 1990
International: +61 2 330 1990
Fax: (02) 330 1551
Telex: AA 75004

STREET ADDRESSES

City Campus

- Broadway
  No. 1 Broadway, Ultimo
- Haymarket
  Corner Quay Street and Ultimo Road, Haymarket, Sydney
- Blackfriars
  Blackfriars Street, Chippendale
- Smail Street
  3 Smail Street, Ultimo
- Wembley House
  839-847 George Street, Sydney

Balmain Campus
(Being replaced by a new building in Harris Street, Ultimo, end 1994)

Corner Mansfield and Batty Streets
Balmain

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
Yarramundi 2753

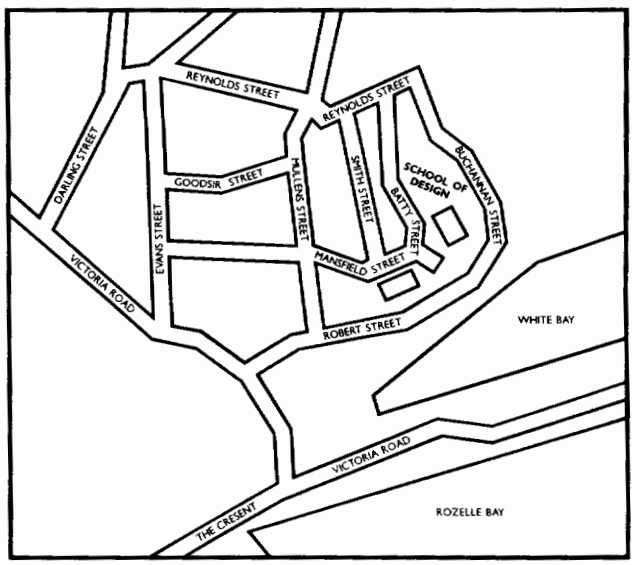
Stroud

Lot AFP 161894
The Bucketts Way
Booral 2425

CAMPUS MAPS

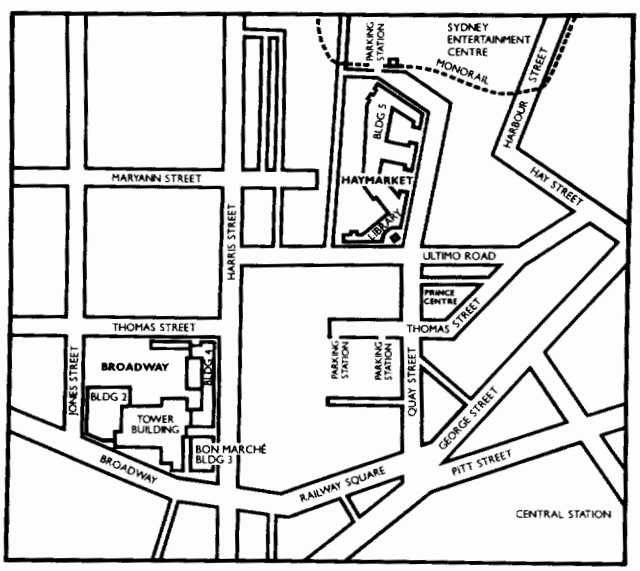
Balmain Campus

Corner Mansfield and
Batty Streets
Balmain



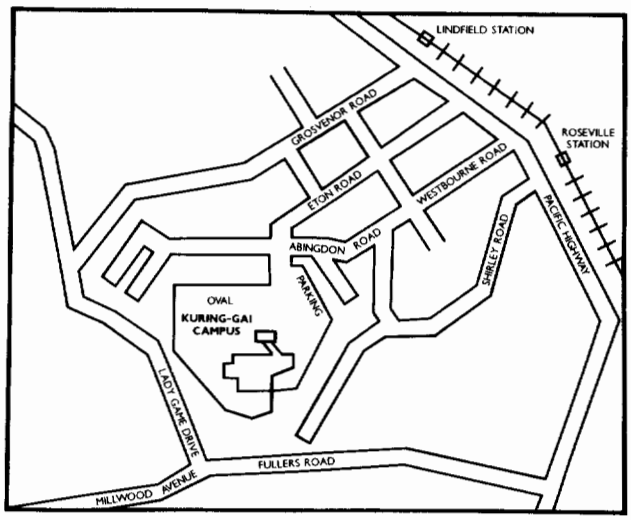
City Campus

- Broadway
  No.1 Broadway, Ultimo
- Haymarket
  Corner Quay Street and
  Ultimo Road
  Haymarket, Sydney
- Smail Street
  3 Smail Street, Ultimo
- Wembley House
  839-847 George Street
  Sydney



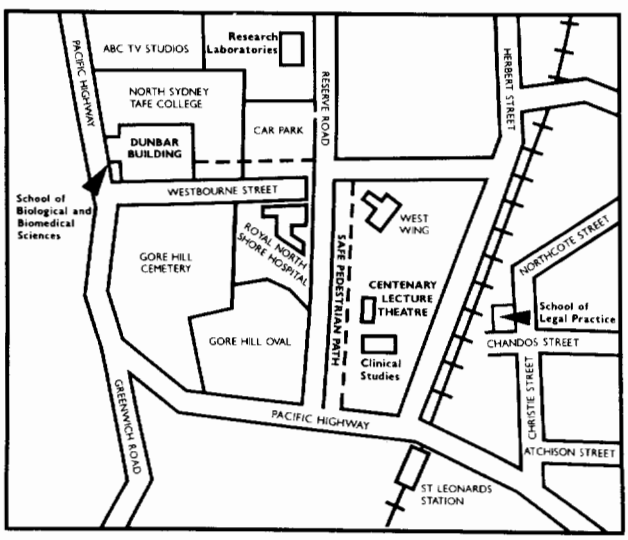
CAMPUS MAPS

Kuring-gai Campus
Eton Road
Lindfield



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



CONTENTS

PREFACE

This handbook is one of a suite of ten publications comprising the University *Calendar* and nine faculty handbooks: Business; Design, Architecture and Building; Education; Engineering; Law and Legal Practice; Mathematical and Computing Sciences; Nursing; Science; and Social Sciences. 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.

The University also publishes a *Student Information Guide*, copies of which 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, you should contact the UTS Information Service or your Faculty office. The latter will provide additional information on courses, methods of assessment, book lists and other faculty-specific information. If in doubt, don't hesitate to ask.

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.

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 consists of the School of Biological and Biomedical Sciences and the School of Physical Sciences. The Faculty is housed on two campuses, City and St Leonards. Within the two schools there are eight departments which offer 16 undergraduate degree programs, six Master's degrees by coursework and Master's and PhD programs by research. The Faculty also provides teaching for several other faculties of the University.

Major course developments in the Faculty are in the areas of environmental management and forensic science. Teaching innovations include a new enquiry/discovery approach to the teaching of laboratory work in first year physics, and the use of multimedia technology in several areas including biochemistry.

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 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 quality professional education in the physical, biological and biomedical sciences and to pursue research, scholarship and other community service activities at a high level in support of the University's mission with a view to bringing social and economic benefit to the Australian community.

PRINCIPAL DATES FOR 1994 [1]

AUTUMN SEMESTER

January

5 School of Legal Practice enrolment day at St Leonards campus
10 Release of HSC results
14 Formal supplementary examinations for 1993 Spring semester students
17 Closing date for changes of preference to the Universities Admissions Centre (UAC) from 1993 NSW HSC applicants (by 4.30 pm)
20-31 Enrolment of students at City campus
26 Australia Day
28 Public school holidays end

February

1-17 Enrolment of students at City campus
2-7 Enrolment of new undergraduate students at City campus – includes UAC and direct applicants
7 Enrolment of Teacher Education students at Kuring-gai campus
21 Enrolment of School of Biological and Biomedical Sciences students at St Leonards campus
28 Classes begin

March

11 Last day to enrol in a course or add subjects
11 Last day to change to upfront HECS payment
25 Last day to apply for leave of absence without incurring student fees/charges
31 HECS Census Date
31 Last day to withdraw from a subject without financial penalty

April

1 Public school holidays begin
1 Good Friday
4 Easter Monday
5-8 Vice-Chancellors' Week (non-teaching)
6 Graduation period begins
8 Public school holidays end
8 Last day to withdraw from a subject without academic penalty[2]
8 Last day to withdraw from a course without academic penalty[2]
22 Graduation period ends
25 Anzac Day
30 Last day to apply to graduate in Spring semester 1994

May

31 Closing date for undergraduate/postgraduate applications for Spring semester

June

13 Formal examination period begins
27 Public school holidays begin

SPRING SEMESTER

July

1 Formal examination period ends
4 School of Legal Practice enrolment day at St Leonards campus
4-8 Vice-Chancellors' Week (non-teaching)
8 Public school holidays end
22 Release of Autumn semester examination results
22 Formal supplementary examinations for Autumn semester students
25-29 Confirmation of Spring semester programs
26-27 Enrolment of new and readmitted students and students returning from leave/concurrent study

August

1 Applications available for undergraduate and postgraduate courses
1 Classes begin
4 Last day to withdraw from full-year subjects without academic penalty[2]
12 Last day to enrol in a course or add subjects
12 Last day to change to upfront HECS payment
26 Last day to apply for leave of absence without incurring student fees/charges (Spring enrolments only)
31 HECS Census Date
31 Last day to withdraw from a subject without financial penalty
31 Last day to apply to graduate in Autumn semester 1995

September

9 Last day to withdraw from a subject without academic penalty[2]
9 Last day to withdraw from a course without academic penalty[2]
26 Public school holidays begin
26 Graduation period begins
26-30 Vice-Chancellors' Week (non-teaching)

30 Closing date for undergraduate applications via UAC (without late fee)
30 Closing date for inpUTS Special Admission Scheme applications
30 Closing date for postgraduate applications (*to be confirmed*)
30 Graduation period ends

October

7 Public school holidays end
31 Closing date for postgraduate research and course award applications
31 Closing date for undergraduate applications via UAC (with late fee)
31 Closing date for undergraduate applications direct to UTS (without late fee)

November

14 Formal examinations begin

December

2 Formal examinations end
19 Public school holidays begin
23 Release of Spring semester examination results

[1] Information is correct as at 5 November 1993. The University reserves the right to vary any information described in Principal Dates for 1994 without notice.

[2] HECS/postgraduate course fees will apply after the HECS Census Date.

THE FACULTY OF SCIENCE

The Faculty of Science consists of two schools, the School of Biological and Biomedical Sciences and the School of Physical Sciences.

The School of Biological and Biomedical Sciences consists of four departments: Applied Biology, Biochemistry and Physiology, Pathology and Immunology, and Microbiology. The School of Physical Sciences also has four departments: Chemistry, Applied Geology, Applied Physics, and Materials Science.

The School of Physical Sciences and the main faculty office are located at the City campus. The School of Biological and Biomedical Sciences and a Dean's office are located at the St Leonards campus. The Bioscience Unit, which is part of the School of Biological and Biomedical Sciences, 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 Sciences and Honours programs are offered in chemistry, 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.

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. A combined BSc LLB

is offered in conjunction with the Faculty of Law, and similarly, a combined BSc in Science Education is offered in conjunction with the Faculty of Education. The Faculty is also involved in the teaching of science to other faculties, in particular Engineering and Nursing.

The Faculty is 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. Much of the Faculty's research is focused in the activities of its research centres and units including the Centre for Environmental Toxicology (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.

Students in the Faculty of Science are strongly encouraged to obtain copies of the 1994 UTS *Calendar*. The UTS *Calendar* contains valuable information about 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 UTS *Calendar* 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

1. 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 fieldwork)
- tests and quizzes

The setting and assessing of these tasks is aimed to promote the following educational aims:

- furthering each student's learning of the subject
- the acquisition of practical skills of laboratory and fieldwork, 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 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, eg, 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 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 (eg, 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 appropriate by considering all the relevant factors (such as size and lie of the land, accommodation required, building restrictions); secondly, design a structure which took 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.

SCHOOL OF BIOLOGICAL AND BIOMEDICAL SCIENCES

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 in the School of Biological and Biomedical Sciences 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 in the School of Biological and Biomedical Sciences 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.

Boehringer Manheim 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.

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 School of Biological and Biomedical Sciences 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 School of Biological and Biomedical Sciences, 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 $200.

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.

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 in the School of Biological and Biomedical Sciences 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.

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 – Biomedical Science. The prize includes a cash award of $350 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.

SCHOOL OF PHYSICAL SCIENCES

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.

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.

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.

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.

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.

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.

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.

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.

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 School of Physical Sciences 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.

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.

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.

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.

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.

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.

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 in the course who had undertaken 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 degree course. The prize was awarded for the first time in 1979.

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.

SCHOOL OF BIOLOGICAL AND BIOMEDICAL SCIENCES

The School of Biological and Biomedical Sciences has, since its inception in 1970, built up a proud record in teaching, research and consultancy.

COURSES

Located at the St Leonards campus of the University of Technology, Sydney, the School offers four undergraduate degrees:

KB02 Bachelor of Science in Biomedical Science
KB03 Bachelor of Science in Urban Horticulture
KB05 Bachelor of Science in Environmental Biology
KB06 Bachelor of Science in Biotechnology

Six Master's degrees (by coursework):

KB53 Master of Science in Clinical Measurement
KB52 Master of Science in Environmental Toxicology
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 Management (in collaboration with other UTS faculties)

Research degrees at three levels:

KB22 Bachelor of Science (Honours) in Biomedical Science
KB23 Bachelor of Science (Honours) in Urban Horticulture
KB25 Bachelor of Science (Honours) in Environmental Biology
KB26 Bachelor of Science (Honours) in Biotechnology
KB51 Master of Science (by thesis)
KB56 Doctor of Philosophy

Three Graduate Diploma courses:

KB62 Environmental Toxicology
KB65 Clinical Biochemistry
KB67 Medical Microbiology

Eight Graduate Certificates:

Six in Biomedical Technology:

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

Two in Environmental Studies:

KB77 Principles of Environmental Toxicology
KB78 Principles of Ecotoxicology

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

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 innovatory areas in keeping with the needs of our highly technological society.

SCHOOL ACTIVITIES

The School of Biological and Biomedical Sciences has a strong record of research and development, essential to the strength of both undergraduate and postgraduate programs. Details of current research projects can be obtained from the School on enquiry to the Administrative Officer. The School has been funded by the following bodies for research work:

National Health and Medical Research Council
Australian Commonwealth Government
Australian Research Council
American Muscular Dystrophy Foundation
Australian Muscular Dystrophy Foundation
Australian Vice-Chancellors' Committee
Bicentennial Park Trust
BHP Australia
Department of Employment, Education and Training
Department of Science and the Environment
Australian Water Resources Council
Ramaciotti Foundation
Private donations
Shell Company of Australia, Ltd
Shell Australia (Refining) Ltd
Sydney Water Board
Telectronics Pacing Systems
CSIRO/UTS Collaborative Research Grants
UTS Research Grants
NSW Cancer Council
NSW Environmental Protection Agency
NSW Education and Training Foundation
NSW State Government
Pulp Mill Research Program
Worksafe

UNITS WITHIN THE SCHOOL

Much of the School'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 School are as follows:

Molecular Phylogeny Unit

The Molecular Phylogeny Unit was established in 1991 as a laboratory investigating evolution, taxonomy, differentiation and diagnosis, of microorganisms based on molecular methods. The research objective of the unit, 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 post-graduate 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.

Immunobiology Unit

The Immunobiology Unit was established in 1989 as a multidisciplinary laboratory undertaking research into basic and applied aspects of the immune system. The activities of the unit are funded almost entirely by external competitive research grants such as those awarded by NHMRC, ARC and various national foundations.

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 of Building 1 in the 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 School'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.

Neurobiology Unit

The Neurobiology Unit was established in 1973 within the Department of Biochemistry and Physiology. The unit 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.

Gore Hill Research Laboratories

The Gore Hill Research Laboratories, which include an animal house, a plant tissue culture laboratory, and an electron microscope unit, are situated in the grounds of the Royal North Shore Hospital. The laboratories are a joint venture between the Hospital and the University and are used by both institutions.

Animals are used by the Hospital for diagnostic and surgical investigations and by the School for teaching and research work. The general biotechnology and tissue culture laboratories are used extensively by Environmental Biology and Urban Horticulture students. The electron microscope facility is jointly operated by the Royal North Shore Hospital and UTS. The transmission electron microscope and scanning electron microscope are used for teaching, diagnostic medical work and research.

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*, on the basis of meeting the general requirements in one of the following categories:

- The NSW Higher School Certificate
- An appropriate TAFE Certificate
- An appropriate Associate Diploma
- Equivalent qualifications
- Adult Entrance (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 course will have studied **at least** two-unit mathematics plus one two-unit science course. Students will be very well prepared if they have done two-unit mathematics plus four units of science. Common combinations include chemistry/physics, chemistry/biology, or multi-strand with biology. Last year the minimum Tertiary Entrance Rank (TER) needed for entry to Urban Horticulture was 73.25, for Biomedical Science the TER needed was 86.65; and for Biotechnology and Environmental Biology the TER needed was 86.85. However, this varies from year to year dependent upon the number of applications for entry and the number of places available.

COURSE STRUCTURE

The School offers four undergraduate degree programs, in Biomedical Science, Biotechnology, Environmental Biology and Urban Horticulture.

The degree programs are organised into stages. Each stage represents a full-time study load for one semester. Thus, for full-time students, subjects for Stages 1, 3 and 5 run in the Autumn semester, while subjects for Stages 2, 4 and 6 run in Spring semester.

Full-time and part-time programs for Stages 1 and 2 are the same in each of the first three degree programs mentioned above,

while Urban Horticulture students do not share all first year subjects in common with the other degrees. 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 (see 1. Credit Points below), 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, ie, 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, ie, a six-year part-time degree should be completed in or under nine years.

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.

2. Professional/work experience – full-time students

Full-time students who desire to complete a period of work/industrial experience during their degree program 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 Full-time.

3. Professional/work experience – part-time students

Part-time students who are employed on a full-time basis in an area relevant to their course should enrol in the subject 91999 Professional Experience Part-time in **every** semester for which they are employed so that the experience gained is reflected on their academic record.

COMMENCEMENT OF STUDIES

Lectures and practical laboratory classes offered by the School of Biological and Biomedical Sciences commence on Monday of the first week in March.

Honours students please note: full-time Honours degree students who have accepted an offer of enrolment are required to have commenced their program on or before the Monday of the first week in February. Students should contact their supervisor for details.

Bachelor of Science in Biomedical Science

The Biomedical Science degree offered by the School of Biological and Biomedical Sciences 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 (LS) (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)
91355 Haematology 1 (3cp)
91351 Immunology 1 (3cp)

Stage 5

Autumn semester

Electives[1] (24cp)

Stage 6

Spring semester

Electives[1] (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)
91301 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 (LS) (3cp)

Spring semester

33105 Introductory Biometrics (3cp)
91365 Biocomputing (3cp)
91317 Human Biology (6cp)

Stages 3 and 4 – in 1994 and even years

Autumn semester

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

Spring semester

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

Stage 5

Autumn semester

Electives[1] (12cp)

Spring semester

Electives[1] (12cp)

Stage 6

Autumn semester

Electives[1] (12cp)

Spring semester

Electives[1] (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 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 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
91334	Molecular Biology 1	4	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	Pharmacology and Toxicology	4	S	6
91356	Diagnostic Cytology 1	8	A	5
91357	Diagnostic Cytology 2	8	S	6
91358	Haematology 2	8	A	5
91359	Immunology 2	8	S	6
91368	Microbial Technology 1	8	A	5
91369	Microbial Technology 2	8	S	6
91372	Clinical Bacteriology and Parasitology	12	S	6
91383	Clinical Mycology	4	S	6
91374	Tissue Culture	4	A	5
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 School of Biological and Biomedical Sciences; subjects from another UTS school or faculty; subjects from another university undertaken on a cross institution enrolment basis. Programs that include more than 4cp of miscellaneous subjects require approval of the Head of School.

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)

Biomedical 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)

Applied Microbiology strand

Stage 5

91331	Microbiology 3 (8cp)
91334	Molecular Biology 1 (4cp)
91368	Microbial Technology 1 (8cp)
and either	
91337	Virology (4cp)
or	
91374	Tissue Culture (4cp)

Stage 6

91372	Clinical Bacteriology and Parasitology (12 cp)
91369	Microbial Technology 2 (8cp)
plus	additional electives (4 cp)

Pathology strand

Stage 5

91356	Diagnostic Cytology 1 (8cp)
91358	Haematology 1 (8cp)
plus	additional electives (8cp)

Stage 6

91341	Blood Bank (4cp)
91357	Diagnostic Cytology 2 (8cp)
91359	Immunology 2 (8cp)
plus	additional electives (4cp)

Immunology strand

Stage 5

91334	Molecular Biology 1 (4cp)
91358	Haematology 1 (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 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. (AIB) and the Australian Society for Microbiology (ASM) as well as being a professional qualification with emphasis on DNA technology and its applications. The course encompasses basic sciences plus microbiology, biochemistry, immunology and genetics, 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, eg, AIDS or Legionnaire's disease 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 themselves 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 School of Biological and Biomedical Sciences, further study in areas of interest via subjects from other faculties of UTS and other individual elective sequences as may be approved by the Head of School, including subjects offered by other universities.

FULL-TIME PROGRAM

Stage 1

Autumn semester

33101 Mathematics 1 (LS) (3cp)
33103 Statistics (LS) (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 2 (8cp)
91334 Molecular Biology 1 (4cp)
91368 Microbial Technology 1 (8cp)
plus Electives[1] (4cp)

Stage 6

Spring semester

91335 Molecular Biology 2 (8cp)
91369 Microbial Technology 2 (8cp)
plus Electives[1] (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

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 (LS) (3cp)

Spring semester

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

Stages 3 and 4 – in 1994 and even years

Autumn semester

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

Spring semester

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

Stages 3 and 4 – in 1995 and odd years

Autumn semester

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

Spring semester

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

Stages 5 and 6 – in 1994 and even years

Autumn semester

91368 Microbial Technology 1 (8cp)
plus Electives[1] (4cp)

Spring semester

91369 Microbial Technology 2 (8cp)
plus Electives[1] (4cp)

Stages 5 and 6 – in 1995 and odd years

Autumn semester

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

Spring semester

91335 Molecular Biology 2 (8cp)
plus Electives[1] (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 1994, the excursions for Stage 5 subjects, Terrestrial Ecology and Aquatic Ecology will be held in February. 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, Department of Environment and 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 School.

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 School of Biological and Biomedical Sciences, and other individual electives as may be approved by the Head of School, for example from another faculty or university.

FULL-TIME PROGRAM

Stage 1

Autumn semester

33101 Mathematics 1 (LS) (3cp)
33103 Statistics (LS) (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
91326 Analytical Biochemistry (6cp)
91330 Microbiology 2 (6cp)
91320 Biochemistry 2 (6cp)

Stage 5

Autumn semester

91364 Aquatic Ecology (8cp)
91365 Terrestrial Ecology (8cp)
plus Electives[1] (8cp)

Stage 6

Spring semester

91366 Pest Control and Toxicology (8cp)
91367 Applied Ecology (8cp)
plus Electives[1] (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)
91301 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 (LS) (3cp)

Spring semester

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

Stages 3 and 4 – in 1994 and even years

Autumn semester

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

Spring semester

Any two of
91330 Microbiology 2 (6cp)
91320 Biochemistry 2 (6cp)
91326 Analytical Biochemistry (6cp)

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 5 and 6 – in 1994 and even years

Autumn semester

91364 Aquatic Ecology (8cp)
plus Electives[1] (4cp)

Spring semester

91366 Pest Control and Toxicology (8cp)
or [2]
91367 Applied Ecology (8cp)
plus Electives[1] (4cp)

Stages 5 and 6 – in 1995 and odd years

Autumn semester

91365 Terrestrial Ecology (8cp)
plus Electives[1] (4cp)

Spring semester

91366 Pest Control and Toxicology (8cp)
or [2]
91367 Applied Ecology (8cp)
plus Electives[1] (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 1994, for example, the Terrestrial Ecology excursion 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 TAFE School of Horticulture, Ryde, 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 from within the School of Biological and Biomedical Sciences, and other individual electives as may be approved by the Head of School, 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 (2 sem)[1] (6cp)
91311 Biology 1 (6cp)

Stage 2

Spring semester

65022 Chemistry 2 (LS) (6cp)
91211 Horticultural Botany (3cp)
91242 Horticultural Procedures (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 Electives [2] (8cp)

[1] Classes for the Horticultural Procedures subject are undertaken at the TAFE School of Horticulture, at Ryde, 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 (4 sem)[1] (3cp)
91311 Biology 1 (6cp)

Spring semester

91211 Horticultural Botany (3cp)
91244 Horticultural Procedures (4 sem)[1] (3cp)
91312 Biology 2 (6cp)

Stage 2

Autumn semester

65012 Chemistry 1 (LS) (6cp)
91201 Horticultural Experimentation (3cp)
91244 Horticultural Procedures (4 sem)[1] (3cp)

Spring semester

65022 Chemistry 2 (LS) (6cp)
91244 Horticultural Procedures (4 sem)[1] (3cp)
91395 Biocomputing (3cp)

Stages 3 and 4 – in 1994 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)

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 5 and 6 – in 1994 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 Project [3] (8cp)
plus Electives[2] (4cp)

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 Project[3] (8cp)
plus Electives[2] (4cp)

[1] Classes for the Horticultural Procedures subject are undertaken at the TAFE School of Horticulture, at Ryde, 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 Stages 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	–
91206	Plant Production	6	A	–	5	
91207	Plants in the Landscape	8	A	–	5	–
91208	Plant Protection	6	A	5	5	–
91218	Australian Plants	6	S	6	6	–
91319	Concepts in Biochemistry	8	A	N/A	N/A	5
91321	Biochemistry 3	8	A	5	5	–
91322	Biochemistry 4	8	S	6	–	–
91330	Microbiology 2	6	S	–	–	6
91331	Microbiology 3	8	A	–	5	–
91334	Molecular Biology 1	4	A	–	5	–
91335	Molecular Biology 2	8	S	–	6	–
91337	Virology	4	A	5	–	–
91346	Environmental Management Procedures	4	S	–	6	6
91347	Toxic Materials in the Environment	4	S	–	6	6
91350	Pharmacology and Toxicology	4	S	6	6	–
91359	Immunology 2	8	S	6	–	–
91362	Plant Ecophysiology	8	S	6	–	–
91363	Animal Ecophysiology	8	S	6	–	6
91364	Aquatic Ecology	8	A	–	–	5
91366	Pest Control and Toxicology	8	S	6	–	6
91368	Microbial Technology 1	8	A	–	5	–
91369	Microbial Technology 2	8	S	–	6	–
91370	Field Studies: Semi-arid Ecology (Jul.'94)	8	S	–	6	6
91371	Field Studies: Mountain Ecology (Nov.'95)	8	A	–	5	5
91372	Clinical Bacteriology and Parasitology	12	S	6	–	–
91383	Clinical Mycology	4	S	–	6	6
91374	Tissue Culture	4	A	5	5	–
91375	Field Studies: Marine Sciences (Feb.'94)	4	A	5	5	5
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 (ie, 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
— = 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 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 (environmental toxicology, coastal resource management) or urban horticulture 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 of the School of Biological and Biomedical Sciences. Applicants will be notified of acceptance by the Academic Registrar.

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.

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) in Biomedical Science
Abbreviation: BSc (Hons)
Course code: KB22

Bachelor of Science (Honours) in Biotechnology
Abbreviation: BSc (Hons)
Course code: KB26

Bachelor of Science (Honours) in Environmental Biology
Abbreviation: BSc (Hons)
Course code: KB25

Bachelor of Science (Honours) in Urban Horticulture
Abbreviation: BSc (Hons)
Course code: KB23

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

Stage 1

Autumn semester

91392 Research Methodology (4cp)
and either
91393 Reading Assignment (8cp)
or
Elective coursework (8cp)
and one of
91391 Project (Biotechnology Honours) (2 sem) (18cp)
91394 Project (Biomedical Sc Honours) (2 sem) (18cp)
91397 Project (Env Biology Honours) (2 sem) (18cp)
91296 Project (Urban Horticulture Hons) (2 sem) (18cp)

Spring semester

One of
91391 Project (Biotechnology Honours) (2 sem) (18cp)
91394 Project (Biomedical Sc Honours) (2 sem) (18cp)
91397 Project (Env Biology Honours) (2 sem) (18cp)
91296 Project (Urban Horticulture Hons) (2 sem) (18cp)

PART-TIME PROGRAM

Stage 1

Autumn semester

91392 Research Methodology (4cp)
and either
91393 Reading Assignment (8cp)
or
Elective coursework (8cp)

Spring semester

One of
91381 Project (Biotechnology Honours) (3 sem) (12cp)
91384 Project (Biomedical Sc Honours) (3 sem) (12cp)
91387 Project (Env Biology Honours) (3 sem) (12cp)
91286 Project (Urban Horticulture Hons) (3 sem) (12cp)

Stage 2

Autumn semester

One of
91381 Project (Biotechnology Honours) (3 sem) (12cp)
91384 Project (Biomedical Sc Honours) (3 sem) (12cp)
91387 Project (Env Biology Honours) (3 sem) (12cp)
91286 Project (Urban Horticulture Hons) (3 sem) (12cp)

Spring semester

One of
91381 Project (Biotechnology Honours) (3 sem) (12cp)
91384 Project (Biomedical Sc Honours) (3 sem) (12cp)
91387 Project (Env Biology Honours) (3 sem) (12cp)
91286 Project (Urban Horticulture Hons) (3 sem) (12cp)

POSTGRADUATE COURSES

GENERAL INFORMATION

The School offers a doctoral program – PhD, Master's degrees by thesis and by coursework, Graduate Diplomas and Graduate Certificate programs. These programs cover both basic and applied biological science in an interdisciplinary environment. Brief outlines of the programs are provided below. For further formal information, consult the *Postgraduate Studies Guide* and individual brochures available from the School upon request.

ATTENDANCE MODES AVAILABLE

PhD
- Full-time
- Part-time
- Part-time with external supervision [1]

Master's degree (by thesis)
- Full-time
- Part-time
- Part-time with external supervision [1]

Master's degrees (by coursework)

Clinical Biochemistry
- Part-time

Clinical Measurement
- Full- and part-time

Environmental Toxicology
- Full- and part-time

Medical Microbiology
- Full- and part-time [2]

Medical Physics
- Full- and part-time

Coastal Resource Management
- Full- and part-time

Graduate Diploma (by coursework)

Clinical Biochemistry
- Part-time

Environmental Toxicology
- Full- and part-time [2]

Medical Microbiology
- Full- and part-time [2]

Graduate Certificates (by coursework)

Biomedical Technology
- Part-time

Environmental Toxicology
- Part-time [2]

Ecotoxicology
- Part-time [2]

[1] See external supervision information below.

[2] To be offered for first time in 1994 subject to approval by Academic Board.

EXTERNAL SUPERVISION

Students applying for 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.

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 sciences by undertaking an appropriate research investigation under professional supervision.

The broad areas of research expertise within the School are:

- cell and molecular biology, including microbiological, biochemical and immunological specialisations;
- biomedical instrumentation and computing;
- medical biochemistry and microbiology;

- environmental biology and ecotoxicology, including terrestrial, freshwater, estuarine and marine habitats, coastal resource management, immunotoxicology; and
- ornamental, amenity and landscape horticulture.

Applications are invited for these research programs. Please consult with a potential academic supervisor or appropriate Head of Department before submitting an application.

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.

MASTER'S DEGREE (BY THESIS)

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 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.

MASTER'S DEGREES (BY COURSEWORK)

Master of Science in Clinical Biochemistry

Master of Science in Clinical Measurement

Master of Science in Environmental Toxicology [1]

Master of Science in Coastal Resource Management [2]

Master of Science in Medical Microbiology

Master of Science in Medical Physics

[1] In collaboration with the NSW Environment Protection Authority.

[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.

Admission requirements and selection

Candidates may be admitted to the course with either 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.

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.

A student who fails in any two subjects, or any one subject twice, or who fails 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 UTS *Calendar*).

Continuing UTS students

Master's degree (by coursework) students who have previously been enrolled in undergraduate UTS courses in the School shall not enrol in postgraduate subjects which are equivalent to subjects previously undertaken towards an undergraduate degree.

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 School.

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 1994 and even years [1]

Stage 1

Autumn semester

91410 Principles of Clinical Biochemistry (5cp)
91426 Analytical Techniques in Biochemistry (10cp)

Spring semester

91411 Biochemical Pathophysiology (6cp)
91424 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

91423 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)

Entry to program in 1995 and odd years [1]

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)

[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, School of Biological and Biomedical Sciences, 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 in two years full-time or in 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 Life Sciences (5cp)

or

98902 Biological Systems (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 (5cp)

Stage 3

Autumn semester

91407 Project – Clinical Measurement (16cp)

Spring semester

91407 Project – Clinical Measurement (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, School of Biological and Biomedical Sciences, 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 will soon be 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

98901	Coastal Resource Management 1 (6cp)
plus	two to three of [1]
98601	Coastal Geology (5cp)
98902	Biological Systems (6cp)
98602	Coastal Environmental Chemistry (5cp)
98401	Estuarine and Coastal Hydraulics (5cp)

Spring semester

98701 Law and Coastal Resources (5cp)
98903 Experimental Design and Resource Management (6cp)
98201 Environmental Economics and Ecologically Sustainable Development (5cp)

Stage 2

Autumn semester

98904 Coastal Biological Resources (5cp)
98603 Geological Resources and Development in Coastal Regions (5cp)
98905 Resource Measurement and Assessment (6cp)

Spring semester

98202 Coastal Planning and Development (5cp)
98906 Coastal Resource Management 2 (6cp)
98907 Pollution Assessment and Monitoring (5cp)

Stage 3

Autumn semester

98203 Coastal Management and Administration (5cp)
98204 Coastal Tourism, Recreation and Natural Systems Management (5cp)
98908 Integrated Environmental Assessment and Management (6cp)

Spring semester

98990 Individual Research Project in Coastal Resource Management (16cp)

FULL-TIME PROGRAM

Stage I

Autumn semester

98901 Coastal Resource Management 1 (6cp)
plus two to three of [1]
98601 Coastal Geology (5cp)
98902 Biological Systems (6cp)
98602 Coastal Environmental Chemistry (5cp)
98401 Estuarine and Coastal Hydraulics (5cp)
98904 Coastal Biological Resources [2] (5cp)
98603 Geological Resources and Development in Coastal Regions [2] (5cp)
98905 Resource Measurement and Assessment [2] (6cp)

Spring semester

98701 Law and Coastal Resources (5cp)
98903 Experimental Design and Resource Management (6cp)
98201 Environmental Economics and Ecologically Sustainable Development (5cp)
98202 Coastal Planning and Development [2] (5cp)
98906 Coastal Resource Management 2 [2] (6cp)
98907 Pollution Assessment and Monitoring [2] (5cp)

Stage 2

Autumn semester

98203 Coastal Management and Administration (5cp)
98204 Coastal Tourism, Recreation and Natural Systems Management (5cp)
98908 Integrated Environmental Assessment and Management (6cp)

Spring semester

98990 Individual Research Project in Coastal Resource Management (16cp)

[1] Advanced standing may be given for up to two of these subjects, depending on background.

[2] Availability subject to timetabling.

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, School of Biological and Biomedical Sciences, Tel: 330 4042/4014/4044 Fax: 330 4003.

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 hazard.

The course provides relevant postgraduate education and training in the developing science of environmental toxicology and is offered in conjunction with the Centre for Environmental Toxicology. This centre is a joint initiative between the New South Wales Environment Protection Authority and the University, and is housed in the School of Biological and Biomedical Sciences.

Admission to the course is open to graduates in the biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent degrees. 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
91420 Biosystems [1] (4cp)
or
91474 Statistics in Bioscience [1] (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 (24cp)

PART-TIME PROGRAM

Stage 1

Autumn semester

91441 Principles of Toxicology (8cp)
and either
91420 Biosystems [1] (4cp)
or
91474 Statistics in Bioscience [1] (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 (12cp)

Spring semester

91475 Environmental Toxicology Project (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, School of Biological and Biomedical Sciences, Tel: 330 4037/ 4044 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 School with support from the Australian Nuclear Science and Technology Organisation (ANSTO), members from the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM) and major teaching hospitals.

The program can be completed in two years of full-time or in 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

98902 Biological Systems (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 (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, School of Biological and Biomedical Sciences, Tel: 330 4152/4044 Fax: 330 4003.

Master of Science in Medical Microbiology

Offered in 1994

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 school, 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 (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). The full-time program would be offered only if numbers warrant.

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 compieted for award of the degree.

For further information contact:
The Course Coordinator, Medical Microbiology, Dr I Stevenson, School of Biological and Biomedical Sciences, Tel: 330 4154 Fax: 330 4003.

GRADUATE DIPLOMA COURSES

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, 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 1994 and even years[1]

Stage 1

Autumn semester

91410 Principles of Clinical Biochemistry (5cp)
91426 Analytical Techniques in Biochemistry (10cp)

Spring semester

91411 Biochemical Pathophysiology (6cp)
91424 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

91423 Clinical Biochemistry – Advanced Aspects B (10cp)
91453 Project Proposal (Clinical Biochemistry) (6cp)

Entry to program in 1995 and odd years[1]

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)

[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 Environmental Toxicology

Offered in 1994 subject to approval of the Academic Board

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 in biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent degrees. 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 I

Autumn semester

91441 Principles of Toxicology (8cp)
91471 Biochemical and Analytical Toxicology (12cp)
and either
91420 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 I

Autumn semester

91441 Principles of Toxicology (8cp)
and either
91420 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 Medical Microbiology

Offered in 1994

Course Coordinator: Dr I Stevenson

Course fees will apply. Postgraduate students are also required to pay the student services charge on enrolment.

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 School, 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.

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 (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. The full-time program would be offered only if numbers warrant. 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 CERTIFICATE COURSES

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 postgraduate level, they allow professionals to undertake a specific group of work-related subjects in order to enhance their knowledge in the rapidly expanding field of science and technology.

The School of Biological and Biomedical Sciences will offer Graduate Certificates in 1994 in the areas of Environmental Toxicology, Ecotoxicology Laboratory Testing and Biomedical 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 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 in biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent degrees. The student load per semester is 12 credit points. Two graduate certificates are offered, each to be completed as one semester of formal coursework.

Principles of Environmental Toxicology

Offered in 1994
Available in Autumn semester
Course Coordinator: Dr R Lim

This certificate 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
91420 Biosystems (4cp)
or
91474 Statistics in Bioscience (4cp)

Principles of Ecotoxicology

Offered in 1994
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 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.

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 (5cp)

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)

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 fields of 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 Life Sciences (5cp)

Human Biology

This certificate is designed to give a foundation education in biological processes, and, in particular, a study of the various physiological processes of the human body. The certificate is suited to scientists and engineers who are in the areas of biomedical engineering, medical physics or related fields, and wish to branch into biological applications.

Available in Autumn semester every year

98902 Biological Systems (6cp)
91421 Principles of Human Biology (10cp)

Medical Instrumentation and Measurement

This certificate is designed to give comprehensive theoretical and practical education in the techniques to monitor and measure 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 – 1994 and even years

91437 Advanced Bioinstrumentation (5cp)
91438 Biosensors and Transducers (5cp)
91439 Physiological Measurement (6cp)

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 – 1994 and even years

91434 Radiation Protection (5cp)
91403 Medical Imaging (6cp)
91404 Physics in Medicine (5cp)

Graduate Certificate in Environmental Engineering

Environmental engineering and management is high on the political agenda. It also has 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

Normal educational qualification for admission is a Bachelor's degree in engineering, science, design, architecture, building, surveying, 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

47381 Introduction to Environmental Engineering and Management (6cp)
47380 Environmental Assessment and Planning (6cp)

Spring semester

47382 Waste Minimisation and Advances in Pollution Control (6 cp)
47383 Urban Water Quality Management (6cp)

Academic enquiries should be directed to schools as follows:

Associate Professor K Brown
School of Biological and Biomedical Sciences, Room GH1.6, tel: 330 4042

Dr M Dawson
School of Physical Sciences, 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 WB3, tel: 330 2986

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 (eg, 3cp), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (eg, 4 hpw); 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.

Undergraduate subjects

91201 HORTICULTURAL EXPERIMENTATION

(3cp); 3 hpw

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); 6 hpw
prerequisites 65012 Chemistry I (LS), 91311 Biology I 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); 6 hpw
prerequisite 91314 Microbiology I

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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 3 hpw

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); 3 hpw

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); 6 hpw
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); 6 hpw
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, eg, 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); 3 hpw
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); 3 hpw
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); 3 hpw

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); 3 hpw
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); 6 hpw, 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); 3 hpw, 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.

91286 PROJECT (HONOURS IN URBAN HORTICULTURE)

(36cp); 27 hpw, 3 semesters
equivalent to 91299

91299 PROJECT (HONOURS IN URBAN HORTICULTURE)

(36cp); 27 hpw, 2 semesters

The project will take the form of an in-depth experimental or theoretical investigation into a problem of scientific or industrial relevance. The results of the investigation, together with a critical literature review, will form the basis of a thesis to be submitted by the last week of the Spring semester. Each student will be required to present a seminar on his or her work at the end of the year. Each student will be individually supervised by a full-time member of the academic staff of the School throughout the course of the project.

91311 BIOLOGY 1

(6cp); 6 hpw
This subject, together with 91312 Biology 2, constitutes a foundation course in biological sciences in the School.

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); 6 hpw
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); 6 hpw
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), necleosides, nucleotides, nucleic acids. Replication and repair of DNA; recombinant DNA. Protein synthesis. Basic concepts of metabolic pathways; energetics of metabolism.

91314 MICROBIOLOGY 1

(6cp); 6 hpw
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); 3 hpw
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 sewerage, 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); 6 hpw
prerequisite 68041 Physics 1 (LS)

Concepts of electricity, electronic and computerised instrumentation, transducers, signal processors, recording and display equipment. Application of instrumentation in the measurement of clinical and biological parameters.

91317 HUMAN BIOLOGY

(6cp); 6 hpw
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); 6 hpw

This subject is available only to students not enrolled in the School of Biological and Biomedical Sciences 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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 6 hpw
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. Antimicrobial substances in the environmental, hospital and laboratory environments.

91331 MICROBIOLOGY 3

(8cp); 6 hpw
prerequisite 91330 Microbiology 2

Public health microbiology. Basic epidemiological principles; mathematical formulation of epidemics; sociological aspects and case studies in epidemiology. Microbiological safety; hygiene, health and safety in the work environment. The hospital and industrial environment; hygiene and sanitation control measures; sterilisation and disinfection. Microbiological aspects of the import and export of materials and products; quarantine. Food, water and airborne diseases; exotic and notifiable diseases; zoonoses. Vaccine production, vaccination procedures and programs. Production of antisera.

91334 MOLECULAR BIOLOGY 1

(4cp); 3 hpw
prerequisites 91314 Microbiology I, 91313 Biochemistry I; 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); 6 hpw
prerequisite 91334 Molecular Biology I

Structure and organisation of the eukaryotic genome. Control of genome expression by regulation of RNA synthesis, processing and translation. Techniques and applications of hybridisation, sequencing and polymerase chain reactions. Preparation, screening and applications of DNA libraries. Techniques and applications of gene transfer and expression in plants and animals.

91337 VIROLOGY

(4cp); 3 hpw
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 and veterinary significance. Chemotherapy and interference principles. Epidemiological principles and advanced case studies, vaccine programs or control of viral and bacterial diseases. Diagnostic serology.

91341 BLOOD BANK

(4cp); 3 hpw
prerequisites 91354 Anatomical Pathology, 91355 Haematology I, 91351 Immunology I

ABO serum and cell grouping. Rh typing. Enzyme and Polybrene techniques. Direct and indirect Coombs' test. Pretransfusion compatibility tests. Antibody identification tests. Organisation of a blood bank. Investigation of transfusion reactions. Platelet serology. Forensic investigations.

91342 CLINICAL BIOCHEMISTRY 1

(4cp); 3 hpw
prerequisite 91320 Biochemistry 2

Principles of Clinical Chemistry. 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 involved. Principle of automation involving discrete and continuous flow methods.

91343 CLINICAL BIOCHEMISTRY 2

(4cp); 3 hpw
prerequisite 91342 Clinical Biochemistry I

Measurements of homeostasis and its malfunction. Liver and kidney function and disorders. Regulation of electrolyte, water and acid-based 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.

91350 PRINCIPLES OF PHARMACOLOGY AND TOXICOLOGY

(4cp); 3 hpw
prerequisites 91317 Human Biology, 91313 Biochemistry I

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); 3 hpw
prerequisites 91354 Anatomical Pathology, and either 91314 Microbiology I or 91313 Biochemistry I

Introduction to the immune system, and immunity. The innate and adaptive immune response. Cells, tissues and organs of the mammalian immune system. Antibody structure and function. Cell-mediated immunity. Regulation. The MHC and graft rejection. Immunisation. Host defence mechanisms.

91354 ANATOMICAL PATHOLOGY

(6cp); 6 hpw
prerequisites 91312 Biology 2, 91317 Human Biology, 65022 Chemistry 2 (LS)

Provides a basic knowledge of disease processes, the body's responses to them (pathology) and the preparation of body tissues for examination of structure (histotechnology). The pathology strand of the subject includes the mechanisms of tissue injury and repair, the development of disease and the examination of the light microscopic appearance of these mechanisms. The histotechnology strand incorporates the chemistry of biological dyes, their uses in the laboratory to highlight normal tissue structures and demonstrate pathological tissue changes. These two disciplines are integrated to present an understanding of disease, its morphological appearance and the laboratory techniques used to interpret these changes.

91355 HAEMATOLOGY 1

(3cp); 3 hpw
prerequisites 91354 Anatomical Pathology, and either 91314 Microbiology I or 91313 Biochemistry I

Introduction to structure and function of blood as a tissue, proteins in blood and other tissues. Structure and function of the various types of blood cells and platelets; homeostasis and disorders of the blood; congenital and acquired haemolytic states; blood collection and quality control.

91356 DIAGNOSTIC CYTOLOGY 1

(8cp); 6 hpw
prerequisites 91354 Anatomical Pathology, 91355 Haematology I

The course provides instruction and practical application in the interpretation and diagnosis, at the light microscope level, of cell samples from all surfaces of the female genital tract. The morphologic features of normal states, inflammatory effects, physiologic patterns, hormonal effects, changes due to specific organisms and viruses, premalignant and malignant conditions and effects of treatment on cell morphology are covered. Principles and procedures of specimen collection, preparation and staining procedures, reporting methods and laboratory systems and procedures are included. At the end of the course the student should be able to diagnose a wide range of physiologic states as well as benign, premalignant and malignant conditions of epithelia of the female genital tract.

91357 DIAGNOSTIC CYTOLOGY 2

(8cp); 6 hpw
prerequisite 91356 Diagnostic Cytology I

Instruction and practical application in the interpretation of benign and malignant states from cell samples of anatomical sites other than the female genital tract. These include the respiratory tract, alimentary tract, urinary tract, serous cavities, central nervous system, breast and thyroid. Specimen collection procedures relevant to specific body sites are covered and there is emphasis on the collection and interpretation of fine needle aspiration samples. Epidemiology and aetiologic factors in malignant diseases and special procedures which complement cytologic diagnoses are included.

91358 HAEMATOLOGY 2

(8cp); 6 hpw
prerequisite 91355 Haematology 1

Correlation of physiological processes, pathological state and diagnostic tools in haematology; quality control and automation; cytogenetics; morphology of peripheral blood films and bone marrows.

91359 IMMUNOLOGY 2

(8cp); 6 hpw
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; clinical immunology; lymphokines and monoclonal antibodies; techniques applicable both in laboratory and industrial research including enzyme-linked immunoabsorbent assay (EIA); cell separation techniques will also be examined.

91360 QUANTITATIVE ECOLOGY

(6cp); 6 hpw
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 multi-species 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); 6 hpw
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); 6 hpw
prerequisite 91360 Quantitative Ecology

Basic concepts in ecophysiology; limiting factors, lethal limits, acclamation. 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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 6 hpw

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 ecosystems.

Industrial visits are an important component of this subject.

91370 FIELD STUDIES: SEMI-ARID ECOLOGY

(8cp); 6 hpw (run over 10–14 day excursion to far-western NSW in July every third year, alternating with 91371, ie, 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); 6 hpw (run over 10-day excursion to south-eastern NSW in December every third year, alternating with 91370, ie, 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); 9 hpw
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.

91373 APPLIED MYCOLOGY

(3cp); 3 hpw
corequisite 91330 Microbiology 2

The structure, function and classification of fungi, with particular reference to those of industrial, and agronomic significance. The growth processes and identification of fungi, as agents of biological breakdown and deterioration. Control procedures for fungi. Each student will undertake a literature survey related to their major study area.

91374 TISSUE CULTURE

(4cp); 3 hpw
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); 3 hpw (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 inter-institutional 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); 3 hpw
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 multi-species 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.

91379 ENVIRONMENTAL SCIENCE FOR ENGINEERS

(3cp); 3 hpw
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); 3 hpw

This subject is available only to students who are not currently enrolled in an undergraduate degree with the School of 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.

91381 PROJECT (HONOURS IN BIOTECHNOLOGY) P/T

(36cp); 3 semesters

For part-time students enrolled in Honours degree over a two-year period. Content is as for 91391.

91383 CLINICAL MYCOLOGY

(4cp); 3 hpw
prerequisite 91330 Microbiology 2
restricted to those students who have not previously completed 91373 Applied Mycology.

This is an elective subject which examines the structure, function and classification of fungi, with particular reference to those of clinical and veterinary significance. The growth processes and identification of fungi, as causative agents of human and animal disease. Each student will undertake a literature and/or laboratory project related to their major study area.

91384 PROJECT (HONOURS IN BIOMEDICAL SCIENCE) P/T

(36cp); 3 semesters

For part-time students enrolled in Honours degree over a two-year period. Content is as for 91394.

91387 PROJECT (HONOURS IN ENVIRONMENTAL BIOLOGY) P/T

(36cp); 3 semesters

For part-time students enrolled in Honours degree over a two-year period. Content is as for 91397.

91388 CONCEPTS IN BIOLOGY

(6cp); 6 hpw

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.

91391 PROJECT (HONOURS IN BIOTECHNOLOGY) F/T

(36cp); 2 semesters

For full-time students enrolled in Honours degree over a one-year period.

The project will take the form of an in-depth experimental or theoretical investigation into a problem of social or industrial relevance. The results of the investigation, together with a critical literature review, will form the basis of a thesis to be submitted by the last week of the Spring semester. Students are required to present a seminar on their work at the end of the year. Each student will be individually supervised by a full-time member of academic staff of the School throughout the course of the project.

91392 RESEARCH METHODOLOGY – HONOURS (BIOLOGICAL AND BIOMEDICAL)

(4cp)

91393 READING ASSIGNMENT – HONOURS (BIOLOGICAL AND BIOMEDICAL)

(8cp)

Each student is required to complete an extensive reading assignment and a 5,000 word written critical analysis on a topic different from their research project work.

91394 PROJECT (HONOURS IN BIOMEDICAL SCIENCE) F/T

(36cp); 2 semesters

For full-time students enrolled in Honours degree over a one-year period.

The project will take the form of an in-depth experimental or theoretical investigation into a problem of social or industrial relevance. The results of the investigation, together with a critical literature review, will form the basis of a thesis to be submitted by the last week of the Spring semester. Students are required to present a seminar on their work at the end of the year. Each student will be individually supervised by a full-time member of academic staff of the School throughout the course of the project.

91395 BIOCOMPUTING

(3cp); 3 hpw
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, Amdahl mainframe, and various software packages available to the biological and biomedical sciences.

91396 ADVANCED BIOCOMPUTING

(4cp); 3 hpw
prerequisite 91395 Biocomputing

Computer programming techniques with emphasis on structured programming using Pascal. Problem analysis and development of solution structures. Writing and verifying programs.

91397 PROJECT (HONOURS IN ENVIRONMENTAL BIOLOGY) F/T

(36cp); 2 semesters

For full-time students enrolled in Honours degree over a one-year period.

The project will take the form of an in-depth experimental or theoretical investigation into a problem of social or industrial relevance. The results of the investigation, together with a critical literature review, will form the basis of a thesis to be submitted by the last week of the Spring semester. Students are required to present a seminar on their work at the end of the year. Each student will be individually supervised by a full-time member of academic staff of the School throughout the course of the project.

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 of the School regarding individual supervision and, in addition, requires special permission of the Head of School.

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 of the School regarding individual supervision and, in addition, requires special permission of the Head of School.

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.

Postgraduate subjects

91403 MEDICAL IMAGING

(6cp); 3 hpw

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); 3 hpw

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); 3 hpw
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); 4.5 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); 9 hpw, 2 semesters
prerequisites all foundation subjects; equivalent to 91406

91408 PRINCIPLES OF BIOCOMPUTING

(5cp); 3 hpw
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. Introduction to software packages: wordprocessing

and editors, statistics, spreadsheets, databases, data acquisition and modelling. 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); 3 hpw

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); 3 hpw
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); 6 hpw

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91413 BIOMEDICAL SCIENCES 2

(10cp); 6 hpw

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91414 ANALYTICAL BIOCHEMISTRY PROJECT 1

(5cp); 3 hpw

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91415 ANALYTICAL BIOCHEMISTRY PROJECT 2

(6cp); 3 hpw

This subject may be undertaken only with special permission of the Head of Department of Biochemistry.

91417 CLINICAL LABORATORY MANAGEMENT

(6cp); 3 hpw
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 multi-phasic health screening; labour relations; methods evaluation; ethical and legal considerations affecting laboratory personnel.

91419 CASE STUDIES IN CLINICAL BIOCHEMISTRY

(6cp); 3 hpw
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 un-expected 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.

91420 BIOSYSTEMS

(4cp); 3 hpw
equivalent to 91420 Principles of Bioscience

This is an introductory course in biological sciences for graduates with little or no prior experience in this discipline.

Characteristics of living things, 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.

91421 PRINCIPLES OF HUMAN BIOLOGY

(10cp); 6 hpw
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); 6 hpw
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); 6 hpw
prerequisite 91410 Principles of Clinical Biochemistry

Chemical pathology of liver and kidney function; pathophysiological effects of alcohol abuse, viral infection and choleostasis. 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); 6 hpw

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); 6 hpw
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); 3 hpw

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); 3 hpw

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); 3 hpw

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); 3 hpw

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); 3 hpw

Blood flow – ultrasound, radioisotope techniques, electromagnetic effects. Cardiac output – Fick technique, radioisotopes. Neurological and electro-physiological 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); 3 hpw

equivalent to 98903 Experimental Design and Resources Management.

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); 6 hpw

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); 6 hpw

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

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

See subject description for 91456 Project 1 (Clinical Biochemistry).

91461 PHYSIOLOGICAL MODELLING

(5cp); 3 hpw

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, non-linear models. Integration errors. Validation of dynamic models against data.

91462 DIGITAL PROCESSING OF SIGNALS AND IMAGES IN MEDICINE

(5cp); 3 hpw

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); 6 hpw

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); 3 hpw

Intel assembler language. Use of Turbo Assembler debugger. Accessing systems hardware, data acquisition and control cards and interface cards. Interfacing to other languages (eg, 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); 3 hpw
prerequisites 91408 Principles of Biocomputing, 91436 Advanced Mathematics in 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); 6 hpw
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

(12 cp); 9 hpw
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 biotransformation. 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 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); 6 hpw
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, eg, fish, invertebrates, plants. Analysis and interpretation of results.

91474 STATISTICS IN BIOSCIENCE

(4cp); 3 hpw
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.

91480 EPIDEMIOLOGY AND DISEASE CONTROL

(4cp); 3 hpw 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); 3 hpw
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); 4 hpw 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); 3 hpw 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)
corequisite 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); 4 hpw 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); 3 hpw

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); 2 hpw

Overview of approaches to research; defining the problem, planning the experimental work; interpretation of laboratory data; critical review of published work.

91488 MOLECULAR MICROBIOLOGY

(8cp); 2 hpw lectures plus 1 week intensive practical session, during semester break, 6 hpw 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
prerequisite all foundation subjects
equivalent to 91484

91490 RESEARCH PROPOSAL DESIGN – MEDICAL MICROBIOLOGY

(4cp); 3 hpw equivalent

This subject complements 91487 and introduces the student to the preparation of internal laboratory reports, funding submissions and research proposals and to the preparation of material for scientific publication. The student will also develop, as part of this subject, 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 School'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

91498 SPECIAL READING ASSIGNMENT P/G – LIFE SCIENCES

(6cp)

This reading assignment can be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff of the School in order to gain agreement to be individually supervised and, in addition, requires special permission of the appropriate Subject Coordinator and Head of School.

91499 INDIVIDUAL PROJECT P/G – LIFE SCIENCES

(10cp)

This individual project can be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff of the School in order to gain agreement to be individually supervised and, in addition, requires special permission of the appropriate Subject Coordinator and Head of School.

Subjects offered for Faculty of Nursing or Acupuncture Students

91509 PHARMACOLOGY

(3cp); 3 hpw
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 – 4 hpw; Physical Science component – 2 hpw
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 – 4 hpw; Physical Science component – 2 hpw
for Faculty of Nursing students

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); 6 hpw
for Faculty of Nursing students

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 microorganisms which affect humans, their

epidemiology and methods of limiting their spread and controlling infection; alterations in nutrition and metabolism.

91521 PATHOPHYSIOLOGY 2

(6cp); 6 hpw; for Faculty of Nursing students

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); 3 hpw; for Faculty of Nursing students

Congenital neurological disorders associated with pre-natal 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. Electromyography (EMG), electroencephalography (EEG) and evoked potentials. Imaging techniques including magnetic resonance imaging (MRI), and computerised axial tomography (CAT) scanning and positron emission tomography (PET).

Postgraduate research degree subjects

91777 MASTER'S THESIS (BIOL AND BIOMED) F/T

This research project can be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff of the School in order to gain agreement to be individually supervised and, in addition, requires special permission of the appropriate Head of Department and Head of School.

91778 MASTER'S THESIS (BIOL AND BIOMED) P/T

This research project can be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff of the School in order to gain agreement to be individually supervised and, in addition, requires special permission of the appropriate Head of Department and Head of School.

91987 DOCTORAL THESIS (BIOL AND BIOMED) P/T

This research project can be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff of the School in order to gain agreement to be individually supervised and, in addition, requires special permission of the appropriate Head of Department and Head of School.

91988 DOCTORAL THESIS (BIOL AND BIOMED) F/T

This research project can be undertaken only following prior negotiation on the part of the student with a full-time member of academic staff of the School in order to gain agreement to be individually supervised and, in addition, requires special permission of the appropriate Head of Department and Head of School.

Interdisciplinary subjects

Master of Science in Coastal Resource Management

98201 ENVIRONMENTAL ECONOMICS AND ECOLOGICALLY SUSTAINABLE MANAGEMENT

(5cp); 3 hpw

Concentrates on the fundamental economic principles that underlie the allocation of coastal resources. The concept of ecologi-

cally 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.

98202 COASTAL PLANNING AND DEVELOPMENT

(5cp); 3 hpw
prerequisite 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.

98203 COASTAL MANAGEMENT AND ADMINISTRATION

(5cp); 3 hpw
prerequisite 98906 Coastal Resource Management 2

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 deal appropriately with external groups which impact on the achievement of these goals.

98204 COASTAL TOURISM, RECREATION AND NATURAL SYSTEMS MANAGEMENT

(5cp); 3 hpw
prerequisite 98906 Coastal Resource Management 2

Examines the management issues that arise from the use of coastal areas for leisure. The Australian coast is a significant site for recreation and tourist activities, particularly its natural areas. 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 develop techniques that will allow this use to continue.

98401 ESTUARINE AND COASTAL HYDRAULICS

(5cp); 3 hpw

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.

98601 COASTAL GEOLOGY

(5cp); 3 hpw

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.

98602 COASTAL ENVIRONMENTAL CHEMISTRY

(5cp); 3 hpw

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.

98603 GEOLOGICAL RESOURCES AND DEVELOPMENT IN COASTAL REGIONS

(5cp); 3 hpw
prerequisites 98601 Coastal Geology, 98401 Estuarine and Coastal Hydraulics
corequisite 98905 Resource Measurement and Assessment

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 mineral resources and their exploitation will be examined. Geological implications in coastal zone management and planning will be considered.

98701 LAW AND COASTAL RESOURCES

(5cp); 3 hpw
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.

98901 COASTAL RESOURCE MANAGEMENT 1

(6cp); 3 hpw

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. Regulatory frameworks, in Australia and overseas, and the roles of organisations involved in coastal resource management will be discussed. The interdisciplinary nature of coastal resources problems, conflicts, and issues will also be considered.

98902 BIOLOGICAL SYSTEMS

(6cp); 3 hpw
equivalent to 91420 Principles of Bioscience

This is an introduction to biological sciences for graduates with little or no prior experience in this discipline. Characteristics of living things, 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.

98903 EXPERIMENTAL DESIGN AND RESOURCES MANAGEMENT

(6cp); 3 hpw
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.

98904 COASTAL BIOLOGICAL RESOURCES

(5cp); 3 hpw
prerequisites 98901 Coastal Resource Management I, 98902 Biological Systems, 98201 Environmental Economics and Ecologically Sustainable Management

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.

98905 RESOURCE MEASUREMENT AND ASSESSMENT

(6cp); 3 hpw
prerequisites 98903 Experimental Design and Resource Management, 98904 Coastal Biological Resources

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.

98906 COASTAL RESOURCE MANAGEMENT 2

(6cp); 3 hpw
prerequisite 98901 Coastal Resource Management I

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.

98907 POLLUTION ASSESSMENT AND MONITORING

(5cp); 3 hpw
prerequisites all first semester subjects

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.

98908 INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT

(6cp); 3 hpw
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; 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.

98990 INDIVIDUAL RESEARCH PROJECT IN COASTAL RESOURCE MANAGEMENT

(16cp)
prerequisites completion of at least three semesters of coursework

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. Studies 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.

Graduate Certificate in Environmental Engineering and Management

47380 ENVIRONMENTAL ASSESSMENT AND PLANNING

(6cp)

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.

47381 INTRODUCTION TO ENVIRONMENTAL ENGINEERING AND MANAGEMENT

(6cp)

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, acid rain etc. Human impact on ecosystems: population growth; terrestrial ecosystems (forest and agricultural land); aquatic ecosystems (lake, river and ocean). Bio diversity; 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.

47382 WASTE MINIMISATION AND ADVANCES IN POLLUTION CONTROL

(6cp)

Environmental auditing of the product life cycle; leading-edge technologies of waste minimization 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.

47383 URBAN WATER QUALITY MANAGEMENT

(6cp)

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.

Other school or faculty subjects

Various general studies elective subjects available from other faculties are listed below. Further details are available from other faculty handbooks, the Information Office in each faculty, or from the School's Student Administration Office, Dunbar Building, St Leonards campus.

33101 MATHEMATICS 1 (LIFE SCIENCES)

(3cp); 3 hpw

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); 3 hpw

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); 3 hpw
prerequisite 33103 Statistics for Life 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.

65012 CHEMISTRY 1 (LIFE SCIENCES)

(6cp); 6 hpw
prerequisite HSC Science or equivalent

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

65022 CHEMISTRY 2 (LIFE SCIENCES)

(6cp); 6 hpw
prerequisite 65012 Chemistry I (Life Sciences)

Introduction to organic chemistry; functional groups; mechanism of reactions; stereochemistry. Reaction Kinetics; chemical equilibrium; acids and bases; solubility.

68041 PHYSICS 1 (LIFE SCIENCES)

(6cp); 6 hpw
prerequisite HSC Mathematics and Science or equivalent; corequisite 33101 Mathematics I (Life Sciences)

General introduction to mechanics, wave motion, optics, thermal physics, properties of matter and modern physics.

1994 SUBJECT CHANGES AND EQUIVALENCE

Undergraduate subjects

Old	*91373*	*Clinical and Applied Mycology*
New	91373	Applied Mycology (3cp)
	or	
New	91383	Clinical Mycology (4cp)
Old	*91216*	*Horticultural Procedures 1*
	with	
	91217	*Horticultural Procedures 2*
New	91242	Horticultural Procedures F/T (2 sem) (12cp)
Old	*91226*	*Horticultural Procedures 1 (2 sem)*
	with	
	91227	*Horticultural Procedures 2 (2 sem)*
New	91244	Horticultural Procedures P/T (4 Sem) (12cp)

Postgraduate subjects

Old	*91420*	*Principles of Bioscience*
New	91420	Biosystems
Old	*91448*	*Introduction to Toxicology*
New	91441	Principles of Toxicology
Old	*91444*	*Analytical Techniques in Toxicology*
	91445	*Biochemical Toxicology*
New	91471	Biochemical and Analytical Toxicology
Old	*91446*	*Field Surveillance and Management of Toxic Substances*
	91447	*Environmental Accumulation and Transformation of Toxic Substances*
New	91472	Field Surveillance, Fate and Management of Toxic Substances
Old	*91442*	*Toxicological Testing/Bioassays*
New	91473	Bioassays/Toxicological Testing
Old	*91433*	*Biostatistics (for Environmental Toxicology only)*
New	91474	Statistics in Bioscience
Old	*91450*	*Project in Environmental Toxicology P/T*
New	91475	Environmental Toxicology Project P/T
Old	*91460*	*Project in Environmental Toxicology F/T*
New	91476	Environmental Toxicology Project F/T

SCHOOL OF PHYSICAL SCIENCES

The School of Physical Sciences has established a sound tradition of providing quality teaching, research and consultancy over the last 25-plus years. The departments of the School are located on the City campus: Chemistry, Applied Geology and Materials Science are in Building 4 on Harris Street and Applied Physics is located in Building 1 on Broadway.

The School offers undergraduate degrees in Applied Chemistry, Applied Geology, Materials Science and Applied Physics, and these programs may be undertaken at both Pass and Honours degree levels.

In 1994, a new Honours degree program in Applied Chemistry/Forensic Science will commence, this being the first undergraduate degree program of this nature at any university in Australia.

The National Centre for Groundwater Management is a joint enterprise between the Faculty of Science and the Faculty of Engineering, and Master's and Graduate Diploma programs in Hydrogeology and Groundwater Management may be undertaken through the School of Physical Sciences.

The activities of the former Centre for Multidisciplinary Studies were transferred into the School of Physical Sciences in August 1993, and Graduate Diploma and Graduate Certificate courses in Occupational Health and Safety are offered by the School, together with Master's and Doctoral programs by research.

The School is also involved in the offering of two joint undergraduate degree programs. The Science/Education program was first introduced at UTS in 1991. 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 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 development of all of the above programs the School 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 School of Physical Sciences has always maintained strong links with industry. Staff maintain contact with industry by undertaking appropriate consulting activities, and in most of the above courses students spend 6 to 12 months working in a relevant industry. The School provides some assistance to students in finding these paid industrial training positions, but students are encouraged 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.

POSTGRADUATE COURSES

The School offers both PhD and Master's programs by research and thesis, the topics covering the broad range of the physical sciences, namely Chemistry, Applied Geology, Applied Physics and Materials Science together with Occupational Health and Safety. 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.

Prospective applicants should consult the UTS *Calendar* for regulations concerning admission to higher degrees.

RESEARCH ACTIVITIES

Consistent with the aims of the School in providing quality in both teaching and research, members of the staff of the School of Physical Sciences have been particularly successful in gaining research grants in recent years and these have allowed the purchase of major state-of-the-art equipment. Current areas of research interest in the School include:

Chemistry – physical, inorganic, organic, analytical, environmental, corrosion, forensic chemistry

Applied Geology – sedimentary, metamorphic and igneous geology, structural geology, tectonics, mineral deposits, coal and petroleum geology, engineering geology

Materials Science – adhesion, polymer technology, extractive metallurgy, composites, ceramics, physical metallurgy, welding, fracture mechanics

Applied Physics – electron microscopy and crystallography studies of materials, materials physics, solar energy physics, medical imaging

COURSE CODES

The following are codes for the courses offered in the School:

Undergraduate degrees

NOO3	Bachelor of Science in Science Education
NCO1	Bachelor of Applied Science (Applied Chemistry)
NCO2	Bachelor of Applied Science (Hons) Applied Chemistry
NGO1	Bachelor of Applied Science (Applied Geology)
NGO2	Bachelor of Applied Science (Hons) Applied Geology
NMO2	Bachelor of Applied Science (Materials Science)
NMO3	Bachelor of Applied Science (Hons) Materials Science
NPO1	Bachelor of Applied Science (Applied Physics)
NPO2	Bachelor of Applied Science (Hons) Physics
LL04	Bachelor of Science/Bachelor of Laws
NC04	Bachelor of Science (Honours) in Applied Chemistry – Forensic Science – code to be announced

Master's degrees (by coursework)

NO57	Master of Science (Hydrogeology and Groundwater Management)
PO55	Master of Occupational Health and Safety

Graduate Diploma courses

NO61	Graduate Diploma in Applied Science (Hydrogeology and Groundwater Management)
PO52	Graduate Diploma in Occupational Health and Safety

Graduate Certificate courses

PO53 Graduate Certificate in Occupational Health and Safety

PO54 Graduate Certificate in Occupational Health and Safety Management

Master of Science (by thesis)

NO56 Master of Applied Science (Groundwater Management)

NO53 Master of Science (Physical Sciences)

Doctor of Philosophy

NO54 PhD (Physical Sciences)

NO55 PhD (Groundwater Management)

UNDERGRADUATE COURSES

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 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 12 or 13 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 2 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 I

Autumn semester

33170 Basic Science Mathematics (3cp)
or
33171 Science Mathematics 1 (4cp)
31870 Introduction to Microcomputers (2cp)
65101 Chemistry 1M (6cp)
68101 Physics 1 (6cp)
91388 Concepts in Biology (6cp)
or
66011 Geology 1 (6cp)

Stage 2

Spring semester

33171 Science Mathematics 1 (4cp)
or
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

33172 Science Mathematics 2 (3cp)
or
33173 Science Mathematics 3 (3cp)
60301 Treatment of Scientific Data (3cp)
65301 Spectroscopy and Structure (7cp)
65302 Inorganic Chemistry (7cp)
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 1 [1]

Spring semester

65997 Industrial Training 2 [1]

Stage 5

Autumn semester

65501 Analytical Chemistry 2 (8cp)
65502 Chemical Process Control (8cp)
65503 Electronics and Instrumentation (5cp)
65504 Chemical Safety (3cp)

Stage 6

Spring semester

65601 Environmental Chemistry (8cp)
65602 Reaction Kinetics (4cp)
65603 Surface Chemistry (4cp)
Elective [2] (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)
33170 Basic Science Mathematics (3cp)
or
33171 Science Mathematics 1 (4cp)
91388 Concepts in Biology (6cp)
or
66011 Geology 1 (6cp)

Spring semester

65011 Chemistry 1 (6cp)
68101 Physics 1 (6cp)

Stage 2

Autumn semester

65021 Chemistry 2 (6cp)
68201 Physics 2 (6cp)

Spring semester

31871 Computing for Science (3cp)
33171 Science Mathematics 1 (4cp)
or
33172 Science Mathematics 2 (3cp)
65202 Organic Chemistry 1 (6cp)

Stage 3

Autumn semester

33172 Science Mathematics 2 (3cp)
or
33173 Science Mathematics 3 (3cp)
65301 Spectroscopy and Structure (7cp)
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/T [1]

Stage 4

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/T [1]

Stage 5

Autumn semester

65501 Analytical Chemistry 2 (8cp)
65604 Chemical Safety (3cp)

Spring semester

65502 Chemical Process Control (8cp)
65503 Electronics and Instrumentation (5cp)

Industrial requirements
65998 Industrial Training P/T [1]

Stage 6

Autumn semester

65601 Environmental Chemistry (8cp)
65602 Reaction Kinetics (4cp)

Spring semester

65603 Surface Chemistry (4cp)
Elective [2] (8cp)
Industrial requirements
65998 Industrial Training P/T [1]

[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.

[2] Chemistry electives offered (subject to satisfactory enrolments):
65701 Applied Organic Chemistry 1 (8cp)
65702 Applied Organic Chemistry 2 (8cp)
65703 Metallurgical Chemistry (8cp)
65704 Coordination and Organometallic Chemistry (8cp)
65705 Corrosion Science (8cp)
65706 Chemistry Project (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. The program provides students with exemptions in a number of subjects and enables certificate holders to complete the Applied Chemistry degree program part-time in five years. Students are admitted with advanced standing into Stage 2 of the course, and undertake the following program. Credit point values are shown in brackets.

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

33171 Science Mathematics 1 (4cp)
68101 Physics 1 (6cp)
65301 Spectroscopy and Structure (7cp)

Semester 2 or Year 2

33172 Science Mathematics 2 (3cp)
65302 Inorganic Chemistry (7cp)
60301 Treatment of Scientific Data (3cp)
68201 Physics 2 (6cp)

Semester 3 or Year 3

65404 Chemical Thermodynamics (4cp)
65403 Electrochemistry (4cp)
65402 Organic Chemistry 2 (new) (8cp)
65502 Chemical Process Control (8cp)

Semester 4 or Year 4

65503 Electronics and Instrumentation (5cp)
65401 Analytical Chemistry 1 (8cp)
65504 Chemical Safety (3cp)
65602 Reaction Kinetics (4cp)
65603 Surface Chemistry (4cp)

Semester 5 or Year 5

65501 Analytical Chemistry 2 (8cp)
65601 Environmental Chemistry (8cp)
Chemistry elective (8cp)

Exemptions granted to Associate Diploma holders
Chemistry 1M
Chemistry 2M
Organic Chemistry 1
Geology 1
Introduction to Microcomputers
Computing for Science
Basic Science Mathematics
Technical Communication

Bachelor of Applied Science (Honours) in Chemistry

The Honours degree in Applied 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 entry to the Honours degree program students must have an average mark of at least 65 for subjects in Stages 3 and 4.

SANDWICH PROGRAM – HONOURS DEGREE

Years 1 and 2

As for Stages 1 to 4 of the Pass course.

Year 3

Autumn semester

65504 Chemical Safety (3cp)
65551 Analytical Chemistry 2 (Adv) (8cp)
65595 Industrial Training (Honours)

Spring semester

65502 Chemical Process Control (8cp)
65503 Electronics and Instrumentation (5cp)
65595 Industrial Training (Honours)

Year 4

Autumn semester

65602 Reaction Kinetics (4cp)
65651 Environmental Chemistry (Adv)[1] (8cp)
65858 Honours Research Project (2 sem) (12cp)

Spring semester

65603 Surface Chemistry (4cp)
Honours elective [1,2] (8cp)

PART-TIME PROGRAM – HONOURS DEGREE

Years I to 4

As for Stages 1 to 4 of the Pass course.

Year 5

Autumn semester

65504 Chemical Safety (3cp)
65551 Analytical Chemistry 2 (Adv) (8cp)
65595 Industrial Training (Honours)

Spring semester

65502 Chemical Process Control (8cp)
65503 Electronics and Instrumentation (5cp)
65595 Industrial Training (Honours)

Year 6

Autumn semester

65602 Reaction Kinetics (4cp)
65651 Environmental Chemistry (Adv)[1] (8cp)

Spring semester

65603 Surface Chemistry (4cp)
Honours elective [1,2] (8cp)

Year 7

Autumn semester

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

[1] Interchangeable

[2] Chemistry Honours electives offered (subject to satisfactory enrolments):
65751 Applied Organic Chemistry 1 (Adv) (8cp)
65752 Applied Organic Chemistry 2 (Adv) (8cp)
65753 Metallurgical Chemistry (Adv) (8cp)
65754 Coordination and Organomet. Chemistry (Adv) (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-time[1] 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.

Industrial training[1] 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 (6cp)
68101 Physics 1 (6cp)
or
91388 Concepts in Biology (6cp)
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 (6cp)
68041 Physics Life Sciences (6cp)
or
68201 Physics 2 (6cp)
33171 Science Mathematics 1 (4cp)
or
33172 Science Mathematics 2 (3cp)

Stage 3

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)

Stage 4

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)

Autumn semester

66996 Industrial Training 1[1]

Stage 5[1]

Spring semester

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 6[1]

Autumn semester

66601 Exploration and Mining Geology (4cp)
66604 Field Project (9cp)
66602 Tectonics (3cp)
66603 Remote Sensing (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 (6cp)
68101 Physics 1 (6cp)
or
68041 Physics Life Sciences (6cp)

Stage 2

Autumn semester

65021 Chemistry 2 (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)
66404 Resource Management (3cp)
Industrial requirements
66998 Industrial Training P/T

Stage 5[1]

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 6[1]

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 (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

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)
66603 Remote Sensing (3cp)
66858 Project (Hons) (2 sem) (8cp)
Two of
66651 Convergent Margin Tectonics (Hons) (3cp)
66652 Conceptual Models 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 (Hons) (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 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 into 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 its applications.

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 Head of School 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 (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)
65021 Chemistry 2 (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)
68501 Nuclear Physics (3cp)
68505 Solid-state Physics (3cp)
68506 X-ray Techniques (3cp)
68507 Electron Microscopy Techniques (3cp)
68502 Field Theory (3cp)
68504 Microprocessors in Instrumentation (3cp)
68508 Project A (2 sem) (3cp)

Stage 6

Spring semester

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)
and
Elective (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 (6cp)
68101 Physics 1 (6cp)

Stage 2

Autumn semester

65021 Chemistry 2 (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

68501 Nuclear Physics (3cp)
68505 Solid-state Physics (3cp)
68507 Electron Microscopy Techniques (3cp)
Elective (3cp)
68996 Industrial Training 1

Spring semester

68503 Materials Physics (3cp)
68603 Applied Thermodynamics (3cp)
68604 Principles of Instrumentation (3cp)
68605 Transducers and Devices (3cp)
68997 Industrial Training 2

Stage 6

Autumn semester

68506 X-ray Techniques (3cp)
68502 Field Theory (3cp)
68504 Microprocessors in Instrumentation (3cp)
68508 Project A (2 sem) (3cp)

Spring semester

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

68503 Materials Physics[1] (3cp)
68502 Field Theory[1] (3cp)
68504 Microprocessors in Instrumentation[1] (3cp)
63395 Industrial Training (Honours)

Spring semester

68603 Applied Thermodynamics[1] (3cp)
68601 Quantum Physics 2[1] (3cp)
68602 Physical Optics[1] (3cp)
68997 Industrial Training 2

Year 4

Autumn semester

68035 Communication Physics (3cp)
68501 Nuclear Physics[1] (3cp)
68505 Solid-state Physics[1] (3cp)
68556 Advanced X-ray Techniques (4cp)
68557 Advanced Electron Microscopy Techniques (4cp)
68858 Project (Honours) (2 sem) (12cp)

Spring semester

68605 Transducers and Devices[1] (3cp)
68655 Advanced Solid-state Physics (4cp)
68604 Principles of Instrumentation[1] (3cp)
68553 Computer Modelling of Physical Systems (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.

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

68501 Nuclear Physics[1] (3cp)
68505 Solid-state Physics[1] (3cp)
68557 Advanced Electron Microscopy Techniques (4cp)
68995 Industrial Training (Honours)

Spring semester

68503 Materials Physics[1] (3cp)
68603 Applied Thermodynamics[1] (3cp)
68605 Transducers and Devices[1] (3cp)
68997 Industrial Training 2

Year 6

Autumn semester

68502 Field Theory[1] (3cp)
68504 Microprocessors in Instrumentation[1] (3cp)
68556 Advanced X-ray Techniques (4cp)
68553 Computer Modelling of Physical Systems (3cp)

Spring semester

68601 Quantum Physics 2[1] (3cp)
68655 Advanced Solid-state Physics (4cp)
68604 Principles of Instrumentation[1] (3cp)
68602 Physical Optics[1] (3cp)

Year 7

Autumn semester

68858 Project (Honours) (2 sem) (12cp)
68035 Communication Physics (3cp)

Spring semester

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 semester hours may be varied to allow students to develop individual interests.

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, ie, 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 more readily undertake postgraduate research.

ATTENDANCE PATTERNS – PASS DEGREE

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.

ATTENDANCE PATTERNS – HONOURS DEGREE

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 Pass degree course are required to undertake one calendar year of full-time, or the part-time equivalent, industrial training of an approved nature. 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 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 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 which is 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 (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 (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
21139 Business Organisation (2cp)
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 (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 (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 (6cp)
68101 Physics 1 (6cp)

Stage 2

Autumn semester

65021 Chemistry 2 (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 (2 sem) (4cp)

Spring semester

67602 Surface Properties of Materials (4cp)
67601 Materials Degradation (2cp)
67604 Composites (2cp)
67505 Project (2 sem) (4cp)
Industrial requirements
67998 Industrial Training P/T

Bachelor of Applied Science (Honours) in Materials Science

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 Science (Honours) in Applied Chemistry – Forensic Science

This course will be introduced in 1994. The forensic subjects will start in 1995.

This chemistry course provides a program of instruction which, together with a research project, will prepare students for entry to professional work in the fields 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

Stage 1

Autumn semester

65101 Chemistry 1M (6cp)
68101 Physics 1 (6cp)
66011 Geology 1 (6cp)
or
91388 Concepts in Biology (6cp)
33171 Science Mathematics 1 (4cp)
31870 Introduction to Microcomputers (2cp)

Stage 2

Spring semester

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

Stage 3

Autumn semester

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

Stage 4

Spring semester

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

Stage 5

Autumn semester

65551 Analytical Chemistry 2 (Adv) (8cp)
65503 Electronics and Instrumentation (5cp)
65504 Chemical Safety (3cp)
65556 Forensic Examination of Physical Evidence 1 (4cp)
65557 Forensic Toxicology 1 (5cp)

Stage 6

Spring semester

65657 Forensic Toxicology 2 (8cp)
65656 Forensic Examination of Physical Evidence 2 (6cp)
65603 Surface Chemistry (4cp)
91382 Introduction to Biological Fluids (3cp)
79990 Legal System (2cp)

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)

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 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)
33170 Basic Science Mathematics (3cp)
or
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)
33171 Science Mathematics 1 (4cp)
or
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)
33172 Science Mathematics 2 (3cp)
or
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 (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 (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 (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 (6cp)
68041 Physics (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 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.

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 (5cp)
70211 Law of Contract (4cp)
70311 Law of Tort (4cp)
70100 Skills 1 Legal Research (2cp)

Stage 2

Spring semester

33171 Science Mathematics 1 (4cp)
65025 Chemistry 2 (Sc Law) (5cp)
70113 Legal Process and History (5cp)
70211 Law of Contract (4cp)
70311 Law of Tort (4cp)
70200 Skills 2 Statutory Interpretation (2cp)

Stage 3

Autumn semester

60301 Treatment of Scientific Data (3cp)
66404 Resource Management (3cp)
70212 Criminal Law (7cp)
70312 Real Property (7cp)
70400 Skills 4 Computerised Legal Research (2cp)

Stage 4

Spring semester

33172 Science Mathematics 2 (3cp)
67201 Materials Science 1 (4cp)
68081 Physics 1 (Sc Law) (5cp)
70411 Commercial Transactions (7cp)
70611 Federal Constitutional Law (7cp)

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 5 Drafting (2cp)
91390 Biology 2 (Sc Law) (5cp)

Stage 7

Autumn semester

71114 Remedies and Restitution (7cp)
71113 Insolvency (3cp)
70600 Skills 6 Pleading (2cp)
Science electives[1](12cp)

Stage 8

Spring semester

71112 Conflict of Laws (7cp)
70300 Skills 3 Conveyancing (3cp)
Science electives[1](12cp)

Stage 9

Autumn semester

71211 Law of Evidence (7cp)
71201 Skills 12 Alternative Dispute Resolution (2cp)
70705 Skills 7 Litigation (4cp)
Science electives[1](11cp)

Stage 10

Spring semester

71212 Revenue Law (7cp)
70900 Skills Moot (3cp)
Science electives[1](6cp)
Law elective[2] (7cp)

[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)
65502 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).

POSTGRADUATE COURSES

POSTGRADUATE COURSES IN OCCUPATIONAL HEALTH AND SAFETY

Current statistics indicate that each year in Australia there are some 300,000 cases of work-related injury or disease, having an estimated national cost in terms of workers' compensation, lost production, rehabilitation and replacement and repair of equipment of more than $12 billion annually.

Education strategies need to focus on the development of prevention and management approaches to address the causes of occupational hazards and means of reducing their impact, in order to achieve significant improvements in the working environment and to alleviate occupational injury, disease and death. The implementation of preventive approaches requires a high level of understanding of the physical, chemical, biological and organisational nature of occupational hazards, and the development of specialised technical and management knowledge, and negotiation and participation skills and attitudes.

It is in pursuit of such a strategy that the University, with its broad range of technical and managerial discipline areas, has developed these courses.

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 as follows:

Graduates of the Graduate Diploma in Occupational Health and Safety will:

- 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/liaise 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; and
- 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, humanities, etc. 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, inspectors, etc 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 expected to do the occupational health subjects in Semesters 2 and 3, whereas those with an essentially non-technical background are expected 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

69313 Organisational Behaviour and Communication (3cp)
69322 Occupational Health in the Workplace (3cp)
69323 Human Factors/Ergonomic Design (3cp)
69331 Building Emergency Control (3cp)

Stage 2

Autumn semester

69324 Biological Hazards and Toxicology (3cp)
69333 Construction Safety (3cp)
69334 Occupational Health Services (3cp)
69343 Occupational Health and Safety Management (3cp)

or

69335 People and the Physical Environment (3cp)

Spring semester

69311 Occupational Health and Safety in Society (3cp)
69332 Chemical Safety (OHS) (3cp)
69341 Problem Solving/Risk Management (6cp)

Master of Occupational Health and Safety

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.

Graduate Certificates

Two Graduate Certificate programs are also offered, in Occupational Health and Safety, and 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.

Master of Applied 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, phone 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
44150 Computing for Groundwater Specialists[1]
44155 Groundwater Modelling
66015 Hydrogeochemistry
44151 Surface Hydrology and Groundwater
Elective 1
Elective 2

Spring semester

62329 Project

Electives

66017 Geopollution Management
66018 Groundwater Geophysics
44154 Groundwater Computing
66016 Geophysics and Remote Sensing of Groundwater Resources
An approved subject offered elsewhere

[1] This is a non-credit subject available to students whose computing background requires strengthening.

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
44150 Computing for Groundwater Specialists[1]
44155 Groundwater Modelling
66015 Hydrogeochemistry
44151 Surface Hydrology and Groundwater
Elective 1
Elective 2

Spring semester

62340 Project

Electives

As for Master of Science.

[1] This is a non-credit subject available to students whose computing background requires strengthening.

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 (eg, 3cp), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (eg, 4 hpw); 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 name of the subject coordinator, if known, 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); 3 hpw
prerequisites 33171 Science Mathemathics I or 33175 Science Mathematics I P/T, 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); 6 hpw

See 62412 Chemistry 1 P/T

65012 CHEMISTRY 1 (LIFE SCIENCES)

(6cp); 6 hpw

See 62417 Chemistry 1 F/T

65021 CHEMISTRY 2 F/T

(6cp); 6 hpw

See 62422 Chemistry 2 P/T

65022 CHEMISTRY 2 (LIFE SCIENCES)

(6cp); 6 hpw
prerequisite 65012 Chemistry I F/T (Life Sciences) or 62417 Chemistry I P/T (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); 6 hpw
subject coordinator Dr B Crawford

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 INTRODUCTION TO ORGANIC CHEMISTRY

(3cp); 3 hpw
prerequisite 65011 Chemistry I F/T or 62412 Chemistry I P/T
corequisite 65021 Chemistry 2 F/T or 62422 Chemistry 2 P/T
subject coordinator Dr G Renwick

Structures, bonding and nomenclature of organic compounds. Functional groups. Preparation properties and reactions of aliphatic hydrocarbons, alkyl halides, 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); 3 hpw
prerequisites 67201 Materials Science I, 33172 Science Mathematics 2, 62422 Chemistry 2 P/T 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); 4 hpw
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); 6 hpw
prerequisites 65406 Physical Chemistry I, plus all Stage I, 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); 3 hpw
prerequisites 65023 Engineering Chemistry, 67021 Materials Engineering I
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); 6 hpw
assumed knowledge: core of HSC 2-unit chemistry or equivalent

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

65201 CHEMISTRY 2M

(6cp); 6 hpw
prerequisite 65101 Chemistry IM F/T or equivalent

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

65202 ORGANIC CHEMISTRY 1

(6cp); 6 hpw

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

65301 SPECTROSCOPY AND STRUCTURE

(7cp); 6 hpw
prerequisites 65021 Chemistry 2 F/T or 65201 Chemistry 2M
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); 6 hpw
prerequisites 65101 Chemistry IM, 65201 Chemistry 2M
subject coordinator Dr A Cameron

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); 6 hpw
prerequisites all Stage 3 subjects
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); 6 hpw
prerequisites 65202 Organic Chemistry I, 65301 Spectroscopy and Structure
subject coordinator Associate Professor G Norton

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

65403 ELECTROCHEMISTRY

(4cp); 3 hpw
prerequisites all Stage I subjects, 33172 Science Mathematics 2, 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); 3 hpw
prerequisites 65301 Spectroscopy and Structure, 33172 Science Mathematics 2
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 charges. 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); 6 hpw
prerequisites all Stage 2 subjects, Stage 3 chemistry subjects, 65403 Electrochemistry, 65401 Analytical Chemistry I
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); 6 hpw
prerequisites all Stage 2 subjects, Stage 3 chemistry 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); 4 hpw
prerequisites all Stage 2 subjects, Stage 3 chemistry 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. Noie, digital filtering. Instrumentation – pH and conductivity measurement, op-amp based voltametric analyses, spectrometers, chromatographic instrumentation, vacuum technology.

65504 CHEMICAL SAFETY

(3cp); 2 hpw
prerequisite completion of Stage 3
subject coordinator Dr B Crawford

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 I–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); 6 hpw
prerequisites all Stage 3 subjects plus 65401 Analytical Chemistry I 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); 3 hpw
prerequisites all Stages I–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); 4 hpw
prerequisites 65401 Analytical Chemistry 1, 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); 6 hpw
prerequisites all Stages 1, 2 and 3 subjects
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); 3 hpw
prerequisites 65406 Physical Chemistry 1, 60301 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects
subject coordinator Dr D Kairaitis

Kinetics: Rate Laws, reaction mechanism, rate theory.

65603 SURFACE CHEMISTRY

(4cp); 3 hpw
prerequisites 65406 Physical Chemistry 1, 60301 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects
subject coordinator Dr A Ashby

Interfacial phenomena, surface active agents, catalysis, rheology.

65651 ENVIRONMENTAL CHEMISTRY (ADVANCED)

(8cp); 6 hpw
prerequisites all Stage 4 subjects plus 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); 4 hpw
prerequisites 65401 Analytical Chemistry 1, 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); 6 hpw
prerequisites 65551 Analytical Chemistry 2 (Advanced), 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); 6 hpw
prerequisites all Stages 1, 2 and 3 subjects and 65405 Organic Chemistry 2
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); 6 hpw
prerequisites 65405 Organic Chemistry 2 and all Stages 1, 2 and 3 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); 6 hpw
prerequisites all Stages 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.

65704 COORDINATION AND ORGANOMETALLIC CHEMISTRY

(8cp); 6 hpw
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); 6 hpw
prerequisites 65406 Physical Chemistry 1 plus all Stages 1, 2 and 3 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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 6 hpw
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); 4 hpw
prerequisite 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); 4 hpw
prerequisites 65551 Analytical Chemistry 2 (Advanced), 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); 4 hpw
prerequisites 65551 Analytical Chemistry 2 (Advanced), 65556 Forensic Examination of Physical Evidence I
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 I–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 Stage 5 of Honours program

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.

65990 THESIS (APPLIED CHEMISTRY) F/T

65991 THESIS (APPLIED CHEMISTRY) P/T AND EXT

65995 INDUSTRIAL TRAINING (APPLIED CHEMISTRY HONOURS)

prerequisites average mark of at least 65 for Stages I–4
subject coordinators Dr H Sharp, 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 HONOURS)

66011 GEOLOGY 1

(6cp); 6 hpw
subject coordinator Mrs J Nicholson

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); 3 hpw
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 IM

(6cp); 6 hpw

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); 4 hpw
prerequisite 66011 Geology I or 66101 Geology IM
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); 2 hpw
prerequisite 66011 Geology I or 66101 Geology IM
subject coordinator Mrs J Nicholson

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); 3 hpw
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); 8 hpw
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 or rock types. Five-day field camp with 66302 Sedimentary Geology.

66302 SEDIMENTARY GEOLOGY

(6cp); 6 hpw
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. Fieldwork.

66303 GEOCHEMISTRY

(3cp); 3 hpw
corequisite 66301 Mineralogy and Petrology
subject coordinator Dr S Sangameshwar

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); 4 hpw
prerequisites 66301 Mineralogy and Petrology, 66302 Sedimentary Geology
subject coordinator Mrs J Nicholson

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); 6 hpw
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 fieldwork.

66403 ECONOMIC GEOLOGY

(4cp); 4 hpw
prerequisites 66301 Mineralogy and Petrology, 66302 Sedimentary Geology
subject coordinator Dr S Sangameshwar

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

66404 RESOURCE MANAGEMENT

(3cp); 3 hpw
prerequisite 66202 Lithology
subject coordinator Mrs J Nicholson

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); 3 hpw
prerequisites 66201 Geological Mapping, 66302 Sedimentary Geology
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; fieldwork.

66406 EXPLORATION GEOPHYSICS

(4cp); 4 hpw
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. Fieldwork.

66501 ENGINEERING AND ENVIRONMENTAL GEOLOGY

(5cp); 6 hpw 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); 4 hpw
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. Ecologites. Metamorphic belts. Metamorphism and crystal evolution. Fieldwork.

66503 FOSSIL FUELS

(4cp); 4 hpw
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 excursions.

66504 EXPLORATION GEOCHEMISTRY

(2cp); 3 hpw
corequisite 66403 Economic Geology
subject coordinator Dr S Sangameshwar

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); 4 hpw
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-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 on hand-specimen, mine and regional scales; metamorphism, deformation and remobilisation or ore deposits; tectonics and ore distribution; the evolution with geologic time of structure, tectonics and ore deposits. Fieldwork.

66506 ADVANCED GEOLOGICAL MAPPING

(3cp); 3 hpw
prerequisites 66201 Geological Mapping, 66402 Structural Geology
subject coordinator Professor E Leitch

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); 3 hpw
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. Fieldwork.

66553 FOSSIL FUELS

(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); 4 hpw
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); 3 hpw
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); 4 hpw
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); 9 hpw
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); 4 hpw
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); 4 hpw
prerequisites 66402 Structural Geology, 66403 Economic Geology
subject coordinator Dr S Sangameshwar

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. Fieldwork.

66607 ADVANCED ENGINEERING GEOLOGY

(4cp); 4 hpw
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); 2 hpw
subject coordinator Associate Professor B Franklin

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

66651 CONVERGENT MARGIN TECTONICS (HONOURS)

(5cp)
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

(3cp)
prerequisites Stage 5 Honours subjects
subject coordinators Dr S Sangameshwar and Dr A Dunlop (University of NSW)

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

(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.

66858 PROJECTS (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.

66990 THESIS (APPLIED GEOLOGY) F/T

66991 THESIS (APPLIED GEOLOGY) P/T AND EXT

66995 INDUSTRIAL TRAINING (HONOURS)

prerequisites Stage 4 subjects
subject coordinators Mrs J Nicholson and 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

66998 INDUSTRIAL TRAINING

67011 MATERIALS 1

(3cp); 3 hpw

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

67021 MATERIALS ENGINEERING 1

(3cp); 3 hpw
prerequisites 42611 Mechanics I, 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); 3 hpw
corequisites 65023 Engineering Chemistry, 43521 Mechanics of Solids I

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 and 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); 3 hpw
prerequisite 68031 Engineering Physics I (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); 3 hpw
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 multi-degree 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); 4 hpw
prerequisites 65011 Chemistry I F/T, 68101 Physics I
corequisites 65021 Chemistry 2 F/T, 68201 Physics 2, 33171 Science Mathematics I
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); 2 hpw
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); 4 hpw
prerequisites 67201 Materials Science I, 33172 Science Mathematics 2, 68201 Physics 2, 65021 Chemistry 2 F/T
subject coordinator Dr M Stevens

Introduction to quantum mechanics and quantum numbers applied to atomic structure. Bond theory of solids. Electrical properties – conductivity, semi-conduction 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); 3 hpw
prerequisites 67201 Materials Science I, 65024 Introductory Organic Chemistry
corequisite 67301 Materials Science 2
subject coordinator Dr G Renwick

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); 3 hpw
prerequisite 67201 Materials Science I
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); 3 hpw
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-anistropic 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); 4 hpw
prerequisite 67302 Polymers 1
subject coordinator Dr G Renwick

The mechanisms, kinetics and statistics of polymerisation reactions. Copolymerisation reactions. Polymerisation conditions. The solution properties of polymers. Polymer fractionation and characterisation (DSC, TGA, etc). Molecular weights and their determination. Fillers, plasticisers and other additives. Industrial excursions.

67403 CERAMICS 1

(4cp); 4 hpw
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); 4 hpw
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); 4 hpw
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); 2 hpw
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); 4 hpw
prerequisites 67403 Ceramics 1, 65031 Thermodynamics
subject coordinator Dr A Ray

Structure and composition of glasses. Phase transformations and nucleation in glass systems and the applications in glass ceramics and glazes. Chemical and physical strengthening of glasses and glass ceramics. Glass fibres and their applications in optical

communication. Raw materials used in the manufacture of commercial glasses. Industrial excursions.

67502 POLYMERS 3

(4cp); 4 hpw
prerequisite 67302 Polymers I
subject coordinator Dr G Renwick

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. Other organic materials (fuels, oil, paper). Paint, coating, adhesives. Industrial excursions.

67503 CERAMICS 3

(4cp); 4 hpw
prerequisites 67301 Materials Science 2, 67303 Mechanical Properties of Materials, 67403 Ceramics I
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); 4 hpw
prerequisites 67404 Physical Metallurgy I, 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 MATERIAL 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 (Hons), 67402 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 I, 67402 Polymers 2, 67303 Mechanical Properties of Materials

The rheology of polymer melts. Processing, fabrication and design in polymer technology. Polymeric laminates. 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 I; 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 its 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 I, 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); 2 hpw
prerequisites 67403 Ceramics I, 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); 4 hpw
prerequisites 65031 Thermodynamics, 67402 Polymers 2, 67405 Physical Metallurgy 2, 67403 Ceramics I
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); 2 hpw
prerequisites 67405 Physical Metallurgy 2, 67403 Ceramics I, 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 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); 2 hpw
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 Professor J Unsworth

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 (Hons), 67553 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.

67990 THESIS (MATERIALS SCIENCE) F/T

67991 THESIS (MATERIALS SCIENCE) P/T AND EXT

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 P/T (MATERIALS SCIENCE)

68011 ENGINEERING PHYSICS (MECHANICAL)

(3cp); 3 hpw
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); 3 hpw
prerequisites 68011 Engineering Physics (Mechanical), 33121 Engineering Mathematics I

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); 6 hpw
corequisites 33120 Engineering Mathematics I, 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); 6 hpw
corequisite 33120 Engineering Mathematics I
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); 3 hpw
prerequisites 33120 Engineering Mathematics I, 68031 Engineering Physics I (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); 3 hpw
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); 3 hpw
prerequisite 68031 Engineering Physics I (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); 3 hpw
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); 6 hpw
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); 4 hpw
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); 6 hpw
corequisites 33170 Basic Science Mathematics or 33171 or 33175 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); 6 hpw
prerequisites 68101 Physics I; corequisites 33171 or 33175 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); 3 hpw
prerequisites 68201 Physics 2, 33171 Science Mathematics 1

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); 3 hpw
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); 3 hpw
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); 6 hpw
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); 3 hpw
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. Orthonomality, interpretation of solutions.

68402 APPLIED MECHANICS

(3cp); 3 hpw
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); 3 hpw
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); 3 hpw
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); 3 hpw
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); 4 hpw
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); 3 hpw
prerequisite 68401 Quantum Physics I
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); 3 hpw
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. Place 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); 3 hpw
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); 3 hpw
prerequisites 31871 Computing for Science, 68304 Electronics I

Computer architecture; machine language, computer interfacing; applications of microcomputers in instrumentation, the FORTH language.

68505 SOLID-STATE PHYSICS

(3cp); 3 hpw
prerequisite 68401 Quantum Physics I
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.

68506 X-RAY TECHNIQUES

(3cp); 3 hpw
prerequisites 68301 Physics 3, 67202 Introduction to Crystallography
subject coordinator Professor A Moon

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.

68507 ELECTRON MICROSCOPY TECHNIQUES

(3cp); 3 hpw
prerequisites 68301 Physics 3, 68302 Applied Optics
subject coordinator Professor A Moon

Electron microscopy; electron optics, transmission electron microscopy and scanning electron microscopy. Image formation and contrast mechanisms. Electron diffraction. X-ray microprobe analysis.

68508 PROJECT A

(6cp); 2 semesters

68553 COMPUTER MODELLING OF PHYSICAL SYSTEMS

(3cp); 3 hpw
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); 3 hpw
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 diffractormetry, 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); 3 hpw
prerequisites 68301 Physics 3, 68302 Applied Optics, 33330 Physical Mathematics
subject coordinator Professor A Moon

Image formation in an electron microscope. Diffraction theories. Contract mechanisms. The transmission and scanning electron microscope. Microprobe and nanoprobe analysis.

68601 QUANTUM PHYSICS 2

(3cp); 3 hpw
prerequisite 68401 Quantum Physics I; corequisite 33330 Physical Mathematics
subject coordinator Dr G Anstis

Quantum mechanics; time-independent perturbation theory, variational principle, applications. Rotational and vibrational spectra of molecules. Multi-electron 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); 3 hpw
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); 3 hpw
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); 3 hpw
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); 3 hpw;
prerequisite 68304 Electronics I, 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)

68655 ADVANCED SOLID-STATE PHYSICS

(4cp); 3 hpw
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); 6 hpw
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); 3 hpw
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

(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)

68990 THESIS (APPLIED PHYSICS) F/T

68991 THESIS (APPLIED PHYSICS) P/T AND EXT

68995 INDUSTRIAL TRAINING (APPLIED PHYSICS HONOURS)

15 hpw
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 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)

99311 OCCUPATIONAL HEALTH AND SAFETY IN SOCIETY

(3cp); 2 hpw

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 con-

structing and changing them and will explore the strategies available to create safer and healthier working situations.

99312 OCCUPATIONAL HAZARD ANALYSIS

(6cp); 4 hpw

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.

99313 ORGANISATIONAL BEHAVIOUR AND COMMUNICATION

(3cp); 2 hpw

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.

99321 QUANTITATIVE ASSESSMENT AND MEASUREMENT

(3cp); 2 hpw

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.

99322 OCCUPATIONAL HEALTH IN THE WORKPLACE

(3cp); 2 hpw

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.

99323 HUMAN FACTORS/ERGONOMIC DESIGN

(3cp); 2 hpw

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 these will be applied to examples of product and equipment design, for safety combined with functionality.

99324 BIOLOGICAL HAZARDS AND TOXICOLOGY

(3cp); 2 hpw

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, chemicals, etc and text methods, hygiene and sanitation.

99325 DATA ANALYSIS IN OCCUPATIONAL HEALTH AND SAFETY

(3cp); 2 hpw

The collection and organisation of data, and access to and use of data bases 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 data bases.

99331 BUILDING EMERGENCY CONTROL

(3cp); 2 hpw

This subject will develop in students an awareness of the various types of emergencies and an understanding of the various scenarios and their 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.

99332 CHEMICAL SAFETY (OHS)

(3cp); 2 hpw

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.

99333 CONSTRUCTION SAFETY

(3cp); 2 hpw

The construction industry continues to be one of the major areas of work-related injury. This subject will discuss all aspects related to 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.

99334 OCCUPATIONAL HEALTH SERVICES

(3cp); 2 hpw

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.

99335 PEOPLE AND THE PHYSICAL ENVIRONMENT

(3cp); 2 hpw

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 require the application of probability and reliability techniques.

99341 RISK MANAGEMENT

(6cp); 4 hpw

This subject introduces the following three aspects of risk, integrating them by use of a case study, supported by audiovisual 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, and ways in which an enterprise can protect itself against the consequences which may follow at each step from accepting risk.

(3) Risk as a personal factor which must be faced individually, by managers, together with suggestions for how that may be achieved.

99342 LEGAL ASPECTS OF OCCUPATIONAL HEALTH AND SAFETY

(3cp); 2 hpw

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.

99343 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

(3cp); 2 hpw

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.

99351 OCCUPATIONAL HEALTH AND SAFETY PROJECT

(24cp)

Subjects offered by the National Centre for Groundwater Management

44150 COMPUTING FOR GROUNDWATER SPECIALISTS

3 hpw
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.

44151 SURFACE HYDROLOGY AND GROUNDWATER

(5cp); 3 hpw

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.

44152, 44153 GROUNDWATER PROJECTS

(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. Topics include investigation consisting of one or more of: modelling, laboratory experiments, fieldwork related to hydrogeology and groundwater management, contaminant transport and processes, waste disposal and groundwater impact.

44154 GROUNDWATER COMPUTING

(5cp); 3 hpw

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.

44155 GROUNDWATER MODELLING

(5cp); 5 hpw

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); 3 hpw

Provides a knowledge of geological occurrence and hydraulics of groundwater flow, exploration techniques, extraction engineering and field management.

66015 HYDROGEOCHEMISTRY

(5cp); 3 hpw

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); 3 hpw

A theoretical and practical examination of the geophysical and remote sensing techniques applicable to groundwater resources evaluation and other environmental problems.

66017 GEOPOLLUTION MANAGEMENT

(5cp); 3 hpw

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); 3 hpw

This subject presents an advanced application of geophysical techniques for groundwater research, resource management and includes contamination assessment and monitoring.

66025 CONTAMINATED SITE MANAGEMENT

(5cp); 3 hpw

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.

Subjects offered by other faculties

21139 BUSINESS ORGANISATION

(2cp); 2 hpw

Examines the various types of private sector business in Australia and studies the manner in which these businesses are managed; and develops decision making, problem solving and planning skills.

31870 INTRODUCTION TO MICROCOMPUTERS

(2cp); 2 hpw

Structure and use of computers, including the use of software packages. hardware and software; operating systems (MS-DOS); file management; spreadsheets, word processing and databases.

31871 COMPUTING FOR SCIENCE

(3cp); 3 hpw
prerequisites 31870 Introduction to Microcomputers, 33170 Basic Science Mathematics

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.

33170 BASIC SCIENCE MATHEMATICS

(3cp); 3 hpw

Basic mathematics for scientists. Quadratic and linear equations. Functions; limits; continuity; derivatives. Trigonometric functions. Introduction to integral calculus.

33171 SCIENCE MATHEMATICS 1

(4cp); 4 hpw
prerequisite 33170 Basic Science Mathematics or 70/100 2-unit HSC Mathematics or 100/150 3-unit HSC Mathematics, or permission

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); 3 hpw
prerequisite 33171 Science Mathematics 1

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, mas 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); 3 hpw
prerequisite 33171 Science Mathematics 1; corequisite 33172 Science Mathematics 2

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); 3 hpw
prerequisites 33172 Science Mathematics 2, 33173 Science Mathematics 3

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); 3 hpw
prerequisite 33221 Engineering Mathematics 2A

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' 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

(2cp); 2 hpw

The principles and practice of effective written and oral reporting, designed to help students in research, 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.

79990 LEGAL SYSTEM

(2cp); 1 hpw
subject coordinator Professor N Carter

This subject will provide the student of forensic science with an understanding of the law and legal system.

79991 FORENSIC SCIENCE CASE STUDY

(8cp); 5 hpw
prerequisites all Stage 6 subjects
subject coordinator Professor N Carter

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.

91382 INTRODUCTION TO BIOLOGICAL FLUIDS

(3cp); 2 hpw
prerequisites 65401 Analytical Chemistry 1, 65557 Forensic Toxicology 1; corequisite 65657 Forensic Toxicology 2
subject coordinator Associate Professor A Dawson

This is an introductory course of the chemistry and biochemistry of biological fluids. Topics will include DNA profiling, blood analysis/grouping, examination of fluids such as sweat, semen, saliva.

SUBJECT NAMES IN ALPHABETICAL ORDER

Statistics in Bioscience	91474
Structural Geology	66402
Surface Chemistry	65603
Surface Hydrology and Groundwater	44151
Surface Properties of Materials	67602
Technical Communication	66401
Tectonics	66602
Terrestrial Ecology	91365
Thermodynamics	65031
Thermodynamics and Energy	68403
Thermodynamics and Energy S	68743
Thesis (Applied Chemistry) F/T	65990
Thesis (Applied Chemistry) P/T and Ext	65991
Thesis (Applied Geology) F/T	66990
Thesis (Applied Geology) P/T and Ext	66991
Thesis (Applied Physics) F/T	68990
Thesis (Applied Physics) P/T and Ext	68991
Thesis (Materials Science) F/T	67990
Thesis (Materials Science) P/T and Ext	67991
Tissue Culture	91374
Transducers and Devices	68605
Treatment of Scientific Data	60301
Urban Water Quality Management	47383
Vacuum and Thin Film Physics	68405
Virology	91337
Waste Minimisation and Advances in Pollution Control	47382
Written and Oral Reporting	51368
X-ray Techniques	68506

CENTRES AND INSTITUTES WITHIN THE FACULTY

There are seven 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 Environmental Toxicology (run jointly with the EPA), the Institute for Coastal Resource Management, the Centre for Biomedical Technology, the Cooperative Research Centre for Cardiac Technology and the National Centre for Groundwater Management (a joint venture with the Faculty of Engineering).

Centre for Science Communication

The aims and objectives of the Centre for Science Communication are to promote science and technology to the general public; to organise and develop undergraduate and postgraduate courses in science communication; to organise information programs on science and technology to schools; to coordinate research into science communication; and to promote UTS as one of Australia's leading technological institutions.

There are several programs under development, including 'Horizons of Science' fora, communication workshops for research workers, public lectures with media briefings; and development of a media and schools resource service. The Centre is located in Building 2 of the City campus.

Centre for Materials Technology

The Centre for Materials Technology, established within the School of Physical Sciences, offers expertise, education, instrumentation and innovation in the areas of materials science and engineering. The aim of the Centre 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 Environmental Toxicology

The Environment Protection Authority (EPA) in conjunction with the University, operates a Centre for Environmental Toxicology located in the School of Biological and Biomedical Sciences. The Centre has facilities for toxicological testing and chemical analysis. It carries out applied research in the area of environmental toxicology and develops toxicological tests and monitoring procedures for the Australian environment. It also provides a research centre for students and visiting scientists and a toxicological testing service for industry. EPA staff of the Centre are involved in teaching aspects of the Master's course in Environmental Toxicology.

Institute for Coastal Resource Management

The Institute for Coastal Resource Management is an inter-faculty 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 Schools of Biological and Biomedical Sciences, Physical Sciences, Civil Engineering, Leisure and Tourism Studies, Graduate School of Business, Law, and Building Studies are involved. The Institute is located in the School of Biological and Biomedical Studies.

The Institute aims to offer interdisciplinary professional courses, conduct relevant research in the coastal zone for industry, government and the community, identifying problem areas and solutions, and enhancing the community awareness of the coastal zone and its problems. These developments, solutions and expertise will be exported to neighbouring countries of the Pacific region and other collaborative linkages will be developed in north America and Europe.

Centre for Biomedical Technology

The Centre for Biomedical Technology is an inter-faculty network of research and education teams within the University, working in the field of biomedical technology. 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. The Centre is located in the School of Biological and Biomedical Sciences.

Staff from the Schools of Biological and Biomedical Sciences, Electrical Engineering, Mechanical Engineering, Physical Sciences, Mathematical Sciences, Computing Sciences, Nursing Therapeutics and Leisure and Tourism Studies are involved with the administrative office at the School of Biological and Biomedical Sciences.

The Centre aims to facilitate and coordinate biomedical technology research, promote continuing education in the field, develop quality medical devices and products and provide consultation to the biomedical technology industry. Research programs are in cardiac electrophysiology and technology, medical imaging, biomathematical modelling, medical instrumentation, diabetes and nursing-technology interface. This Centre is the key participant in the Cooperative Research Centre for Cardiac Technology.

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. A further ten organisations including industry, hospitals, universities and CSIRO are partners in the Centre. These include Telectronics Pacing Systems, Royal North Shore Hospital, CSIRO, University of New South Wales, Westmead Hospital, St Vincents Hospital, Associative Measurement, AMRAD, University of Queensland and University of Sydney.

Participants in the CRC for Cardiac Technology from UTS include members from 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 the 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.

National Centre for Groundwater Management

The National Centre for Groundwater Management is a joint enterprise between the Faculty of Science and the Faculty of Engineering, with the general aims of researching groundwater problems of strategic national importance, co-ordinating 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 Council (now corporation) as a National Centre for research and consultancy training in groundwater and environmental applications.

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 postgraduate courses section for the School of Physical Sciences. For further enquiries please contact

Associate Professor Michael Knight
Director, National Centre for Groundwater Management, Room 2/429, Tel 330 1984.

FACULTY BOARD IN SCIENCE

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
Professor E Leitch

Head, Department of Applied Physics
Associate Professor R W Cheary

Head, Department of Biochemistry and Physiology
Dr J Swann

Head, Department of Chemistry
Associate Professor G Norton

Head, Department of Materials Science
Professor J Unsworth

Head, Department of Microbiology
To be announced

Department of Pathology and Immunology
Professor R L Raison
Professor G B Smith

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

Faculty staff members

SCHOOL OF BIOLOGICAL AND BIOMEDICAL SCIENCES

Academic staff

Associate Professor R T Buckney
Mrs K Cordatos
Dr J T Ellis
Dr A M George
Dr N Lovell
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 A Ray
Dr G Skilbeck
Dr M Stevens
Dr R L S Woolcott
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 member

Associate Professor M J Knight

SCHOOL BOARD IN BIOLOGICAL AND BIOMEDICAL SCIENCES

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Dr B Bloomfield
Dr K Broady
Associate Professor K R Brown
Associate Professor R Buckney
Associate Professor M Burchett
Dr C Clarke
Associate Professor A Dawson
Ms B Dunston
Dr L De Filippis
Ms D Edwards
Mr D Edwards
Dr A George
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Dr R Lim
Dr N Lovell
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Dr S Sangameshwar
Dr H Sharp
Dr G Skilbeck
Dr R Sleet
Professor G Smith
Associate Professor W Stern
Ms L Taaffe
Professor J Unsworth
Dr R Woolcott
Dr W Yeung
Dr B Young

SCHOOL AND COURSE ADVISORY COMMITTEES

The composition of school advisory committees in the Faculty of Science usually contains a majority of members external to the School, 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 School;
One or more staff members of the School;
External members from business and/or industry, professional associations and recent graduates of the School.

The Faculty of Science has a school advisory committee for each of its two schools. In addition to this, there are four course advisory committees in the School of Physical Sciences.

School Advisory Committee: School of 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 of School

Associate Professor K R Brown
Head, Department of Applied Biology

Dr J Swann
Head, Dept of Biochemistry and Physiology

To be announced
Head, Dept of Microbiology

Professor R L Raison
Head, Dept of Pathology and Immunology

Associate Professor R T Buckney
Alternate Head of School

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 L Schwarzkopf
Research Director, Arthur Webster Pty Ltd

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, Ryde School of Horticulture

Dr R Smart
Department of Nuclear Medicine, St George Hospital

School Advisory Committee: School of Physical Sciences

Internal members

Professor A R Moon
Dean, Faculty of Science

Associate Professor R W Jones
Head of School

External members

Dr A R Collins
Group General Manager Pancontinental Mining Limited

Dr G Batley
Senior Principal Research Scientist, Centre for Advanced Analytical Chemistry, CSIRO Division of Coal and Energy

Dr B Window
Senior Principal Research Scientist, CSIRO Division of Applied Physics

Dr K Reeve
Ceramics Section, ANSTO

Course Advisory Committee: Department of Applied Geology in the School of Physical Sciences

Internal members

Professor A R Moon
Dean, Faculty of Science

Associate Professor R W Jones
Head of School

Professor E C Leitch
Head of Department

External members

Dr A R Collins (Chair)
Group General Manager, Pancontinental Mining Limited

Dr I Wallace
Manager, Technical Services, Boral Research, Boral Resources (NSW) Pty Limited

Ms M McMahon
Director, McMahon Associates Pty Limited

Dr D Hobday
Director, In-situ Australia Pty Limited

Dr M Smyth
Principal Research Scientist, Division of Petroleum Resources, CSIRO

Dr G Roder
Exploration Manager, Bridge Oil

Course Advisory Committee: Department of Applied Physics in the School of Physical Sciences

Internal members

Professor A R Moon
Dean, Faculty of Science

Associate Professor R W Jones
Head of School

Associate Professor R W Cheary
Head of Department

External members

Dr B Window (Chair)
Senior Principal Research Scientist, CSIRO Division of Applied Physics

Ms C Astley-Boden
First Assistant Secretary (Office of Chief Scientist), Office of the Prime Minister

Dr N Cutmore
Senior Project Manager, In-Line Analysis, CSIRO Division of Mineral and Process Engineering, Lucas Heights Research Laboratories

Mr B Hutton
Chief Physicist, Dept of Nuclear Medicine, Royal Prince Alfred Hospital

Mr N Crothers
Manager Technical Department, Choice Magazine, Australia Consumers Association

Course Advisory Committee: Department of Chemistry in the School of Physical Sciences

Internal members

Professor A R Moon
Dean, Faculty of Science

Associate Professor R W Jones
Head of School

Associate Professor G P Norton
Head of Department

External members

Dr G Batley (Chair)
Senior Principal Research Scientist, Centre for Advanced Analytical Chemistry, 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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ISSN 1036-0719

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