UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

1993 HANDBOOK

FACULTY OF SCIENCE

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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. There are eight departments within the faculty which offer 10 undergraduate honours degree programs, five masters degrees by coursework and Masters and PhD programs by research. All the undergraduate degrees offered by the School of Physical Sciences are cooperative in nature which means that there is a mandatory period of industrial training during the degree studies.

The faculty's plans for the future includes the development of honours programs in applied chemistry and applied biology majoring in forensic science, the introduction of combined science/business degrees and the development of environmental management studies at undergraduate and postgraduate level.

Research within the faculty is mainly concentrated in Centres and Institutes of which there are six: the Centre for Environmental Toxicology, the Centre for Materials Technology, the Centre for Biomedical Technology, the Centre for Science Communication, and the Institute for Coastal Resource Management.

Recently the National Centre for Groundwater Management has been jointly established between the Faculties of Science and Engineering.

I am proud of our graduates who enjoy a reputation for excellence, relevance and dedication; they are sought after by employers and have helped to produce an international reputation for the Faculty of Science.

I have great pleasure in welcoming new students to the faculty, and on behalf of all the staff wish you a pleasant and successful stay within the Faculty of Science.

Professor Bob Breakspere

UNIVERSITY MISSION STATEMENT

UTS provides higher education aimed at enhancing professional practice, advancing the technologies and generally contributing to the creation, application and extension of knowledge for the benefit of society. The University is concerned to improve educational provision for students from a diversity of backgrounds by valuing exemplary teaching and developing flexible study patterns. It is committed to close interaction with the professions, business, government, science and the human services in promoting scholarship, research, continuing education, consultancy and technology transfer.

Objectives

1. To ensure high standards in teaching and professional experience in all academic programs.

2. To achieve an increased level of research funding and postgraduate research students, and increased research experience of staff.

3. To develop library resources of the highest standard and appropriate to faculty and student needs.

4. To improve links with industry, the professions, and the community through the provision of consultancy and continuing education programs.

5. To develop international linkages in the application of knowledge and learning.

6. To gain and retain an equitable level of funding.

7. To increase the level of entrepreneurial activity.

8. To improve the physical, social and educational environment of students and staff.

9. To provide an efficient, effective and responsible internal management.

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.

PREFACE

This faculty handbook is intended as a reference for students currently enrolled at the University of Technology, Sydney. In addition to basic general information about the university, it contains detailed information about courses offered by the faculty. The information is correct as at October 1992. Please note that the titles of courses offered by the university have recently been revised. A full list of the university's courses, showing the name, the abbreviation and the title as indicated on the testamur, is provided in the 1993 Calendar.

More detailed information of a general nature is contained in the UAC Information Guide and in the Undergraduate and Postgraduate Studies Guides, available from the UTS Student Information Service. The faculty provides additional information about its courses, methods of assessment, book lists and other information which was not available at time of publication. Students should also make sure to read the student rules and the By-law relating to students, which contain essential information about matters such as minimum rate of progress, variation to approved programs of study, leave of absence, examinations and so on. The rules and By-law are included in the University Calendar, a companion volume to this handbook. Copies are held in the library and in the faculty offices, and are available for sale in the Co-op Bookshop.

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

Freedom of information (FOI) legislation gives people the legal right to obtain access to information held by State Government agencies (universities are regarded as government agencies for this purpose), to request amendments to personal records which are inaccurate, and to appeal against any decision not to grant access or amend personal records. The university will make every attempt to meet all reasonable FOI requests.

The names and telephone numbers of people to contact for further information are given throughout this handbook. If in doubt – ask!

We wish you well in your program of study this year.

CONTENTS

GENERAL INFORMATION

ACADEMIC OFFICE

The Academic Office is responsible for administering the rules which relate specifically to the student body at UTS. The branches within the Academic Office are:

- UTS Student Information Service
- Course promotions
- Undergraduate admissions (includes external award and extension study)
- Postgraduate studies and scholarships
- Enrolments and Undergraduate studies (includes examinations, graduation, HECS and student records)
- Student systems
- Facilities Hire
- Kuring-gai Student Administration Centre

The rules may be found in the University Calendar and cover all areas of undergraduate, postgraduate and non-award (external and extension) study. Details include admission, registration and enrolment, fees and charges, identification, conduct, attendance and study requirements, postgraduate supervision, examinations, progression, appeals, exclusion, leave of absence, internal course transfer, readmission, graduation and awards.

INFORMATION

The **UTS Student Information Service** provides information and assistance regarding all administrative matters. It is the principal point of contact between students, the public and the central administration. The UTS Student Information Service is located in the foyer area of the Tower Building at 15-73 Broadway and in the foyer area at the Kuring-gai campus in Eton Road, Lindfield. The postal address for enquiries is: UTS Student Information Service, University of Technology, Sydney, PO Box 123, Broadway 2007. Telephone enquiries should be directed to (02) 330 1222 or (02) 330 5555.

Further details regarding academic and administrative matters may be obtained from the branches listed above or from the following:

UTS Undergraduate Studies Guide
UAC Information Guide
UTS Postgraduate Studies booklet
UTS Postgraduate Scholarships Guide
UTS Calendar and Faculty handbooks.

APPLICATION

Applications for most undergraduate and postgraduate courses may be obtained from the UTS Student Information Service during the main application period, August, September, and October, for admission in the following year. Closing dates and application requirements vary for UTS courses, and applicants are encouraged to make early enquiries.

In general, most undergraduate applications through the Universities Admissions Centre (UAC) close on the last working day of September. Applications for some UAC courses are accepted during October, but require payment of a late fee. Certain undergraduate courses accept applications direct to the university. Applications for these courses and most postgraduate courses close on the last working day of October.

A smaller mid-year application period occurs for some courses during April and May, with applications closing on the last working day of May.

International fee paying applicants must apply through the International Programs Office. Specific information can be found in the following pages.

Formerly enrolled UTS students seeking readmission should lodge a new application during the application period. Currently enrolled UTS students who wish to transfer to another UTS course must complete an internal transfer application, available from the UTS Student Information Service.

Full details on application requirements and closing dates for all undergraduate and postgraduate courses are available from the UTS Student Information Service.

ADMISSION

To be eligible for admission to a course at UTS, all applicants must satisfy the rules relating to undergraduate and postgraduate admission (see the Calendar), and be selected in competition with other eligible applicants for that course.

Applicants must have an adequate background in English. A minimum level such as 2-unit General English in the HSC is recommended. If the majority of an applicant's education was undertaken in a language other than English, completion of an English Test may be required.

UTS accepts the results of two tests: the Combined Universities Language Test (CULT), conducted by the Institute of Languages at the University of New South Wales, in which a minimum pass of 65% is required; and the International English Language Testing System (IELTS), conducted through the UTS International Programs Office. A minimum score of 6.5 overall, with at least 6.0 in writing, is required.

No application for admission will be considered until proficiency in English, where requested, has been demonstrated.

Admission is based on the quota of places available in each course, and the number and quality of eligible applicants applying for each course. Selection is determined through the order of merit of each applicant in competition with other eligible applicants.

Special admission schemes are available for Aboriginal and Torres Strait Islander applicants (SCATS) and those applicants with high academic potential whose education has been disadvantaged by circumstances beyond their control (inpUTS). Information concerning these schemes is given below.

Further details regarding all aspects of admission may be obtained from the UTS Student Information Service.

ENROLMENT

New students receive offers of enrolment by mail. Each successful applicant must enrol as indicated in the information enclosed with the offer or that offer will lapse. Other information enclosed covers dates for enrolment, student service fees and course fees, the Higher Education Contribution Scheme (HECS), admission with advanced standing or with subject exemption, and information on deferment.

Continuing students are required to re-enrol annually. Information regarding re-enrolment is sent with each continuing student's Spring semester results, usually by late December. Information is also forwarded to students regarding their student service fees and course fees or HECS charges.

The main enrolment period each year is from mid January to late February. A smaller enrolment period in July follows any mid-year offers.

Those who cannot enrol on the specified enrolment dates may be permitted to enrol at a later date subject to payment of a late enrolment fee. These students must contact the UTS Enrolments Office to explain their situation and gain permission for a late enrolment.

The location of enrolment may vary, but the main sites are at the City (Broadway) campus and the Kuring-gai campus.

Student Service Fees

Compulsory annual fees and charges are payable to the University Union and Students' Association. The 1992 fees were $252 for new students and $232 for re-enrolling students. In 1992 this amount included a Student Accommodation Levy of $35, which has increased to $42 for 1993 and is expected to increase to $50 for 1994. All fees and charges may vary from year to year.

Higher Education Contribution Scheme (HECS) Charges

HECS was introduced in 1989 by the Commonwealth Government to collect a contribution from certain categories of higher education students towards the cost of their education.

As a part of enrolment, all students who are liable to pay the HECS charge are required to nominate their status as either an "upfront" or "deferred" payer. If nominating "upfront" payment, students are then notified by the university of the amount owing and the date by which payment is required. If a "deferred" payer, students are advised of the amount owing to the Australian Taxation Office. All amounts are determined according to the subject load which HECS eligible students are undertaking for the coming semester. Students who nominate the "upfront" option but do not make payment by the due date will have their enrolment terminated.

Course Fees

Certain categories of students are not required to pay the above HECS charges. These students, unless enrolled under an approved scholarship or HECS exempt program, will be required to pay course fees. Course fee information is available during each application period.

Admission with Advanced Standing or with Subject Exemption

Applicants who receive an offer of enrolment to UTS and have previously completed appropriate subjects of courses at recognised tertiary education institutions or Australian technical colleges may apply for subject exemptions in their offered UTS course.

An exemption application form with instructions is forwarded to all new students with their offer letter. Admission with advanced standing or with subject exemption may be approved by a faculty subject to rules 2.29.1 to 2.29.5.

Deferment

All new undergraduate students will receive a deferment application form with their offer letter. With the exception of three courses (Bachelor of Accounting, Bachelor of Information Technology and Bachelor of Manufacturing Management) offers of admission to all other undergraduate courses can be deferred on request. Deferred enrolment will be approved for up to one year; however, a deferred place will lapse if the student enrols in an under-

graduate or postgraduate degree, diploma or associate diploma course during the period of approved deferment.

All students must re-apply as directed upon completion of their approved deferment period.

Deferment of enrolment in postgraduate courses at UTS is not permitted.

Full details regarding student fees, HECS charges, course fees, admission with advanced standing or with subject exemption, and deferment may be obtained from the UTS Student Information Service.

ACADEMIC ATTENDANCE AND PROGRESSION

Course and Subject Variation

Students wishing to add or delete subjects must apply on the appropriate form as obtained from Faculty or School offices or the UTS Student Information Service. Specific dates apply (see *Principal Dates* below) and students are reminded that HECS or postgraduate course fees still apply after the HECS Census dates of 31 March and 31 August.

Academic transcripts will indicate a fail against subjects where students have not withdrawn by the due date.

Examinations and Results

Formal examinations are held at the end of each semester. Preliminary timetables for examinations will be displayed on noticeboards near Faculty and School offices and in the foyer areas of the Tower Building at Broadway and Kuring-gai campus. Such timetables are on display for two weeks from calendar week 19 for the Autumn semester and calendar week 40 for the Spring semester.

Students who identify concerns with these preliminary timetables must write to the Academic Registrar immediately. Final timetables showing dates, times and location will be displayed in the areas indicated above for two weeks prior to the commencement of the examination period.

Students will be notified by mail of their semester results in mid July and late December each year. Results will also be displayed on noticeboards in the areas indicated above.

Formal enquiries or concerns regarding results must be expressed in writing to the Academic Registrar. Initial enquiries may be made in person at the UTS Student Information Service on the City (Broadway) or Kuring-gai campuses. No information will be given by telephone.

All students are advised to read carefully rules 2.15 to 2.24 to understand the regulations concerning examinations.

Assessment Review and Appeals

Where students are not satisfied with their assessment, they may lodge an appeal of assessment at the UTS Student Information Service. In cases of appeal, a Student Assessment Appeals Committee of the relevant Faculty Board considers the appeal following the criteria and procedures approved by Academic Board.

Full details of appeals against assessment may be found under rule 2.26.

Progression, Probation and Exclusion

Full details regarding student progression, probation and exclusion are provided in rules 3.1.13 to 3.1.19.

Readmission after Exclusion – Undergraduate

A student can re-apply to the course from which he or she was excluded following the specified period of exclusion. Readmission is not automatic and the student must compete with other eligible applicants for that course during the given admission period. Where readmission to the previous course is achieved, the student will be reinstated in the progression category which applied prior to exclusion.

Where a former student's first application for readmission to the course from which he/she was excluded is refused, an appeal may be lodged with the Academic Registrar. Full details are forwarded to such students following lodgement of their application for readmission. Each submitted appeal against refused readmission is forwarded to the relevant Dean for reconsideration. Where such a reconsideration is recommended for dismissal by the Dean, the appeal is forwarded to the Appeals Committee of Academic Board for final decision.

Where the Dean or the Appeals Committee upholds the appeal, the student will be reinstated in the progression category which applied prior to exclusion.

Further details may be obtained from the Undergraduate Admissions Branch.

Discontinuation of Registration – Postgraduate

Students at the Graduate Diploma, Masters or Doctoral level may have their registration discontinued if they fail to complete all prescribed work within a given period of time or if the specific Faculty Board is dissatisfied with the student's progress.

Full details regarding this and the subsequent appeal regulations may be found under rules 3.2, 3.3, 3.4 and 3.5.

Readmission after Discontinuation of Registration – Postgraduate

A student can re-apply to the course from which her or his registration was discontinued following the specified period of exclusion. Readmission is not automatic and the student must compete with other eligible applicants for that course during the given admission period. Where readmission is successful a maximum number of semesters for completion shall be nominated by the university.

Rules for postgraduate students regarding appeal against refused readmission after a period of discontinued registration vary. Full details may be found rules 3.2, 3.3, 3.4 and 3.5.

Further details may be obtained from the Postgraduate Studies Branch.

AWARDS AND GRADUATION

All students who believe they will qualify for an award of the university at the end of their current semester must complete an *Application for Award* form, available from the UTS Student Information Service. A specific lodgement date applies and students are encouraged to make early enquiries at the UTS Student Information Service.

Graduation ceremonies are conducted during a specific period in April - May and September - October each year. Information regarding graduation will be forwarded to eligible students following receipt of the above application form.

Academic dress can be hired from the university. The faculty colour for the Faculty of Science is Wattle Yellow, PMS 123.

ACADEMIC MISCONDUCT

The University has strict rules relating to the conduct of students. Examples of academic misconduct are cheating in examinations, and the use of plagiarism, which is an attempt to present another person's work as your own by not acknowledging the source. "Work" includes written materials such as books, journals and magazine articles or other papers, and also includes films and computer programs. The two most common types of plagiarism are from published materials and other students' work.

Published materials

In general, whenever you use anything from someone else's work, whether it is an idea, an opinion or the results of a study or review, you should use a standard system of referencing. Examples of plagiarism may include a sentence or two, or a table or a diagram that have been taken from a book or article without acknowledgment. There have been cases when an entire paper consisted of material copied from a book, with only a few sentences added by the student. Both these examples are plagiarism. The first, however, may be treated as a simple failure to cite the references, while the second is more likely to be seen in the same way as cheating in an examination.

Most assignments are likely to require the use of the works of other people. To avoid plagiarism, you should keep a detailed record of where various ideas and findings came from, and to make sure that these sources are always clearly indicated in your work. At the tertiary level of education, assignments should not consist simply of bits and pieces copied from books and articles.

Other students' work

It is not unusual for students to pass round relevant articles and to discuss their ideas before writing an assignment. However, unless the assignment is clearly to be done on a group basis, students should write their own paper. Examples of this type of plagiarism include the inclusion of identical or very similar sentences, paragraphs or sections. When two students submit the same or similar papers, both are likely to be penalised.

Penalties

Alleged cheating or plagiarism during formal examinations is investigated by an examinations conduct committee, which may recommend to the Vice-Chancellor an appropriate penalty from the range of penalties which apply to breaches of discipline under the university By-law. Any instance of plagiarism associated with informal examinations or any other form of assessment is also treated as a breach of discipline, and is subject to the same range of penalties. The relevant provision is in Chapter 8, Division 2 of the By-law; and the relevant rules are 2.17, 2.23 and 2.24 of the student rules. The By-law and rules are set out in full in the University Calendar.

SPECIAL ASSISTANCE ADMISSION SCHEMES

inpUTS

The inpUTS Special Admission Scheme is designed to assist certain applicants to gain entry to UTS undergraduate courses. A reserve quota is established for most undergraduate courses for applicants with high academic potential whose education has

been disadvantaged over a long time by circumstances beyond their control.

Applications must be received by 30 September each year in order for a working party of the Equity and Access Committee of Academic Board to assess eligibility for admission. Applications are forwarded to ACT and NSW high schools and TAFE colleges during July and are available from the UTS Student Information Service from August each year.

The scheme is aimed at those persons who have not had the opportunity to attempt tertiary studies. It is open to all applicants who satisfy the university rules as described under 3.1.1 to 3.1.12.

SCATS

Under the direction of Jumbunna Aboriginal Education Centre at UTS a special admission scheme (SCATS), incorporating a supplementary course leading to degree studies, is available for Aboriginal and Torres Strait Islander applicants. All Aborigines and Torres Strait Islanders who are considering tertiary education are encouraged to apply. Jumbunna assesses all applications to determine if supplementary studies are required.

SKATE (Street Kids Access Tertiary Education)

The target group for the SKATE program is disadvantaged young people with a high potential for a life of abuse, violence, crime and self-destruction, who wish to change their lifestyle and regain access to education. Entry criteria: those who are aged between 16 and 25 years; have little or no family support; have not completed secondary school; and have had experience of or been involved in homelessness, unemployment, drug/alcohol abuse, property offences or violence.

The program follows Board of Secondary Education NSW content and is backed by an extensive bio-social support system.

Tertiary entry status is not automatic and students apply as category B students. No formal arrangements for acceptance of graduates exists with other institutions; however, personal initiatives with support of the SKATE program director have achieved successful entries. For further information contact the Director on 330 5337.

INSEARCH LANGUAGE CENTRE

Insearch Language Centre, University of Technology, Sydney is an ELICOS (English Language Intensive Course for Overseas Students) and Asian Languages Centre operating in its premises on Levels 2 and 3, Prince Centre, 8 Quay Street, Ultimo. ILC also has a second campus at 187-189 Thomas Street (opposite the Prince Centre), ILC was established in October 1987 and since that time there has been a phenomenal growth in student numbers and courses on offer in both the ELICOS and Asian Languages Departments. In the ELICOS department ILC offers courses in General English, English for Academic Purposes (EAP), English for International Business (EIB), English for Matriculation and Foundation Studies (EFS), English for Test Preparation - IELTS, Tertiary Orientation Program (TOP), Evening English and Holiday English.

The ELICOS Department also offers teacher training courses leading to the Cambridge University/Royal Society of Arts Certificate or Diploma in Teaching English as a Foreign Language to Adults.

The Asian Languages department offers individual and group tuition as well as corporate development programs in Japanese, Korean, Thai, Indonesian, Mandarin, Cantonese and Vietnamese.

Courses are offered in the above languages for beginners through to advanced level students.

In the Japanese language area the ILC also offers HSC coaching, Japanese for teachers, advanced conversation and reading – which helps to prepare students for the *Japanese Proficiency Test* and teacher training.

The European Languages Department offers individual and group tuition in French, Italian and Spanish.

For more information contact: Insearch Language Centre, Level 3, Prince Centre, 8 Quay Street, Sydney NSW 2000 Australia, telephone (02) 281 4544, fax (02) 281 4675.

EXCHANGE PROGRAMS

The university, through individual faculties, has an extensive exchange program arrangement which include the following institutions:

Wirtschaftsuniversitat, Vienna, Austria
University of Waterloo, Canada
Aarhus School of Business, Denmark
Insa de Lyon, France
Fachhochschule, Wiesbaden, Germany
Technical University of Budapest, Hungary
Tilburg University, The Netherlands
Dr Soetomo Press Institute, Indonesia
Yonsei University, Seoul, Korea
South China Institute of Technology, Guangzhou, People's Republic of China
Tilburg University, The Netherlands
Oregon State University, USA

In the United Kingdom: University of Brighton, De Montfort University, University of Humberside, University of Portsmouth and Saint Martin's School of Art

In Thailand: Pranakorn Teachers' College, Chiang Mai University, Mahidol University, and King Mongkut's Institute of Technology, Thonburi

Interested persons should make initial enquiries through the International Programs Office or faculty offices.

INTERNATIONAL STUDENTS PROGRAM

Fee-paying international students are encouraged to apply for admission to selected undergraduate and postgraduate courses on a fee-paying basis.

Application for Admission

Application will be assessed on the basis of academic results in high school, post-secondary studies or university.

International students who are studying for an Australian Year 12 examination (either in Australia or overseas) should apply to UTS through the Universities Admissions Centre.

International students who are studying for a Bachelor degree at an Australian university and wish to transfer to UTS should also apply through the Universities Admissions Centre.

All other international students (undergraduate and postgraduate) should apply direct to the International Programs Office.

Note: Australian citizens or those who have permanent residency status should contact the University's Student Information Service.

Documentation

The following comments must be included with an application:

- an original (or properly certified* copy) of the applicant's **official** transcript or results sheet
- an original (or properly certified* copy) of the applicant's **official** school leaving diploma or certificate
- a certified* official translation of any document not in English
- a certified* copy of any scholarship.

*Note: a properly certified copy means a copy certified by either the issuing institution or a statutory body (e.g. Public Notary). Copies certified by a Justice of the Peace or a lawyer are not acceptable.

The applicant should include any relevant letters of support from his or her employers.

English Language

All international students are required to provide evidence of English language proficiency. UTS prefers students to have a satisfactory score on the IELTS test (6.5 overall with a minimum of 6.0 in writing). Details and application forms for the IELTS test are available from the International Programs Office.

Course Fees 1993

Fees for selected courses offered to fee-paying students range from $A10,000 to $A16,500 per annum, depending on the course. Fees are normally paid on a six-monthly basis.

Financial Assistance

UTS is unable at this time to offer any scholarships or financial assistance to international students.

The Australian Government offers some scholarships under the John Crawford Scholarship Scheme (JCSS) and the Overseas Postgraduate Scholarship Program (OPRS). Details and application forms for JCSS are available only at Australian Embassies and Australian Education Centres overseas. Details and application forms for OPRS are available from the International Programs Office.

Student Visas

Following offer of a place at UTS and payment of first semester fees, International Programs will provide an acceptance advice form which is required when applying for a student visa. Visitors to Australia on a visitors' visa are unable to change their visa status whilst in Australia but must leave the country and apply for a student visa from outside Australia.

Additional Information

For further information and application forms for undergraduate or postgraduate courses please contact the International Program office, Level 5, Tower Building, Broadway.

Postal address: University of Technology, Sydney, International Programs, PO Box 123, Broadway NSW 2007, Australia, telephone (61 2) 330 1531, fax (61 2) 330 1530.

ASSISTANCE SCHEMES

AUSTUDY

AUSTUDY provides income support to financially disadvantaged students over 16 years of age undertaking approved courses of study in higher education institutions. Maximum benefit rates are age-related and aligned with those for relevant Social Security payments (Job Search and Newstart Allowances). Benefits are paid to 16-17 year old students with higher rates for those 18 years old and

over, and those aged over 21 years in special categories. This assistance is provided subject to parental and personal income and assets tests for dependent students or personal and spouse income tests for independent students. AUSTUDY is also subject to academic progress rules.

Following consideration of the review of AUSTUDY commissioned by DEET, fundamental changes are to be made to the program.

A supplementary scheme will be introduced from 1 January 1993, to provide flexibility for tertiary students to tailor assistance to their individual needs.

Under the proposed arrangements, tertiary students eligible for AUSTUDY and ABSTUDY will have the option of "trading-in" part of their grant assistance for a repayable income supplement of twice the amount, up to a maximum of $4000 per annum. A similar repayable income supplement of up $2000 will also be available to tertiary students whose parental income, while excluding them from receiving grants through the parental income test, is less than $50,000 a year, provided other eligibility criteria are met.

How to apply: the Student Welfare Officer located in the Student Services Unit at Broadway and Kuring-gai campuses will be able to supply all forms and will help with other problems or queries that may arise when filling in forms. To make an appointment telephone 330 1177 or 330 5342 for any assistance.

ABSTUDY

ABSTUDY assists Aboriginal and Torres Strait Islander students by providing income support and other assistance tailored to their needs. The basic rates of assistance are similar to AUSTUDY, with additional assistance available to part-time students, pensioners and those over 21 years of age. Aboriginal tertiary students will also be eligible for the voluntary "loan" scheme. ABSTUDY payments are not subject to assets tests. The staff in the Aboriginal Education office, Jumbunna, will be happy to help with any queries. Telephone 330 1905 and ask for the Student Services Officer.

Postgraduate Assistance

The Commonwealth Government offers each year a limited number of awards for full-time postgraduate study at Australian higher education institutions.

Australian Postgraduate Course Awards at the University of Technology, Sydney are available to students undertaking a Masters Degree by coursework. A good academic record is essential and preference is given to those with relevant employment experience. Applications close at the end of October 1992.

Australian Postgraduate Research Awards are tenable for full-time postgraduate research leading to the degree of Master or Doctor of Philosophy at UTS. Applications close at the end of October of the year prior to the year of study.

The awards are available to Australian citizens and those who have been granted permanent resident status and lived in Australia continuously for the last 12 months. Applicants should have completed a four-year undergraduate degree with at least Second Class Honours, Division One, or equivalent.

Application forms may be obtained from the UTS Student Information Service or the Postgraduate Studies and Scholarships Office, Level 5, Tower Building.

University Research Scholarships

These Scholarships, including the R L Werner Postgraduate Scholarship and University of Technology, Sydney Doctoral Scholarship, are normally available to an applicant of the highest academic calibre for full-time research at UTS.

Applications must be made on the prescribed form and close with the Academic Registrar at the end of October of the year prior to which applicants intend to commence candidature.

Further information and conditions of award may be obtained from the Postgraduate Studies and Scholarships Office, Level 5, Tower Building.

Commonwealth Scholarship and Fellowship Plan Awards

The awards are intended for postgraduate study or research and are tenable in the United Kingdom, Canada, Hong Kong, India, Jamaica, Malaysia, Malta, Nigeria, Sri Lanka, Trinidad and Tobago.

Applications from UTS graduates must be made on the prescribed form, and close with the Academic Registrar in early October of the year to which applicants intend to study overseas.

Further information may be obtained from the Postgraduate Studies and Scholarships Office, Level 5, Tower Building.

STUDENT OMBUDSMAN

Enrolled or registered students with a complaint against decisions of university staff may seek assistance from the Student Ombudsman. The position of the Student Ombudsman was created by the University Council of the old UTS in 1989 for a trial period of one year, and the scheme has now been extended to all campuses.

The university policy on the role of the Student Ombudsman is published in the Calendar.

The Student Ombudsman's office is located in Room 402, Building 2 on the City campus at Broadway, telephone 330 2575/76.

All matters are treated with the strictest confidence.

LEARNING CENTRES

Jumbunna Aboriginal Education Centre

Located on the City campus at Broadway, Jumbunna Aboriginal Education Centre was established in 1987 with only two indigenous students. Today it has more than 250 Aboriginal and Torres Strait Islander students and a staff of 10.

The Centre was conceived to afford indigenous Australians the opportunity to gain access to tertiary studies through the provision of academic and cultural support programs. The name *Jumbunna* comes from the Aboriginal word meaning a *meeting place.*

Jumbunna Centre is predominantly staffed by black Australians and offers a range of award courses, many unique to UTS. Owing to its programs, its support system and its caring environment, Jumbunna Centre has fast gained a reputation among the indigenous community as being a most desirable place to study. Jumbunna's courses include: adult education, tourism and leisure, business studies, social sciences, design, life sciences and nursing, law, media studies, architecture and building.

For further information contact the Jumbunna Centre on 330 1902.

ELSSA Centre

ELSSA, the English Language and Study Skills Assistance Centre, provides free English language and study skills courses for students enrolled at UTS and university staff. These include communication electives for award to degrees, intensive vacation courses and weekly workshop courses. The Centre runs courses on essay writing, report writing, advanced grammar, critical thinking, discussion skills, seminar presentation, effective reading, pronunciation and writing at postgraduate level.

Students may make an appointment for an individual consultation with a lecturer at the Centre to discuss difficulties with academic work. The Centre also has books and tapes for self-study. Brochures with further details of ELSSA programs are available at school offices and at the Centre.

For further information and appointments, telephone 330 2327, fax 330 2321, Level 18, Tower Building, Broadway.

Student Learning Centre

The major role of the Student Learning Centre is to assist students to realise their academic potential for tertiary studies. The Centre fosters the development of student learning and encourages student autonomy through access to the Centre's resources. It provides individual and group tuition to students from various faculties of the university in areas of language and study skills such as time management, writing essays, ESL, presenting seminars, taking part in tutorials, examination preparation, and in mathematics, statistics, and problem-solving strategies. Bridging and preparatory programs are held during the year. Qualified and experienced staff members are committed to an ethic of service in helping students succeed at the highest level.

Students may visit the Centre on their own initiative or on a voluntary basis when referred by academic staff. The Centre is located in rooms 2.520-2.522 above the main Library on the Kuring-gai campus. Telephone 330 5160 (Language and Study Skills), and 330 5186 (Mathematics).

SERVICES

THE UNIVERSITY LIBRARY

The University Library houses more than half a million books, journals and audiovisual items and provides services to staff and students through five campus libraries.

Balmain Campus – Design Library
The Design Library is managed as a joint library service with the Sydney College of the Arts, and houses materials relating to visual arts and design. It is located on the corner of Mansfield and Batty Streets, Rozelle.

City Campus – Markets Library at Haymarket
The Markets Library collects materials in a wide range of subject areas including architecture, building, business, computing science, education, engineering, humanities, law, mathematics, physical sciences, social sciences. It is located in the Haymarket area on the corner of Quay Street and Ultimo Road.

Kuring-gai Campus – George Muir Library
The George Muir Library is located at the Kuring-gai campus in Eton Road, Lindfield. The library's collection is broad: major subject areas include business, education, leisure, information and communication studies and nursing. The library also has a curriculum collection associated with education studies.

St Leonards Campus – College of Law Library
This library provides services for staff and students undertaking courses in practical legal training and is located at 2 Chandos Street, St Leonards.

St Leonards Campus – Gore Hill Library
This library collects materials in the areas of life sciences and nursing. It is located on the corner of the Pacific Highway and Westbourne Street, Gore Hill.

The library's collection is recorded in the UNILINC catalogue which is available as an up-to-date on-line catalogue, and as a compact disc catalogue with enhanced search features. The catalogue can be accessed in each of the libraries as well as in offices and laboratories throughout the university. Access to library information and other bibliographic and numeric databases is extended nationally and internationally through high speed communications networks such as AARNet (the *Australian Academic and Research Network*). Access within Australia is extended through participation in ABN (the *Australian Bibliographic Network*) and the Linked Library System which links the university libraries in New South Wales and the ACT.

The library has a firm commitment to provide the best possible information service and has established a team of Faculty and School Liaison Librarians who, in partnership with academic staff, assist users in achieving their objectives in education and information. The Liaison Librarians for the Faculty of Science are

Sally Scholfield (St Leonards – Gore Hill; School of Biological and Biomedical Sciences)
Anne Newton and Julie Sweeten (City; School of Physical Sciences)

Services provided include loans, reservations, intercampus document delivery, interlibrary loans from Australian and international sources, reciprocal borrowing with other institutions, user education, and on-line, compact disc and print-based information retrieval services.

Service guides can be obtained from the libraries. Opening hours are posted in the libraries.

INSTRUCTIONAL TECHNOLOGY SERVICES

In 1992 a new unit, Instructional Technology Services (ITS), was created. Initially this unit will concentrate on establishing a high standard of classroom audiovisual services across the university's campuses. It is also intended that it will deliver a high quality technical and maintenance service, as well as a production capacity.

Services currently available include provision of a one-stop booking service, enhanced presentation lecture theatres, reticulated video services, a trolley service for audiovisual equipment, videotape duplication services and a mediawatch service for current affairs programs.

At present ITS has offices at the Kuring-gai campus and in the Bon Marche Building, City campus. Administratively, the Service is controlled by the University Librarian.

COMPUTING SERVICES

The Computing and Communications Services Division provides a comprehensive range of facilities and services to meet the major computing requirements of academic and administrative areas of the university.

Equipment
The academic facilities consist of four large Sun SPARCserver computers and an Amdahl 5860 mainframe computer. These systems provides the academic community with a wide range of programming languages and application packages. They run the UNIX operating system, and can be accessed by users from public PC and Macintosh laboratories operated by the Division.

A Prime 9955-II computer, running the PRIMOS operating system, which has provided academic facilities on the Kuring-gai campus, has been replaced by a Sun SPARCserver 630 system on the Broadway campus.

Other central academic computing facilities consist of 12 PC laboratories, four Macintosh laboratories and three terminal rooms. It is also planned to install two Sun workstation laboratories for use in 1993.

A Data General MV20000, a Sun 4/470 and a Sequent S2000/200 systems support administrative data processing, while a Data General MV15000 services office automation and systems development work.

All computer systems are connected to the university's Local Area Network (UTSnet), which covers the City, Kuring-gai, Balmain and St Leonards campuses. Connected to the network are personal computers and terminals located in the public laboratories and terminal rooms, as well as various School minicomputers.

Location of Facilities
Located on level 9 of Building 1 at Broadway are the Sun, Amdahl, Sequent and Data General systems, as well as Computing and Communications Services Division staff offices.

Public laboratories and terminal rooms are located on the following campuses:

City Campus
Building 1
Room 1017 - 15 x Macintosh SE
Room 1313A - 20 x PC XT

Building 2
Room 421 - 25 x PC XT
Building 4
Room 104 - 20 x PC 486SX
Room 438 - 20 x Terminal
Room 440 - 20 x Terminal
Room 444 - 20 x PC XT
Building 5
Room A209- 15 x PC XT
Room A210 - 20 x PC XT
Bon Marche
Room 439 - 20 x Macintosh LCII

Balmain Campus
Balmain North Basement - 20 x Macintosh LC
Block A

St Leonards Campus
Dunbar Building
Room 507 - 20 x Macintosh LC
Room 511 - 16 x PC XT

Kuring-gai Campus
Stage 2
Room 461 - 20 x Terminal
Room 524 - 20 x PC 386SX
Stage 3
Room 338 - 20 x PC 386SX
Room 339 - 20 x PC XT
Room 340 - 18 x PC XT
Room 341 - 20 x PC 386SX
General enquiries should be directed to the Response Centre, Room 913, Level 9, Building 1, City campus (telephone 330 2111).

Services

Services provided by the Computing and Communications Services Division include:

- academic and administrative computer processing
- consulting on programming languages, application packages and system usage
- consulting on use of microcomputer hardware and software
- installation, maintenance and support of data communications equipment, terminals and microcomputers
- connection to the University's Local Area Network
- connection to the University's Voice Communications (Telephone) Network
- design, development and support of administrative data processing systems
- operation of a help desk for user enquiries and problems
- production of newsletters and technical documentation
- operation of a retail Microcomputer Shop

Microcomputer Shop

The Computing and Communications Services Division operates a Microcomputer Shop. This shop is a self-supporting, non-profit retail outlet that aims to provide the university and its staff and students with microcomputers and microcomputer software at the lowest possible prices. Purchases from the shop are restricted to university schools/units and to registered students and staff.

The shop stocks hardware and software from the following vendors:

Apple	Microsoft
Ashton-Tate	Mitsui
Borland	Netcomm
Claris	Novell
Data Flow	SourceWare
Hyundai	Star
InfoMagic	Tech Pacific
IBM	Techflow
Ipex	WordPerfect
Lotus	

Other services include Macintosh rentals.

The shop is located on Level 27, Room 2713 of Building 1 at Broadway, telephone 330 2474. Trading hours for the shop are 9am to 5pm Monday to Friday.

UTS UNION

UTS Union is the community centre for the university. It provides food and drink services, lounges and recreational areas, comprehensive social and cultural programs, sports facilities and programs, stationery shops, newsagency and car park. The union also provides student accommodation, runs the University Careers and Appointments Service, provides a legal service with a full-time solicitor, and operates a large ski lodge at Jindabyne.

MANAGEMENT

The union is controlled by a Board of 15 persons consisting of eight students, three staff representatives, three Council appointees and one Alumni nominee. Annual elections are usually held in September and all students and staff are eligible to stand for a position on the Board. The union employs a staff of about 150, headed by the Secretary/Manager.

MEMBERSHIP

All registered students and university staff are members of the union.

FEES

All students pay an annual fee to the union and new students pay a joining fee as well. Staff fees are paid by the university.

Fee Exemptions

Students who have paid seven annual fees to the union are entitled to exemption from further fees. For further information, please contact the Union Office (not the university).

ENQUIRIES

For general information, contact the Union Receptionist in the Broadway Union Centre or Union Centre at Kuring-gai campus. For information about membership, fees or management, contact the Union Office on Level 6 of the Tower building. For all sporting enquiries, contact the Sports Office in the Union Sports Centre at Broadway.

Telephone Numbers

The telephone number for the Union Receptionist, Union Office and all other branches of the union at Broadway is 330 1444. The union's telephone number at Haymarket is 330 1444. The union's telephone number at Haymarket is 330 3369, Gore Hill is 330 4048, at the Faculty of Nursing 330 4375 and at Kuring-gai 330 5011.

CATERING SERVICES

The union operates food services on all campuses except Balmain, where the service is provided by the Sydney College of the Arts Students' Association.

Licensed bars are provided at Broadway, Haymarket and Kuring-gai.

Functions Catering Service

The Functions Catering Service can cater for lunches, buffets, dances dinners, weddings, etc. Most of these are held in the Gallery Function Centre on Level 6 of the Tower building or at Kuring-gai. Ask about the special discount rates which apply for student and other union groups.

UNION SHOPS

There are union shops at Broadway, Haymarket, Balmain and Gore Hill with a wide range of items to meet course requirements, including calculators, stationery and technical drawing equipment. The Union Shop at Broadway also carries a range of university sweaters, pennants and memorabilia.

ACTIVITIES

The Union Activities Department arranges the social and cultural programs at UTS. These include dances, concerts, films, barbecues, creative leisure courses, art exhibitions, plays and lunchtime speakers. Faculty clubs and societies and hobby and social clubs (the Activities Clubs) receive financial and other support from the Activities Department. The Activities Officers are located in the Bornholt Room in the Broadway Union Centre. The Activities Officer at Kuring-gai is located in the Union Centre, telephone 330 5013.

PUBLICATIONS

The union produces a monthly magazine *Plexus*, the weekly *Union News* and a diary which is given to all students and staff at the beginning of the year and many other publications.

SPORT

Facilities

The Union Sports Centre at Broadway contains five squash courts (with special discount rates for union members) gymnasium, weights room, men's and women's saunas, change rooms with lockers and showers, sports office, sports clinic and sports shop. There is also an open air basketball/volleyball court on the roof of the squash courts. The Sports Centre is located on the lower ground floor of Building 4, extending into the quadrangle.

The union runs squash courts at Kuring-gai and can also arrange the hire of tennis courts. The Sports Department at Kuring-gai can be contacted on 330 5012.

Fitness Classes and Programs

The union runs daily fitness classes at Broadway and Kuring-gai. Contact the Sports Office for further information.

Intervarsities and Interfaculty

The union sponsors teams to state and national intervarsity meetings. As well, numerous interfaculty competitions are organised within the university throughout the year.

Clubs

There are many sporting clubs affiliated with the union. They receive financial support from the union and new members are most welcome.

Kookaburra Lodge

Kookaburra Lodge, which is owned and operated by the union, is located in Jindabyne at the foot of the Snowy Mountains, The Lodge, which overlooks the lake, is fully renovated and offers 30 rooms (some with en suites), heated pool, comfortable dining room and large recreation room. The union offers numerous weekend and mid-week trips during the ski season, with prices for members well below commercial rates.

In the off season, bed and breakfast is available from as little as $20 per night, so Kookaburra Lodge is also an excellent base for those interested in bush-walking and non-winter activities in the Snowy Mountains.

All bookings are made through the Broadway Sports Office, phone 330 2444.

UTS Haberfield Rowing Club
Formed after a merger between Haberfield Rowing Club and the union, the UTS Haberfield Rowing Club caters for beginners through to elite rowers.

The club is located in Dobroyd Parade, Haberfield, less than15 minutes by car from the City campus.

For further information, phone the club on 797 9523.

STUDENT ACCOMMODATION

The union has its own student residence, the *Imperial*, at 54-58 City Road, Chippendale. Just 10 minutes walk from the City Campus, Broadway, the *Imperial* offers high quality, low cost accommodation in single and double rooms. Preference is given to first and second year students from outside the metropolitan area. For further information, contact the Union Housing Office at Broadway, on 330 1509.

CAREERS AND APPOINTMENTS SERVICE

The UTS Careers and Appointments Service is a division of the union and provides the following services:

- A directory of employers seeking full-time, part-time and casual staff.
- Advice on employment skills such as interview techniques, personal presentation and resume writing.
- A register of students seeking employment, linked to a mailing and telephone contact service.
- A career counselling service aimed at assisting students and graduates in clarifying and focusing their career objectives.
- Ongoing campus interview programs which introduce final year students to a range of leading employers.

The Careers and Appointments Service is located on Level 5 of the Tower Building at Broadway, telephone 330 1500, and at Kuring-gai in the Union Centre, telephone 330 5016. To take full advantage of the services offered, all students are urged to register with the Careers and Appointments Service at the earliest opportunity.

LEGAL SERVICE

The union employs a full-time solicitor who provides a range of legal services, in most cases free of charge, to members.

Free advice and assistance in any matter is available, especially those involving criminal charges, motor vehicle claims, family law, tenancy disputes, consumer and debt claims and welfare matters.

Representation in Local Courts is normally available free of charge to full-time students and students on low incomes.

Members can discuss any problems at the Solicitor's Office on level 5 of the Tower Building, telephone 330 1511, where all enquiries are dealt with in the strictest confidence. The solicitor is available at Kuring-gai campus one day a week, telephone 330 5017.

WORK EXPERIENCE INSURANCE

At UTS students who participate in approved work experience programs are insured by the university for "workcare" benefits (other than weekly payments) arising out of work related injuries sustained anywhere in Australia. The scheme is administered by UTS Union on behalf of the university. To obtain a letter of confirmation, or for further information, or to make a claim, contact the Union Office on level 6 of the Tower Building, telephone 330 1642.

CHILD CARE

UTS Child Care Inc. is an incorporated Association which coordinates the operation of all child care services at UTS. The Board of UTSCC Inc. comprises representatives of the University, the union, the Students' Association and parent users of the centres. The Board plans new child care facilities for UTS, and aims at providing a variety of services at each campus. It also sets operational policies to ensure that child care services are of high quality and meet the needs of members of the university community.

Each child care centre is managed by a Director who reports to a Management Committee, the majority of whose members are elected parent representatives. All parents are invited to become involved in the management of the centres.

Operating costs for the various children's services are provided by State and Federal Funding: 8%, UTS sources (Union/SA/University): 10% and parent fees: 73%.

Under the Federal Government Fee Relief Scheme, families earning under $440 per week pay minimum fees. Parents earning between $440-$1150 (approx) per week receive some fee relief benefit according to a sliding scale. Those with incomes greater than $1150 per week pay full fees.

Access to child care facilities is open to all staff and students under "Priority of Access" guidelines. Priority is given to working and studying parents. There are waiting lists at each centre which take into account various factors including family circumstance, length of time on the waiting list and the

family's need for care, in establishing priority of access to the centres. Waiting time varies depending on the family circumstances, the child's age, and the type of care required. There is little or no wait for night care or for vacation care.

Kuring-gai Kuring-gai Campus Child Care Centre is situated next to the oval on campus, and provides 45 day care places for babies to five year olds, from 8am until 6pm for 50 weeks each year. There are also 10 evening care places for babies to 10 year olds, until 10pm Monday - Friday during semester periods only. Enrolment is available on a full-time, regular part-time, evening only, semester only, or emergency basis. Some occasional care may be available during the December-February period. Occasional weekend care can be provided (by prior arrangement) when the university hosts conferences and seminars. Vacation care for school aged children is available during school holiday period. Telephone 330 5105 for information.

Balmain UTS supports Allen Street Glebe Child Care Centre which is attached to Sydney College of the Arts (Sydney University). Enrolment is available on a full-time or part-time basis daily.

City Campus Magic Pudding Child Care Centre is behind Building 1 on the Broadway campus, and provides 40 day care places for babies to five year olds, from 8am until 6.30pm for 51 weeks each year. There are also 15 evening care places for babies to 10 year olds, until 10pm Monday-Friday during semester periods only. Enrolment is available on a full-time, regular part-time, evening only, semester only, or emergency basis. Some occasional care may be available during the December-February period. Occasional weekend care can be provided (by prior arrangement) when the university hosts conferences and seminars. Vacation care for school aged children is available during the Christmas and July school holiday periods.

Telephone 330 1456 for information.

St Leonards St Leonards Campus Child Care Centre is situated just off the Pacific Highway opposite the Dunbar Building at Gore Hill. It provides 25 day care places for babies to five year olds, from 8am until 6pm for 48 weeks each year. Enrolment is available on a full-time, regular part-time, semester only, or emergency basis. Some occasional care may be available during non-semester periods. Telephone 330 4023 for information.

STUDENT SERVICES

Student Services staff are employed by the university to cater for students' health, counselling, and welfare needs. Staff also assist in the development of study skills and provision for students with disabilities. All interviews are strictly confidential.

Welfare

Welfare Officers offer assistance with personal financial matters. Central to their work is administration of the Student Loan Fund, financial counselling and advising on AUSTUDY claims and appeals.

Health

The Health Service has two locations: level 3A of the Tower Building at Broadway and level 5 of Kuring-gai campus. The practice offers a free service to students with an emphasis on health education and promotion.

Counselling

Counsellors are available on all campuses. The service is full-time at City and Kuring-gai and part-time at Balmain and St Leonards campuses. The counsellors are experienced in dealing with all kinds of personal difficulties and can advise on administrative matters in relation to the university, such as appeals against exclusion.

International Student Counsellor

The International Student Counsellor can help students from overseas and from non-English speaking backgrounds with personal, practical and administrative problems while studying at UTS.

Learning Skills

The Learning Skills Counsellor helps students to understand how best they can learn. Advice is given on time management, writing assignments, reading effectively and preparing for exams. As well as individual consultations, workshops are held during both semesters.

Special Needs Coordinator

The Special Needs Coordinator works with other university staff to ensure appropriate support is available for students with disabilities and students admitted through the inpUTS Special Admission Scheme. Students with physical, sensory and learning disabilities are encouraged to contact the Coordinator. The Coordinator can also provide information and advice to prospective students who have disabilities.

To contact Student Services:

Broadway. Level 3A Tower Building, telephone 330 1177, fax 330 1172, TTY 330 1166
Health Service Appointments: 330 1166

Balmain. Student Centre, appointments 330 1177.

Kuring-gai. Level 5, telephone 330 5342, fax 330 5537.

St Leonards. appointments 330 5342.

STUDENTS' ASSOCIATION

The Students' Association (SA) is the elected representative body of students at the UTS: it is an organisation run by students for students. All students become members of the Students' Association upon enrolment. It is the only body in the university which can legitimately claim to truly represent the concerns, issues and problems students face on a day-to-day basis whilst at this university. All students have the right to stand for election of the Students' Association and to vote in the annual elections. There are 23 general representatives on the Council that makes policy for the Students' Association. It also has specialised portfolios and office bearers to deal with a range of issues: the environment, women, students with special needs, gay and lesbian rights, overseas students and postgraduates.

The Students' Association maintains close links with student organisations from other universities. Its political role is to defend and extend educational standards and conditions for students both within the university and the tertiary sector as a whole. Campus committees deal with campus-specific issues. This has proved to be the most effective and equitable means of ensuring that all students from all campuses are adequately represented in the make-up of the Students' Association. At this level, campus conveners carry out the directions of campus committees, which are also elected annually.

In general the Students' Association plays a representative and advocacy role on behalf of students. It acts as the voice of the student body. As part of this function it produces a fortnightly newspaper,*Vertigo,* and a weekly radio show on 2SER *Student Voice*. It liaises closely with the University Union, which provides services to students (e.g. the cafeteria, reading and leisure areas) and the Student Services Unit, which is funded by the university to provide welfare advice and counselling, loan assistance and medical services. The Students' Association also employs specialised education staff to assist in enquiries about AUSTUDY, HECS, appeals against exclusion and assessment grades and any other problems that students encounter at UTS. The Students' Association has lots to offer all students and welcomes student involvement.

Locations and Services

City campus 330 1155
The main office of the Students' Association is located on the City campus, Broadway on Level 3A of the Tower Building (near the bar and cafeteria) and offers the following services:

- General student representatives
- Elected office bearers
  - Women's officers
  - Overseas students' officers
  - Special needs officers
  - Gay and lesbian officers
  - Environment officer
  - Postgraduate officer
- Specialist education, research and welfare staff
- General student enquiries
- Academic coaching service
- Photocopying
- Funding of PERC Clubs

Haymarket Resource Centre
This is located in Room B110 and its services include:

- Computer, fax
- Photocopying
- Secondhand books

Design School Student Centre 330 2958
This is located on the Balmain campus, Mansfield Street, Balmain and is open Tuesday to Friday and offers:

- Photocopying
- Computer facilities

Gore Hill Resource Centre 330 4040
This is located in Room 1/18 in the Dunbar Building and its services include:

- Photocopying
- Secondhand books
- Computer facilities

Kuring-gai Campus 330 5237
Located next to State Bank, the services offered include:

- General and campus representatives
- Specialist education, research and welfare staff
- General student enquiries

RADIO STATION 2SER-FM

In conjunction with Macquarie University, UTS operates Sydney Educational Broadcasting Ltd (2SER-FM), Sydney's first mass coverage educational radio station thus expanding the institution's role in education to a wide community audience. The station, on air 24 hours a day, broadcasts a variety of spoken word educational programs covering arts and sciences. In addition to a small core of paid staff, some 400 volunteers, including UTS staff and students, are involved in programming the station.

THE CO-OP BOOKSHOP

The Bookshop is located next to the Tower Building on Broadway. While committed to supplying textbooks for all timetabled courses it also attempts to cater to the needs of the university community for general books, stationery, calculators and computer books and software.

Through its extensive computer system linking over 40 branches in Australia, the bookshop can often get hold of hard-to-get titles. Students and staff are welcome to place special orders, and charge accounts are available for approved customers.

At the start of each semester the bookshop runs temporary branches at the City campus, Haymarket (Room C117) and Gore Hill. The Kuring-gai campus is also serviced by a permanent Co-op Bookshop specialising in texts used on that campus.

The Broadway bookshop is open from 9am till 6pm Monday to Thursday, 9am till 5pm on Friday and 9am till 1pm on Saturday. There are normally extended hours at the beginning of each semester. The Bookshop can be contacted on 212 3078 or 330 2163.

STATE BANK

Full branches of the State Bank are situated on Level 4 of the Tower Building, Broadway, and at Kuring-gai campus. A complete range of banking services is provided. Normal banking hours apply all year at Broadway and the hours at Kuring-gai are 10am to 3pm.

The State Bank also offers complete banking services at Gore Hill, St Leonards and Haymarket, operating through the UTS union facilities.

THE FACULTY OF SCIENCE

The Faculty of Science consists of the former Faculty of Physical Sciences and the School of Biomedical and Biological Sciences. There are 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: Applied 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 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. All the degrees offered by the School of Physical Sciences 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 Masters degrees by thesis and five Master of Science programs by coursework: clinical biochemistry, clinical measurement, coastal resource management (with the Faculties of Engineering, Law and Business), environmental toxicology (in conjunction with the Environmental Protection Agency), and medical physics. A Graduate Certificate in Biomedical Technology is offered in six different areas, and from 1993 a Graduate Diploma in Clinical Biochemistry will also be offered. 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 supply teaching of science to other faculties, in particular Engineering and Nursing.

Competitive research funding is obtained across a wide range of areas of expertise. Research tends to be concentrated in Centres and Institutes of which there are five: the Centre for Environmental Toxicology (run jointly with the EPA), the Centre for Science Communication (funded in part by DEET), the Institute for Coastal Resource Management, the Centre for Materials Technology and the Centre for Biomedical Technology. This last was the vehicle through which the Faculty of Science became the leading organisation in a Cooperative Research Centre in Cardiac Technology. In 1991 the faculty was awarded over $3m in external and internal research grants, which makes it the most active faculty in terms of research within the university.

On 1 August 1992, the National Centre for Groundwater Management was established jointly between the Faculties of Science and Engineering. As a result, the faculty is also offering a Master of Science and a Graduate Diploma in Hydrogeology and Groundwater Management from 1993.

The faculty's plans for the future include the development of honours programs in applied chemistry and applied biology majoring in forensic science and the introduction of a combined BSc BBus with the Faculty of Business. In research, the areas targeted for development include forensic science, environmental management, immunotoxicology and surface engineering.

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.

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

Five Masters degrees by coursework:

KB53 Master of Science in Clinical Measurement
KB52 Master of Science in Environmental Toxicology
KB55 Master of Science in Clinical Biochemistry
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

Graduate Diploma:

KB65 Clinical Biochemistry

Graduate Certificates 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

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 seen from the list of staff members and further details can be provided by 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
BHP Australia
Department of Education, Employment and Training
Department of Science and the Environment
Australian Water Resources Council
Ramaciotti Foundation
Private Donations
Shell Company of Aust, 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

IMMUNOBIOLOGY UNIT

The Immunobiology Unit was established in 1989 as a multi-disciplinary 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 private foundations.

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.

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 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 Applied Science (Acupuncture) course offered by 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.

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 of Technology, Sydney 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 the UTS as set out in the University 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* 2-unit mathematics plus one 2-unit science course. Students will be very well prepared if they have done 2-unit mathematics plus 4 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 76.70, and for Biotechnology, Environmental Biology, and Biomedical Sciences the TER needed was 81.35. 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 Sciences, 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% 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 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. b, below), a minimum of 75% 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% of the normal progression period, i.e. a 3 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% of the normal progression period, i.e. a 6 year part-time degree should be completed in or under 9 years.

Requirements for award of Bachelor 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 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 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.

4. **Double Majors in Biomedical Science Degree**

It is possible for Biomedical Science students to complete two major strands of subjects in the degree program. This entails undertaking an additional 20 credit points. In order to be credited with a double major students must:

(a) apply to the School for approval to complete a double major and obtain an approved program,
(b) complete all mandatory and elective subjects of a single major totalling 144 credit points,
(c) complete all remaining mandatory subjects and/or extra elective subject(s) totalling 20 credit points *minimum* under the second major. A *minimum* total of 164 credit points is required to be eligible for graduation with a double major,
(d) students must have completed, or expect to complete in the current semester, all subjects required for award of the degree before applying for graduation. The double major must be indicated on the application for award. The names of both completed majors will appear on their academic record.

Commencement of Studies

Lectures and practical laboratory classes offered by the School of Biological and Biomedical Sciences commence on the 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 and bioinstrumentation. Students then select a major strand to follow for the remainder of the course, either Biochemistry, Microbiology, or Pathology and Immunology. Students also undertake a number of electives which introduce them to important areas of 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 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 hours 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,
other individual elective sequences as may be approved by the Head of School, for example from another university.

FULL-TIME PROGRAM

Stages 1 to 4 are common to all three major strands of the Biomedical Science degree.

Stage 1

Autumn semester

33101 Mathematics I (LS) (3cp)
33103 Statistics (LS) (3cp)
65012 Chemistry I (LS) (6cp)
68041 Physics I (LS) (6cp)
91311 Biology I (6cp)

Stage 2

Spring semester

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

Stage 3

Autumn semester

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

Stage 4

Spring semester

91320 Biochemistry II (6cp)
91326 Analytical Biochemistry (6cp)
91330 Microbiology II (6cp)
91355 Haematology I (3cp)
91351 Immunology I (3cp)

For final year subject program (stages 5 and 6) see the programs for individual majors which follow the part-time program.

PART-TIME PROGRAM

Stages 1 to 4 are common to all three major strands of the Biomedical Science degree.

Stage 1

Autumn semester

65012 Chemistry I (LS) (6cp)
91301 Biology I (6cp)

Spring semester

91312 Biology II (6cp)
65022 Chemistry II (LS) (6cp)

Stage 2

Autumn semester

68041 Physics I (LS) (6cp)
33101 Mathematics I (LS) (3cp)
33103 Statistics (LS) (3cp)

Spring semester

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

Stage 3

Autumn semester

91313 Biochemistry I (6cp)
91314 Microbiology I (6cp)

Spring semester

91316 Bioinstrumentation (6cp)
91330 Microbiology II (6cp)

Stage 4

Autumn semester
91326 Analytical Biochemistry (6cp)
91354 Anatomical Pathology (6cp)
Spring semester
91320 Biochemistry II (6cp)
91355 Haematology I (3cp)
91351 Immunology I (3cp)
For subjects for stages 5 and 6 see the part-time programs for individual majors which follow.

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

BIOCHEMISTRY MAJOR
FULL-TIME PROGRAM

Stage 5

Autumn semester
91321 Biochemistry III (8cp)
91334 Molecular Biology I (4cp)
91342 Clinical Biochemistry I (4cp)
and either
91331 Microbiology III (8cp)
or
91358 Haematology II (8cp)

Stage 6

Spring semester
91322 Biochemistry IV (8cp)
91343 Clinical Biochemistry II (4cp)
Plus *Electives (12cp)

PART-TIME PROGRAM

Stage 5

Autumn semester
91321 Biochemistry III (8cp)
91342 Clinical Biochemistry I (4cp)
Spring semester
91322 Biochemistry IV (8cp)
91343 Clinical Biochemistry II (4cp)

Stage 6

Autumn semester
91334 Molecular Biology I (4cp)
and either
91331 Microbiology III (8cp)
or
91358 Haematology II (8cp)
Spring semester
Plus * Electives (12cp)

Notes

1. Total elective credit points to be completed: 12
2. * For details of the electives available for the Biochemistry Major, Biomedical Science see Elective Options Table
3. Subjects for part-time students may be offered in a different order or combination in any one year.

PATHOLOGY and IMMUNOLOGY MAJOR
FULL-TIME PROGRAM

Stage 5

Autumn semester
91356 Diagnostic Cytology 1 (8cp)
91358 Haematology II (8cp)
Plus * Electives (8cp)

Stage 6

Spring semester
91341 Blood Bank (4cp)
91357 Diagnostic Cytology II (8cp)
Plus * Electives (12cp)

PART-TIME PROGRAM

Stage 5

Autumn semester
91356 Diagnostic Cytology 1 (8cp)
Plus * Electives (4cp)
Spring semester
91357 Diagnostic Cytology II (8cp)
Plus * Electives (4cp)

Stage 6

Autumn semester
91358 Haematology II (8cp)
Plus * Electives (4cp)
Spring semester
91341 Blood Bank (4cp)
Plus * Electives (8cp)

Notes

1. Total elective credit points to be completed: 20
2. * For details of the electives available for the Pathology and Immunology Major, Biomedical Science see Elective Options Table
3. Subjects for part-time students may be offered in a different order or combination in any one year.

MICROBIOLOGY MAJOR
FULL-TIME PROGRAM

Stage 5

Autumn semester
91331 Microbiology III (8cp)
Plus * Electives (8cp)
and either
91321 Biochemistry III (8cp)
or
91358 Haematology II (8cp)

Stage 6

Spring semester

91372 Clinical Bacteriology and Parasitology (12cp)

Plus * Electives (12cp)

PART-TIME PROGRAM

Stage 5

Autumn semester

91331 Microbiology III (8cp)

Plus * Electives (4cp)

Spring semester

91372 Clinical Bacteriology and Parasitology (12cp)

Stage 6

Autumn semester

91321 Biochemistry III (8cp)

or

91358 Haematology II (8cp)

Plus * Electives (4cp)

Spring semester

* Electives (12cp)

Notes

1. Total elective credit points to be completed: 20
2. * For details of the electives available for the Microbiology Major, Biomedical Science see Elective Options Table
3. Subjects for part-time students may be offered in a different order or combination in any one year.

ELECTIVES TABLE FOR BIOMEDICAL SCIENCE COURSE

Code	Name	Credit Points	Semester A/S	MAJOR STRAND Biochem	Pathology	Micro
91321	Biochemistry III	8	A	—	5	5
91322	Biochemistry IV	8	S	—	6	6
91331	Microbiology III	8	A	5	5	—
91334	Molecular Biology I	4	A	–	5	5
91335	Molecular Biology II	8	S	6	6	6
91337	Virology	4	A	5	5	5
91341	Blood Bank	4	S	6	—	6
91342	Clinical Biochemistry I	4	A	—	5	5
91343	Clinical Biochemistry II	4	S	—	6	6
91350	Pharmacology and Toxicology	4	S	6	6	6
91358	Haematology II	8	A	5	—	5
91359	Immunology II	8	S	6	6	6
91368	Microbial Technology 1	8	A	5	5	5
91369	Microbial Technology II	8	S	6	6	6
91372	Clinical Bacteriology and Parasitology	12	S	6	6	—
91373	Clinical and Applied Mycology	3	S	6	6	6
91374	Tissue Culture	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
XXXX	General Studies Elective/LS Elective (i.e. a subject from another School or Faculty)	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 Science
5 or 6	=	Recommended Elective Stage 5 or 6
*	=	Supervision Form must be completed

Notes

1. Subjects marked 5 and 6 can be undertaken by part-time students when programmable provided the prerequisite requirements are met.
2. Owing to timetabling constraints, not all electives may be available to all students in any given semester.
3. Subjects not marked may be able to be taken as electives following discussion with an appropriate member of academic staff.

DOUBLE MAJORS IN BIOMEDICAL SCIENCE

An additional 20 credit points subject load is the requirement for award of an undergraduate degree with a double major, giving a total of 164 credit points. Therefore, in addition to the core subjects required for completion of stages 1 to 4 of the Biomedical Science degree, the following combinations of subjects are recommended for completion of a double major.

BIOCHEMISTRY/PATHOLOGY PROGRAM

91321 Biochemistry III (8cp)
91322 Biochemistry IV (8cp)
91334 Molecular Biology I (4cp)
91342 Clinical Biochemistry I (4cp)
91343 Clinical Biochemistry II (4cp)
91358 Haematology II (8cp)
* Electives (12cp)

Plus Pathology subjects

91341 Blood Bank (4cp)
91356 Diagnostic Cytology 1 (8cp)
91357 Diagnostic Cytology II (8cp)

BIOCHEMISTRY/MICROBIOLOGY PROGRAM

91321 Biochemistry III (8cp)
91322 Biochemistry IV (8cp)
91334 Molecular Biology I (4cp)
91342 Clinical Biochemistry I (4cp)
91343 Clinical Biochemistry II (4cp)
91358 Haematology II (8cp)
* Electives (12cp)

Plus Microbiology subjects

91331 Microbiology III (8cp)
91372 Clinical Bacteriology and Parasitology (12cp)

PATHOLOGY/BIOCHEMISTRY PROGRAM

91341 Blood Bank (4cp)
91356 Diagnostic Cytology 1 (8cp)
91357 Diagnostic Cytology II (8cp)
91358 Haematology II (8cp)
* Electives (12cp)

Plus Biochemistry subjects

91321 Biochemistry III (8cp)
91322 Biochemistry IV (8cp)
91334 Molecular Biology I (4cp)
91342 Clinical Biochemistry I (4cp)
91343 Clinical Biochemistry II (4cp)

PATHOLOGY/MICROBIOLOGY PROGRAM

91341 Blood Bank (4cp)
91356 Diagnostic Cytology 1 (8cp)
91357 Diagnostic Cytology II (8cp)
91358 Haematology II (8cp)
* Electives (20cp)

Plus Microbiology subjects

91331 Microbiology III (8cp)
91372 Clinical Bacteriology and Parasitology (12cp)

MICROBIOLOGY/BIOCHEMISTRY PROGRAM

91331 Microbiology III (8cp)
91358 Haematology II (8cp)
91372 Clinical Bacteriology and Parasitology (12cp)
* Electives (12cp)

Plus Biochemistry subjects

91321 Biochemistry III (8cp)
91322 Biochemistry IV (8cp)
91334 Molecular Biology I (4cp)
91342 Clinical Biochemistry I (4cp)
91343 Clinical Biochemistry II (4cp)

MICROBIOLOGY/PATHOLOGY PROGRAM

91331 Microbiology III (8cp)
91358 Haematology II (8cp)
91372 Clinical Bacteriology and Parasitology (12cp)
* Electives (20cp)

Plus Pathology subjects

91341 Blood Bank (4cp)
91356 Diagnostic Cytology 1 (8cp)
91357 Diagnostic Cytology II (8cp)

* For details of the electives available for Biomedical Sciences see Elective Options Table.

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, such as 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 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 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 I (LS) (3cp)
33103	Statistics (LS) (3cp)
65012	Chemistry I (LS) (6cp)
68041	Physics I (LS) (6cp)
91311	Biology I (6cp)

Stage 2

Spring semester

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

Stage 3

Autumn semester

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

Stage 4

Spring semester

91320	Biochemistry II (6cp)
91326	Analytical Biochemistry (6cp)
91330	Microbiology II (6cp)
91351	Immunology I (3cp)
91373	Clinical and Applied Mycology (3cp)

Stage 5

Autumn semester

91331	Microbiology III (8cp)
91334	Molecular Biology I (4cp)
91368	Microbial Technology I (8cp)
Plus	* Electives (4cp)

Stage 6

Spring semester

91335	Molecular Biology II (8cp)
91369	Microbial Technology II (8cp)
Plus	* Electives (8cp)

Note on Electives

1. Total credit points to be completed: 12
2. * For details of the electives available for the Biotechnology Degree, see Elective Options Table

PART-TIME PROGRAM

Stage 1

Autumn semester
65012 Chemistry I (LS) (6cp)
91311 Biology I (6cp)
Spring semester
91312 Biology II (6cp)
65022 Chemistry II (LS) (6cp)

Stage 2

Autumn semester
68041 Physics I (LS) (6cp)
33101 Mathematics I (LS) (3cp)
33103 Statistics (LS) (3cp)
Spring semester
33105 Introductory Biometrics (3cp)
91365 Biocomputing (3cp)
91317 Human Biology (6cp)

Stage 3

Autumn semester
91313 Biochemistry I (6cp)
91314 Microbiology I (6cp)
Spring semester
91316 Bioinstrumentation (6cp)
91330 Microbiology II (6cp)

Stage 4

Autumn semester
91326 Analytical Biochemistry (6cp)
91376 Environmental Measurement (3cp)
91315 Biomonitoring (3cp)
Spring semester
91320 Biochemistry II (6cp)
91351 Immunology I (3cp)
91373 Clinical and Applied Mycology (3cp)

Stage 5

Autumn semester
91331 Microbiology III (8cp)
91334 Molecular Biology I (4cp)
Spring semester
91335 Molecular Biology II (8cp)
Plus * Electives (4cp)

Stage 6

Autumn semester
91368 Microbial Technology I (8cp)
Plus * Electives (4cp)
Spring semester
91369 Microbial Technology II (8cp)
Plus * Electives (4cp)

Notes

1. Total elective credit points to be completed: 12
2. * For details of the electives available for the Biotechnology Degree, see Elective Options Table
3. Subjects for part-time students may be offered in a different order or combination in any one year.

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 ecosystems. 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 and the far west. **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.**

Employment Opportunities

Graduates of the course may be employed as scientific officers with government agencies such as the Water Board, Environment Protection Agency, 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 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 I (LS) (3cp)
33103 Statistics (LS) (3cp)
65012 Chemistry I (LS) (6cp)
68041 Physics I (LS) (6cp)
91311 Biology I (6cp)

Stage 2

Spring semester

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

Stage 3

Autumn semester

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

Stage 4

Spring semester

91362 Plant Ecophysiology (6cp)
91363 Animal Ecophysiology (6cp)
Plus any 2 of:
91326 Analytical Biochemistry (6cp)
91330 Microbiology II (6cp)
91320 Biochemistry II (6cp)

Stage 5

Autumn semester

91364 Aquatic Ecology (8cp)
91365 Terrestrial Ecology (8cp)
Plus * Electives (8cp)

Stage 6

Spring semester

91366 Pest Control and Toxicology (8cp)
91367 Applied Ecology (8cp)
Plus * Electives (8cp)

Note on Electives

1. Total credit points to be completed: 16
2. * For details of the electives available for the Environmental Biology Degree, see Elective Options Table

PART-TIME PROGRAM

Stage 1

Autumn semester

65012 Chemistry I (LS) (6cp)
91301 Biology I (6cp)
Spring semester
91312 Biology II (6cp)
65022 Chemistry II (LS) (6cp)

Stage 2

Autumn semester

68041 Physics I (LS) (6cp)
33101 Mathematics I (LS) (3cp)
33103 Statistics (LS) (3cp)
Spring semester
33105 Introductory Biometrics (3cp)
91365 Biocomputing (3cp)
91317 Human Biology (6cp)

Stage 3

Autumn semester

91313 Biochemistry I (6cp)
91314 Microbiology I (6cp)
Spring semester
91316 Bioinstrumentation (6cp)
91330 Microbiology II (6cp)
or
91320 Biochemistry II (6cp)

Stage 4

Autumn semester

91326 Analytical Biochemistry (6cp)
91360 Quantitative Ecology (6cp)
Spring semester
91362 Plant Ecophysiology (6cp)
91363 Animal Ecophysiology (6cp)

Stage 5

Autumn semester

91364 Aquatic Ecology (8cp)
Plus * Electives (4cp)
Spring semester
91366 Pest Control and Toxicology (8cp)
Plus * Electives (4cp)

Stage 6

Autumn semester

91365 Terrestrial Ecology (8cp)
Plus * Electives (4cp)
Spring semester
91367 Applied Ecology (8cp)
Plus * Electives (4cp)

Notes

1. Total elective credit points to be completed: 16
2. * For details of the electives available for the Environmental Biology Degree, see Elective Options Table
3. Subjects for part-time students may be offered in a different order or combination in any one year.
4. 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. as a professional qualification in plant science and as a specialist qualification in ornamental and amenity, landscape and environmental horticulture. The course gives a scientific education in the basic sciences plus plant physiology, ecology, genetics and biogeography, soil science, biochemistry and microbiology. Students also gain advanced technological skills in plant cultivation, protection, breeding and management. 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 week **prior to semester.**

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 12 hours 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 I (LS) (6cp)
91201 Horticultural Experimentation (3cp)
91210 Landscape Horticulture (3cp)
91216 Horticultural Procedures I (6cp)
91311 Biology I (6cp)

Stage 2

Spring semester

65022 Chemistry II (LS) (6cp)
91217 Horticultural Procedures II (6cp)
91211 Horticultural Botany (3cp)
91312 Biology II (6cp)
91395 Biocomputing (3cp)

Stage 3

Autumn semester

91206 Plant Production (6cp)
91208 Plant Protection (6cp)
91314 Microbiology I (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 (8cp)

Note on Electives

1. Total credit points to be completed: 8
2. * For details of the electives available for the Urban Horticulture Degree, see Elective Options Table

PART-TIME PROGRAM

Stage 1

Autumn semester

91210 Landscape Horticulture (3cp)
91226 Horticultural Procedures I (2 sem)† (3cp)
91311 Biology I (6cp)

Spring semester

91211 Horticultural Botany (3cp)
91226 Horticultural Procedures I (3cp)
91312 Biology II (6cp)

Stage 2

Autumn semester

65012 Chemistry I (LS) (6cp)
91201 Horticultural Experimentation (3cp)
91227 Horticultural Procedures II (2 sem)† (3cp)

Spring semester

65022 Chemistry II (LS) (6cp)
91227 Horticultural Procedures II (3cp)
91395 Biocomputing (3cp)

Stage 3

Autumn semester

91314 Microbiology I (6cp)
91206 Plant Production (6cp)

Spring semester

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

Stage 4

Autumn semester

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

Spring semester

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

Stage 5

Autumn semester

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

Spring semester

91224 Horticultural Production Management (4cp)
Plus Electives* (8cp)

Stage 6

Autumn semester

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

Spring semester

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

Notes

1. Total elective credit points to be completed: 8
2. * For details of the electives available for the Urban Horticulture Degree, see Elective Options Table
3. Subjects for part-time students may be offered in a different order or combination in any one year.
4. Entrants with an Associate Diploma in Horticulture, or equivalent, are exempted from those subjects indicated by ** in the Part-Time program.
5. † Entrants with a TAFE Certificate in Horticulture, or equivalent, are exempted from the subjects Horticultural Procedures I and II.
6. 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.

ELECTIVES TABLE FOR ENVIRONMENTAL BIOLOGY, BIOTECHNOLOGY and URBAN HORTICULTURE COURSES

Code	Name	Credit Points	Semester A/S	Environ Biology	Biotech	Urban 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 III	8	A	–	5	–
91322	Biochemistry IV	8	S	–	6	–
91330	Microbiology II	6	S	–	–	6
91331	Microbiology III	8	A	5	–	–
91334	Molecular Biology I	4	A	5	–	–
91335	Molecular Biology II	8	S	6	–	–
91337	Virology	4	A	–	5	–
91346	Environmental Management Procedures	4	S	6	–	6
91347	Toxic Materials in the Environment	4	A	5	–	5
91350	Pharmacology and Toxicology	4	S	6	6	–
91359	Immunology II	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	–	5
91369	Microbial Technology II	8	S	6	–	–
91370	Field Studies: Semi Arid Ecology	8	S	6	–	6
91371	Field Studies: Mountain Ecology	8	A	5	–	5
91372	Clinical Bacteriology and Parasitology	12	S	–	6	–
91373	Clinical and Applied Mycology	3	S	6	–	6
91374	Tissue Culture	4	A	5	5	–
91375	Field Studies: Marine Sciences	4	A&S	5 or 6	5 or 6	5 or 6
91396	Advanced Biocomputing	4	S	6	6	6
91398	Special Reading Assignment LS*	4	A&S	5 or 6	5 or 6	5 or 6
91399	Individual Project LS*	8	A&S	5 or 6	5 or 6	5 or 6
XXXXX	General Studies Elective/LS Elective (i.e. a subject from another School or Faculty)	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 Science
5 or 6	=	Recommended Elective Stage 5 or 6
*	=	Supervision Form must be completed
N/A	=	Not available to students in this degree

Notes

1. Subjects marked 5 and/or 6 can be undertaken by part-time students when programmable provided the prerequisite requirements are met.
2. Owing to timetabling constraints, not all electives may be available to all students in any given semester.
3. Subjects not marked may be able to be taken as electives following discussion with an appropriate member of academic staff.
4. **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 degree in Biomedical Science, Biotechnology, Environmental Biology or Urban Horticulture from the 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 involving a nominal 18 hours attendance per week over two semesters, or as a part-time program involving a nominal nine hours attendance per week over four semesters. The first stage of the course contains coursework partly devoted to research methodology, including experimental design, and partly to expanding the students' knowledge in areas other than those in which they are undertaking research. 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 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 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 have commenced work on their honours program on or before 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 in Biomedical Science (Honours)
Abbreviation: BSc (Hons)
Course Code: KB22

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

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

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

Further Information

Interested students should discuss the program with Heads of Departments or with individual members of academic staff.

FULL-TIME PROGRAM

Stage 1

Autumn semester

91392 Research Methodology (4cp)
and either
91393 Reading Assignment
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
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)

SUBJECT CHANGES and EQUIVALENCE

Changes introduced for 1992

Old:	*91334*	*Introductory Molecular Biology*
New:	91334	Molecular Biology I
Old:	*91335*	*Advanced Molecular Biology*
New:	91335	Molecular Biology II
Old:	*91351*	*Introductory Immunology*
New:	91351	Immunology I
Old:	*91354*	*Pathobiology I*
New:	91354	Anatomical Pathology
Old:	*91355*	*Pathobiology II*
New:	91355	Haematology I
and	91351	Immunology I
Old:	*91358*	*Haematology*
New:	91358	Haematology II
Old:	*91359*	*Advanced Immunology*
New:	91359	Immunology II
Old:	*91297*	*Professional Experience – Urban Horticulture FT*
New:	91997	Professional Experience – (Biol/Biomed) FT
Old:	*91299*	*Professional Experience – Urban Horticulture PT*
New:	91999	Professional Experience – (Biol/Biomed) PT

Changes introduced for 1993

Old:	*62417*	*Chemistry I (LS) (2 sem) PT*
New:	65012	Chemistry I (LS)
Old:	*62416*	*Chemistry I (LS) FT*
New:	65012	Chemistry I (LS)
Old:	*62426*	*Chemistry II (LS)*
New:	65022	Chemistry II (LS)
Old:	*63112*	*Physics (LS) (2 sem) PT*
New:	68041	Physics (LS)

Old:	*63111*	*Physics (LS) FT*
New:	68041	Physics (LS)
Old:	*91220*	*Horticultural Management II*
New:	91224	Horticultural Production Management
and	91225	Open Space Management
Old:	*91229*	*Horticultural Management I*
New:	91229	Horticultural Financial Management
Old:	*91235*	*Special Horticultural Topics*
New:	91236	Plant Tissue Culture
Old:	*91301*	*Biology I PT (2 sem)*
New:	91311	Biology I
Old:	*91337*	*Clinical Microbiology*
New:	91337	Virology
Old:	*91378*	*Concepts in Biology PT (2 sem)*
New:	91388	Concepts in Biology
Old:	*91384*	*Project (Honours – Biological and Biomedical Sciences) PT*
New:	91381	Project: Honours (Biotechnology) PT
or	91284	Project: Honours (Biomedical Science) PT
or	91287	Project: Honours (Environmental Biol) PT
Old:	*91394*	*Project (Honours – Biological and Biomedical Sciences) FT*
New:	91391	Project: Honours (Biotechnology) FT
or	91294	Project: Honours (Biomedical Science) FT
or	91297	Project: Honours (Environmental Biol) FT

Subjects used for Exemption Purposes

Old:	99993/4	Life Science Elective – 4cp
Old:	99996/7	Life Science Elective – 8cp
Old:	99995	General Studies Elective – 4cp

Subjects to be selected with the approval of the approval of the Head of School.

Equivalences for Transfer into Biotechnology

From:	91360	Quantitative Ecology
or	91354	Anatomical Pathology
To:	91315	Biomonitoring
And	91376	Environmental measurement
From:	91396	Advanced Biocomputing
To:	91334	Molecular Biology I
From:	91322	Biochemistry IV
To:	91335	Molecular Biology II

HONOURS SUBJECTS

Changes introduced for 1992

Old:	*91212*	*Advanced Horticultural Research Project*
New:	91286	Project: Honours (Urban Horticulture) PT
or	91296	Project: Honours (Urban Horticultural) FT

POSTGRADUATE COURSES

General Information

The School offers a doctoral program – PhD, Masters degrees by thesis and by coursework, either full-time or part-time, a graduate diploma and graduate certificate programs on a part-time basis. 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 *	
Masters degree (by thesis)	Full-Time
	Part-time
	Part-time with
External Supervision *	

* See External Supervision information below

Masters degree (by coursework)	
Clinical Biochemistry	Part-time
Clinical Measurement	Full and part-time
Environmental Toxicology	Full and part-time
Medical Physics	Full and part-time
Coastal Resource Management	Full and part-time
Graduate Diploma (by coursework)	
Clinical Biochemistry	Part-time
Graduate Certificates (by coursework)	
Biomedical Technology	Part-time

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 upon 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 Masters 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 Graduate Studies Department, 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 Masters 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
- 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.

MASTERS 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 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.

PhD PROGRAM

Admission requirements

The PhD program is normally a minimum of three years' duration on a part-time basis and two years' duration on a full-time basis if applicants hold a Masters degree, or four years part-time, and three years full-time for applicants with a Bachelor degree. Candidates may be admitted to the program with an appropriate Honours degree from UTS, or a Masters degree from UTS, or an equivalent qualification.

MASTERS DEGREES BY COURSEWORK

Master of Science in Clinical Biochemistry
Master of Science in Clinical Measurement
Master of Science in Medical Physics
Master of Science in Environmental Toxicology
Master of Science in Coastal Resource Management*

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

Admission Requirements and Selection

Candidates may be admitted to the course with either a bachelor 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 Masters degree by coursework shall have each subject assessed according to the normal rules of this university. However, there is no allowance for conceded pass, and Weighted Average Mark will not be calculated.

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 Calendar).

Continuing UTS Students

Masters 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

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 the 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 length.

PART-TIME PROGRAM

Entry to Program in 1993 and odd years *

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 I (Clinical Biochemistry) (10cp)

Spring semester

91459 Project II (Clinical Biochemistry) (16cp)

* Entrants in odd and even years will undertake some subjects in a different order.

Notes

1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.
3. A minimum of 96 credit points must be successfully completed for award of the degree.

MASTER OF SCIENCE IN CLINICAL MEASUREMENT

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 the student 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 *

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**

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)

* Sets of Spring semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programs.

Notes

1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.
3. 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 FT, in each year. All other subjects are as outlined above for part-time program.

MASTER OF SCIENCE IN COASTAL RESOURCE MANAGEMENT

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 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 Masters 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
- 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
- an ability to manage coastal resources in developing and developed environments.

The course includes fieldwork, 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 1

Autumn semester

98901 Coastal Resource Management I (6cp)
Plus two to three of: *
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 II (6cp)
98907 Pollution Assessment and Monitoring (5cp)

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

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)

For further information contact:
The Project Coordinator, Coastal Resource Management, School of Biological and Biomedical Sciences, tel: (02) 330-4042 /4014 /4044.

MASTER OF SCIENCE IN ENVIRONMENTAL TOXICOLOGY

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 Environment Protection Agency and the University of Technology, Sydney, 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 eight formal subjects which cover the essential knowledge and skills for the practising environmental toxicologist. The formal coursework comprises lectures, tutorials and supervised laboratory 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 two years.

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, 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;
- assess the risk from toxic chemicals and advise on environmentally sound management procedures.

PART-TIME PROGRAM

Stage 1

Autumn semester

91448 Introduction to Toxicology (10cp)

91433 Biostatistics (6cp)

*Spring semester**

91442 Toxicological Testing – Bioassay (10cp)

91443 Environmental Management (6cp)

Stage 2

Autumn semester

91444 Analytical Techniques in Toxicology (10cp)0

91447 Environmental Accumulation and Transformation of Toxic Substances (6cp)

*Spring semester**

91446 Field Surveillance and Management of Toxic Substances (10cp)

91445 Biochemical Toxicology (6cp)

Stage 3

Autumn semester

91450 Project – Environmental Toxicology (16cp)

Spring semester

91450 Project – Environmental Toxicology (16cp)

* Sets of Spring semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programs.

Notes

1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.
3. 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 91460 Project – Environmental Toxicology FT, in each year. All other subjects are as outlined above for part-time program.

MASTER OF SCIENCE IN MEDICAL PHYSICS

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 being 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 computer hardware and software in clinical and physiological data acquisition;
- extensive range of biomathematical, biostatistical, signal processing and image processing skills;
- grounding in the complex physiological processes of the body;
- skills to conduct and report on an extensive research project;
- 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**

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**

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 PT (16cp)
Spring semester
91489 Project – Medical Physics PT (16cp)

* Sets of Spring semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programs.

Notes

1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.
3. 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 FT, in each year. All other subjects are as outlined above for part-time program.

GRADUATE DIPLOMA COURSES

GRADUATE DIPLOMA IN CLINICAL BIOCHEMISTRY

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 Masters degree program in Clinical Biochemistry.

PART-TIME PROGRAM

***Entry to Program in 1993 and odd years** **

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)

* Entrants in odd and even years will undertake slightly different programs.

Notes

1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of approximately nine hours per week, over one afternoon and two evenings.

GRADUATE CERTIFICATE COURSES

Graduate Certificate courses will normally consist of three subjects offered over one semester for 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.

GRADUATE CERTIFICATES IN BIOMEDICAL TECHNOLOGY

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.

Graduate Certificates available Autumn semester
Data Processing and Management in the Life Sciences
Electronics and Computing in the Life Sciences
Human Biology

Graduate Certificates available Spring semester 1993 and odd years only
Computer Data Acquisition in the Life Sciences

1994 and even years only
Medical Instrumentation and Measurement
Physics in Medicine

Course Fees

Course fees will apply. Postgraduate students are also required to pay the Student Service Charge on enrolment.

Attendance

Each Graduate Certificate Course requires attendance of nine hours each week for one semester 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.

Spring semester

91463	Hardware for Clinical Data Acquisition and Control
91464	Laboratory Biocomputing
91465	Advanced Programming

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.

Autumn semester

91462	Digital Processing of Signals and Images in Medicine
91461	Physiological Modelling
91433	Biostatistics

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.

Autumn semester

91405	Bioelectronics
91408	Principles of Biocomputing
91436	Advanced Mathematics in Life Sciences

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.

Autumn semester

98902	Biological Systems
91421	Principles of Human Biology

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.

Spring semester

91437	Advanced Bioinstrumentation
91438	Biosensors and Transducers
91439	Physiological Measurement

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.

Spring semester

91434	Radiation Protection
91403	Medical Imaging
91404	Physics in Medicine

POSTGRADUATE SUBJECT CHANGES and EQUIVALENCE

Changes introduced for 1992

Old:	*91403*	*Physics in Medicine I*
New:	91403	Medical Imaging
Old:	*91404*	*Physics in Medicine II*
New:	91404	Physics in Medicine
Old:	*91449*	*Experimental Design*
New:	91433	Biostatistics
Old:	*91462*	*Medical Imaging and Signal Processing*
New:	91462	Digital Processing of Signals and Images in Medicine

Changes introduced for 1993

Old:	*91326*	*Analytical Biochemistry*
New:	91426	Analytical Techniques in Biochemistry
Old:	*91342*	*Clinical Biochemistry I*
New:	91410	Principles of Clinical Biochemistry
Old:	*91343*	*Clinical Biochemistry II*
New:	91411	Biochemical and Pathophysiology
Old:	*91449*	*Experimental Design*
New:	91433	Biostatistics
Old:	*91453*	*Project (Clinical Biochemistry)*
New:	91453	Project Proposal (Clinical Biochemistry)
Old:	*91456*	*Project (Clinical Biochemistry)*
New:	91456	Project I (Clinical Biochemistry)
Old:	*91459*	*Project (Clinical Biochemistry)*
New:	91459	Project II (Clinical Biochemistry)
Old:	*91420*	*Principles of Bioscience*
New:	98902	Biological Systems

SUBJECT DESCRIPTIONS

UNDERGRADUATE SUBJECTS

Guide to subject descriptions

The subject descriptions shown below indicate the subject code and name, the number of credit points for the subject (i.e. *3cp*), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (i.e. *four 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.

91201 HORTICULTURAL EXPERIMENTATION *(3cp); three 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); six hpw; prerequisites 65012 Chemistry I, 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); six 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); six hpw; prerequisite 91312 Biology II*

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, with nursery and intensive cultivation systems.

91207 PLANTS IN THE LANDSCAPE *(8cp); six hpw; prerequisites 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 discussion with the managers of these areas.

91208 PLANT PROTECTION *(6cp); six hpw; prerequisites 91211 Horticultural Botany, 91314 Microbiology I*

Advances an understanding of plant pests and disease, their transmission and control. The subject deals with major groups of plant pests, the safe handling of herbicides and other control substances, and biological control approaches.

91210 LANDSCAPE HORTICULTURE *(3cp); three hpw; corequisite 91311 Biology I or equivalent*

Introduces students to landscape studies by considering the significance and inter-relationships 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); three hpw*

The biological principles involved in the horticultural use of plant materials; plant structure and function. Plant development.

91215 HORTICULTURAL RESEARCH PROJECT *(8cp); six hpw; corequisite 91224 Horticultural Production Management II*

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 (of about 40 pages of text) 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.

91216 HORTICULTURAL PROCEDURES I *(6cp); six hpw; equivalent to 91226*

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 program.

91217 HORTICULTURAL PROCEDURES II *(6cp); six hpw; prerequisite 91216 Horticultural Procedures I; equivalent to 91227*

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.

91218 AUSTRALIAN PLANTS *(6cp); six hpw; prerequisite 91360 Quantitative Ecology*

The taxonomy, identification, distribution natural ecology and biogeography of Australian plants. The potential of native plants for horticultural exploitation. Cultivation techniques for native species.

91224 HORTICULTURAL PRODUCTION MANAGEMENT *(4cp); three hpw; prerequisite 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 as applicable to urban, garden and landscape situations. Long-term and construction design of plant production units will be discussed.

91225 OPEN SPACE MANAGEMENT *(4cp); three 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. 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.

91226 HORTICULTURAL PROCEDURES I *(6cp); three hpw; two semesters; equivalent to 91216*

91227 HORTICULTURAL PROCEDURES II *(6cp); three hpw; two semesters; equivalent to 91217*

91229 HORTICULTURAL FINANCIAL MANAGEMENT *(4cp); three 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); three hpw; prerequisites 91211 Horticultural Botany, 91208 Plant Protection*

Principles of plant cell and tissue culture, and the application of these techniques to cloning, somatic embryogenesis, somoclonal variation and plant variety development. The program includes media nutrient requirements and growth substances; facilities and equipment used; new technologies of haploid culture; pathogen detection and elimination; and laboratory design for large scale horticultural breeding or commercial production.

91286 PROJECT – HONOURS IN URBAN HORTICULTURE *(36cp); 27 hpw, three semesters; equivalent to 91299*

91299 PROJECT – HONOURS IN URBAN HORTICULTURE *(36cp); 27hpw; two semesters*

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. 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 I *(6cp); six hpw; this subject, together with 91312 Biology II, 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 II *(6cp); six hpw; prerequisite 91311 Biology I or equivalent*

Theme: inter-relationship 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 I *(6cp); six hpw; prerequisites 91311 Biology I, 65022 Chemistry II (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 I *(6cp); six hpw; prerequisite 91312 Biology II*

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); three hpw; prerequisites 91312 Biology II, 91317 Human Biology; corequisites 91314 Microbiology I*

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); six hpw; prerequisite 68041 Physics (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); six hpw; corequisite 91312 Biology II*

Basic gross anatomy and detailed study of microscope 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); six hpw*

This subject is available only to students not enrolled in the School of Biological and Biomedical Science 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 characeristics: 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 II *(6cp); six hpw; prerequisite 91313 Biochemistry I*

Principles of catalysis. Purification properties and nomenclature of enzymes. Vitamins and enzyme cofactors. Localisation of enzymes. Regulation of enzyme action at genetic 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 III *(8cp); six hpw; prerequisite 91320 Biochemistry II*

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 IV *(8cp); six hpw; prerequisite 91320 Biochemistry II*

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); six hpw; prerequisite 91313 Biochemistry I*

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 II *(6cp); six hpw; prerequisite 91314 Microbiology I*

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 III *(8cp); six hpw; prerequisite 91330 Microbiology II*

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 I *(4cp); three hpw; prerequisites 91314 Microbiology I, 91313 Biochemistry I; corequisites 91330 Microbiology II and/or 91320 Biochemistry II*

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 II *(8cp); six 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); three hpw; prerequisite 91330 Microbiology II*

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); three 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 I *(4cp); three hpw; prerequisite 91320 Biochemistry II*

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 II *(4cp); three 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.

91346 ENVIRONMENTAL MANAGEMENT PROCEDURES *(4cp); three hpw; prerequisite satisfactory completion of stages 1 to 4*

This is an elective subject recommended for the final year of the Environmental Biology degree and is normally run in alternate years.

Environmental legislation; the NSW Environmental Acts and their associated regulations; comparison of the Federal Acts with those from other States; Significance of socio-economic factors on decision making in environmental matters; Cost/benefit analysis and prediction of social impact; environmental impact assessment; objectives, contents and procedures for the preparation of environmental statements. National and international legislation. Risk analysis and management strategies to reduce risk from environmental pollution. Use of toxicology data in Environmental Impact Statements.

91347 TOXIC MATERIALS IN THE ENVIRONMENT *(4cp); three hpw; prerequisite satisfactory completion of Stages 1 to 4*

This is an elective subject recommended for the final year of the Environmental Biology degree and is normally run in alternate years.

Pathways of toxic substances in the environment. Transfer mechanism between different environment compartments. Bio-accumulation and biotransformation.

91350 PRINCIPLES OF PHARMACOLOGY AND TOXICOLOGY *(4cp); three 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 I *(3cp); three 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); six hpw; prerequisites 91312 Biology II, 91317 Human Biology, 65022 Chemistry II (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 I *(3cp); three 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 I *(8cp); six 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 II *(8cp); six 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 II *(8cp); six hpw; prerequisite 91355 Haematology I*

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 II *(8cp); six hpw; prerequisite 91351 Immunology I*

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); six hpw; prerequisites 91312 Biology II, 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 *(8cp); six 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 *(8cp); six hpw; prerequisite 91360 Quantitative Ecology*

Basic concepts in ecophysiology; limiting factors, lethal limits, acclimation. Patterns of physiological responses to natural and selected man-made stressors. Coordination of physiological processes with environmental factors; neuro-endocrine control of life cycles and physiological responses, stress syndrome. Population changes; basic animal population dynamics, structure, growth and regulation of populations. This subject includes a field excursion.

91364 AQUATIC ECOLOGY *(8cp); six 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.

91365 TERRESTRIAL ECOLOGY *(8cp); six 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.

91366 PEST CONTROL AND TOXICOLOGY *(8cp); six 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); six 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 socio-economic 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 MICROBIAL TECHNOLOGY I *(8cp); six hpw; prerequisite 91330 Microbiology II*

Fermentation technology; processes of formation and extraction of useful products of microbial, animal and plant cells; he microbiological, physiological and biochemical bases of industrially useful fermentations, in the food beverage and 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 MICROBIAL TECHNOLOGY II *(8cp); six hpw; prerequisite 91368 Microbial Technology I or 91331 Microbiology III*

Industrial Microbiology in Practice. Microbiological quality control in the food, beverage, pharmaceutical, cosmetic and related industries – raw material to finished product. Hygiene practices as related to quality control and safety. Modern developments in microbial detection and quantitation; metabolite assays.

91370 FIELD STUDIES: SEMI-ARID ECOLOGY *(8cp); six hpw (run over 10-14 day excursion to far-western NSW in July every third year, alternating with 91371, i.e. a major field elective every 18 months)*

This and other electives are normally taken in senior stages of the degree course. It can thus be assumed that students will have a thorough knowledge of basic ecology. (See also elective field study subjects 91371 and 91375.) The aim of the subject is to broaden students' understanding of environmental biology and its management applications by demonstration and experimentation outside the Sydney Basin. The importance of water and water management, rangeland management and National Parks management of dry areas will be included, along with ecological studies of factors determining the composition and structure of semi arid vegetation.

Assessment will involve submission of a log book/ journal and a project report or presentation, to be completed after the field excursion.

91371 FIELD STUDIES: MOUNTAIN ECOLOGY *(8cp); six hpw (run over 10 day excursion to south-eastern NSW in December every third year, alternating with 91370, i.e. a major field elective every 18 months)*

This and other electives are normally taken in senior stages of the degree course. It can thus be assumed that students will have a thorough knowledge of basic ecology. (See also elective field study subjects 91370 and 91375.) The aim of the subject is to broaden the student's understanding of environmental biology and its management applications by demonstration and experimentation outside the Sydney Basin. The student will be introduced by demonstration and experimentation to the ecology of tall forests and mountain areas, the management of mountain forests, the impacts of forestry operations, and the management of National Park 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); nine hpw; prerequisite 91331 Microbiology III*

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 CLINICAL AND APPLIED MYCOLOGY *(3cp); three hpw; corequisite 91330 Microbiology II*

The structure, function and classification of fungi, with particular reference to those of clinical, industrial, veterinary and agronomic significance. The growth processes and identification of fungi, as causative agents of human and animal disease; and as agents of biological breakdown and deterioration. Control procedures for fungi. Each student will undertake a literature and/or laboratory project related to their major study area.

91374 TISSUE CULTURE *(4cp); three hpw; prerequisite 91351 Immunology*

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); three 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); three hpw; prerequisites 91312 Biology II, 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); three 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); three 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) PT *(36cp); 27 hpw, three semesters*

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

91384 PROJECT (HONOURS IN BIOMEDICAL SCIENCE) PT *(36cp); 27 hpw; three 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) PT *(36cp); 27 hpw, three semesters*

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

91388 CONCEPTS IN BIOLOGY *(6cp); six hpw*

This is an elective subject available to students from Physical Sciences and 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) FT *(36cp); 27hpw; two 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); three hpw*

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

91393 READING ASSIGNMENT – HONOURS (BIOLOGICAL and BIOMEDICAL) *(8cp); six hpw*

Each student is required to complete either an extensive reading assignment and a 4,000 word written critical analysis on a topic different from their research project work *or* senior undergraduate and/or postgraduate subjects amounting to 8 credit points of study.

91394 PROJECT (HONOURS IN BIOMEDICAL SCIENCE) FT *(36cp); 27hpw; two 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); three hpw; prerequisites 33103 Statistics (LS), or 91201 Horticultural Experimentation for Urban Horticulture students*

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); three 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) FT *(36cp); 27 hpw; two 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); three hpw*

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); six hpw*

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); six 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); three 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); six hpw; corequisite 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); four and a half hpw; four semesters; 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 Masters Degree by Coursework.

91407 PROJECT (CLINICAL MEASUREMENT) P/T *(32cp); nine hpw; two semesters; prerequisite all foundation subjects; equivalent to 91406*

91408 PRINCIPLES OF BIOCOMPUTING *(5cp); three hpw; prerequisite: 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, statistical, 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); three 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); six 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 I *(10cp); six hpw*

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

91413 BIOMEDICAL SCIENCES II *(10cp); six hpw*

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

91414 ANALYTICAL BIOCHEMISTRY PROJECT I *(5cp); three hpw*

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

91415 ANALYTICAL BIOCHEMISTRY PROJECT II *(6cp); six hpw*

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

91417 CLINICAL LABORATORY MANAGEMENT *(6cp); six hpw*

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); six hpw; prerequisite 91343 Clinical Biochemistry II*

A variety of case studies, each illustrative of a different kind of problem, will be introduced. Real and simulated cases which involve conceptual and practical problems stemming from uncertain or ambivalent analytical procedures, faulty instrument calibration, poor quality control, inappropriate data handling, and unexpected or apparently inexplicable relationships between sets of biochemical data are used. Students work individually or in groups, studying particular cases, leading class discussions, and suggesting alternative technical or management procedures as well as new technological innovations that might be usefully employed in each case.

91421 PRINCIPLES OF HUMAN BIOLOGY *(10cp); six 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); six hpw; prerequisite 91342 Clinical Biochemistry I*

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); six hpw; prerequisite 91342 Clinical Biochemistry I*

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); six 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); six 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); three 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 LIFE SCIENCES *(5cp); three 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 BIO-INSTRUMENTATION *(5cp); three 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); three 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); six hpw*

Blood flow – ultrasound, radioisotope techniques, electromagnetic effects. Cardiac output – Fick technique, radioisotopes. Neurological and electrophysiological studies – EEG, ECG, heart, nerve and brain stem, evoked potential membrane physiology, electrical propagation. Respiratory measurements/spirometry. Implantable devices – telemetry of information. Audiometry. Biomagnetic and impedance imaging.

91442 TOXICOLOGICAL TESTING – BIOASSAY *(10cp); six hpw; prerequisites 91448 Introduction to Toxicology and 91433 Biostatistics*

Toxicity tests to determine acute and chronic effects of toxic substances on a wide range of organisms e.g. fish, invertebrates, plants. Analysis and interpretation of results.

91443 ENVIRONMENTAL MANAGEMENT *(6cp); six hpw; prerequisites 91448 Introduction to Toxicology and 91433 Biostatistics*

Environmental legislation: the NSW Environmental Acts and their associated regulations; comparison of the Federal Acts with those from other States;

significance of socio-economic factors on decision making in environmental matters; cost/benefit analysis and prediction of social impact; environmental impact assessment; objectives, contents and procedures for the preparation of environmental impact statements.

National and international environmental legislation. Risk analysis and management strategies to reduce risk from environmental pollution. Use of toxicological data in Environmental Impact Statements.

91444 ANALYTICAL TECHNIQUES IN TOXICOLOGY *(10cp); six hpw; prerequisites 91448 Introduction to Toxicology, 91433 Biostatistics; corequisite 91445 Biochemical Toxicology*

Techniques and instrumentation used for toxicological testing of environmental and biological samples.

91445 BIOCHEMICAL TOXICOLOGY *(6cp); six hpw; prerequisite 91448 Introduction to Toxicology; corequisite 91444 Analytical Techniques in Toxicology*

Biochemical mechanisms involved in entry, transformation and removal of toxic substances in plants, animals and selected micro-organisms.

91446 FIELD SURVEILLANCE AND MANAGEMENT OF TOXIC SUBSTANCES *(10cp); six hpw; prerequisites 91448 Introduction to Toxicology, 91433 Biostatistics; corequisite 91447 Environmental Accumulation and Transformation of Toxic Substances*

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.

91447 ENVIRONMENTAL ACCUMULATION and TRANSFORMATION OF TOXIC SUBSTANCES *(6cp); six hpw; prerequisite 91448 Introduction to Toxicology, corequisite 91446 Field Surveillance and Management of Toxic Substances*

Pathways of toxic substances in the environment. Transfer mechanisms between different environment compartments. Bio-accumulation and bio-transformation.

91448 INTRODUCTION TO TOXICOLOGY *(10cp); three 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.

91450 PROJECT (ENVIRONMENTAL TOXICOLOGY) P/T *(32cp); nine hpw; two semesters; prerequisite all foundation subjects*

All Masters 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 co-operation with employers so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Masters Degree by Coursework.

91453 PROJECT PROPOSAL (CLINICAL BIOCHEMISTRY) *(6cp); six hpw; prerequisites 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 I (CLINICAL BIOCHEMISTRY) *(10cp); six hpw; 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 Masters Degree by Coursework.

91459 PROJECT II (CLINICAL BIOCHEMISTRY) *(16cp); nine hpw; prerequisite 91453 Project proposal*

See subject description for 91456.

91460 PROJECT (ENVIRONMENTAL TOXICOLOGY) F/T *(32cp); four and a half hpw; four semesters; corequisite all foundation subjects equivalent to 91450*

91461 PHYSIOLOGICAL MODELLING *(5cp); three 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); three 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); six 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); three hpw*

Intel assembler language. Use of Turbo Assembler debugger. Accessing systems hardware, data acquisition and control cards and interface cards. Interfacing to other languages (e.g. TURBO, PASCAL). Use of Interrupts (DOS, BIOS, Hardware and interrupt handlers). When/Why use Assembler code. Applications in medicine and biology.

91465 ADVANCED PROGRAMMING – LIFE SCIENCES *(5cp); three 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.

91484 PROJECT (MEDICAL PHYSICS) F/T *(32cp); four and a half hpw; 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 Masters Degree by Coursework.

91489 PROJECT (MEDICAL PHYSICS) P/T *(32cp); nine hpw; two semesters; prerequisite all foundation subjects equivalent to 91484*

91498 SPECIAL READING ASSIGNMENT P/G – LIFE SCIENCES *(6cp); six hpw*

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); six hpw*

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.

91509 PHARMACOLOGY *(3cp); three 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 I *(6cp); Bioscience component – four hpw; Physical Science component – two 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, principle 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 II *(6cp); Bioscience component – four hpw; Physical Science component – two 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 I *(6cp); six 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 micro-organisms which affect humans, their epidemiology and methods of limiting their spread and controlling infection; alterations in nutrition and metabolism.

91521 PATHOPHYSIOLOGY II *(6cp); six 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); three 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).

91777 MASTERS 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 MASTERS 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.

98902 BIOLOGICAL SYSTEMS *(6cp); three 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.

INTERDISCIPLINARY SUBJECTS

MASTER OF SCIENCE IN COASTAL RESOURCES MANAGEMENT

98201 ENVIRONMENTAL ECONOMICS AND ECOLOGICALLY SUSTAINABLE MANAGEMENT *(5cp); three hpw*

Concentrates on the fundamental economic principles that underlie the allocation of coastal resources. The concept of ecologically sustainable development will be considered within an economic framework, and its significance to coastal resources will be assessed. Case studies and applications of environmental economic techniques to coastal resource management problems will be investigated.

98202 COASTAL PLANNING AND DEVELOPMENT *(5cp); three 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); three hpw; prerequisite 98906 Coastal Resource Management II*

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); three hpw; prerequisite 98906 Coastal Resource Management II*

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); three 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); three 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); three hpw*

Focuses on basic environmental chemistry of estuarine and ocean waters, and freshwater 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); three 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); three 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 I *(6cp); three 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); three hpw; 91420 Principles of Bioscience or equivalent*

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); three 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); three 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); three 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 II *(6cp); three 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); three 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); three 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 multi-disciplinary 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); nine hpw; prerequisites completion of at least three semesters of coursework*

Normally in their final semester, students will complete the requirements for the Masters 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.

GENERAL STUDIES ELECTIVE SUBJECTS

Various subjects are available from other faculties, some of which 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 I (LIFE SCIENCES) *(3cp); three 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); three 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); three 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 I (LIFE SCIENCES) *(6cp); six 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 II (LIFE SCIENCES) *(6cp); six hpw; prerequisite 65012 Chemistry I (LS)*

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

68041 PHYSICS (LIFE SCIENCES) *(6cp); six hpw; prerequisite HSC Mathematics and Science or equivalent; corequisite 33101 Mathematics I (LS)*

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

THE SCHOOL OF PHYSICAL SCIENCES

The School of Physical Sciences is located on the university's city campus. The Departments of Chemistry, Applied Geology and Materials Science are in Building 4 on Harris Street and the Department of Applied Physics is in Building 1 on Broadway.

The School offers undergraduate degrees in Applied Chemistry, Applied Geology, Materials Science, and Applied Physics

Honours courses are available in all these areas.

The School of Physical Sciences has always maintained strong links with industry. Staff maintain contact with industry by undertaking appropriate consulting activities, and in all the above courses students spend 6 to 12 months working in a relevant industry. The School assists students in finding these paid industrial training positions.

The School is involved in the offering of two joint degrees in Science/Education, and in Science/Law.

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

POSTGRADUATE COURSES

The School offers both PhD and Masters programs by research and thesis, the topics covering the broad range of the physical sciences, namely Chemistry, Applied Geology, Applied Physics and Material Science. Prospective students should discuss possible topics of research with the Head of School 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 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. Areas of research interest in the School are:

Applied Chemistry – physical, inorganic, organic, analytical, environmental, corrosion

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.

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

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

Stage 1

Autumn semester

33170 Basic Science Mathematics (3cp)
or
33171 Science Mathematics I F/T (4cp)
31870 Introduction to Microcomputers (2cp)
65101 Chemistry IM F/T (6cp)
68101 Physics I F/T (6cp)
91388 Concepts in Biology F/T (6cp)
or
66011 Geology I F/T (6cp)

Stage 2

Spring semester

33171 Science Mathematics I F/T (4cp)
or
33172 Science Mathematics II F/T (3cp)
31871 Computing for Science (3cp)
65201 Chemistry IIM (6cp)
65202 Organic Chemistry I (6cp)
68201 Physics II F/T (6cp)

Stage 3

Autumn semester

33172 Science Mathematics II (3cp)
or
33173 Science Mathematics III (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 I (8cp)
65402 Organic Chemistry II (new) (8cp)
65403 Electrochemistry (4cp)
65404 Chemical Thermodynamics(4cp)

Autumn semester

65996 Industrial Training I **

Spring semester

65997 Industrial Training II **

Stage 5

Autumn semester

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

Stage 6

Spring semester

65601 Environmental Chemistry (8cp)
65602 Reaction Kinetics (4cp)
65603 Surface Chemistry (4cp)
Elective* (8cp)

PART-TIME PROGRAM

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 I (4cp)
91388 Concepts in Biology (6cp)
or
66011 Geology I (6cp)

Spring semester

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

Stage 2

Autumn semester

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

Spring semester

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

Stage 3

Autumn semester

33172 Science Mathematics II (3cp)
or
33173 Science Mathematics III (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**

Stage 4

Autumn semester

65402 Organic Chemistry II (new) (8cp)
65403 Electrochemistry (4cp)

Spring semester

65401 Analytical Chemistry I (8cp))
65404 Chemical Thermodynamics (4cp)

Industrial Requirements

65998 Industrial Training P/T**

Stage 5

Autumn semester

65501 Analytical Chemical II (8cp)
65604 Chemical Safety (3cp)

Spring semester

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

Industrial Requirements

65998 Industrial Training P/T**

Stage 6

Autumn semester

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

Spring semester

65603 Surface Chemistry (4cp)
Elective* (8cp)

Industrial Requirements

65998 Industrial Training P/T**

* Chemistry electives offered (subject to satisfactory enrolments):

65701 Applied Organic Chemistry I (8cp)
65702 Applied Organic Chemistry II (8cp)
65703 Metallurgical Chemistry (8cp)
65704 Coordination and Organometallic Chemistry (8cp)
65705 Corrosion Science (8cp)
65706 Chemistry (Project (8cp)

** 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.

To be eligible for consideration for an honours award students must complete all the formal coursework together with an advanced chemistry project.

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.

Stage 2

Autumn semester

63212 Physics I P/T (2 sem) (3cp)
67201 Materials Science I (4cp)
33170 Basic Science Mathematics (3cp)
or
33175 Science Mathematics I P/T (2 sem) (2cp)

Spring semester

63212 Physics I P/T (2 sem) (3cp)
33175 Science Mathematics I P/T (2 sem) (2cp)
65303 Structural Inorganic Chemistry (5cp)
31870 Introduction to Microcomputers (2cp)

Stage 3

Autumn semester

63222 Physics II P/T (2 sem) (3cp)
33171 Science Mathematics I F/T (4cp)
or
33172 Science Mathematics II (3cp)
31871 Computing for Science (3cp)

Spring semester

63222 Physics II P/T (2 sem) (3cp)
33172 Science Mathematics II (3cp)
or
33173 Science Mathematics III (3cp)
65305 Chemical Spectroscopy (5cp)

Industrial Requirements

65998 Industrial Training P/T

Stages 4, 5 and 6

These stages are identical to the applied chemistry degree program above, with the exception that 60301 Treatment of Scientific Data is undertaken in lieu of of Written and Oral Reporting.

Exemptions Granted to Associate Diploma Holders

Chemistry IM
Chemistry IIM
Organic Chemistry I
Chemical Analysis I
Written and Oral Reporting
Geology I
Introduction to Microcomputers
Chemical Technology 1

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, but the award of honours may be made to any student who has performed meritoriously in formal coursework and has submitted a project report of high standard. (A new Honours degree in Applied Geology is planned. Details of the program have still to be approved.)

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

FULL-TIME PROGRAM

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 IM F/T (6cp)
65011 Chemistry I F/T (6cp)
68101 Physics I F/T (6cp)
or
91388 Concepts in Biology F/T (6cp)
33170 Basic Science Mathematics (3cp)
or
33171 Science Mathematics I F/T (4cp)
31870 Introduction to Microcomputers (2cp)

Stage 2

Spring semester

66201 Geological Mapping (4cp)
66202 Lithology (2cp)
66203 Geodynamics (3cp)
65021 Chemistry II F/T (6cp)
68041 Physics LS F/T (6cp)
or
68201 Physics II F/T (6cp)
33171 Science Mathematics I F/T (4cp)
or
33172 Science Mathematics II (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 I

Stage 5*

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*

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 II

PART-TIME PROGRAM

Stage 1

Autumn semester

62312 Geology I P/T (2 sem) (3cp)
62412 Chemistry I P/T (2 sem) (3cp)
63212 Physics I P/T (2 sem) (3cp)
33170 Basic Science Mathematics (3cp)
or
33175 Science Mathematics I P/T (2 sem) (2cp)

Spring semester

62312 Geology I P/T (2 sem) (3cp)
62412 Chemistry I P/T (2 sem) (3cp)
63212 Physics I P/T (2 sem) (3cp)
33175 Science Mathematics I P/T (2 sem) (2cp)
31870 Introduction to Microcomputers (2cp)

Stage 2

Autumn semester

66202 Lithology (2cp)
62422 Chemistry II P/T (2 sem) (3cp)
63222 Physics II P/T (2 sem) (3cp)
33175 Science Mathematics I P/T (2 sem) (2cp)
or
33172 Science Mathematics II (3cp)

Spring semester

66201 Geological Mapping (4cp)
66203 Geodynamics (3cp)
62422 Chemistry II P/T (2 sem) (3cp)
63222 Physics II P/T (2 sem) (3cp)
33175 Science Mathematics I P/T (2 sem) (2cp)

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*

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*

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

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

BACHELOR OF APPLIED SCIENCE IN 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 enroling 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 their 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

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 I F/T (6cp)
65011 Chemistry I F/T (6cp)
66011 Geology I F/T (6cp)
or
91388 Concepts in Biology F/T (6cp)
31870 Introduction to Microcomputers (2cp)
33171 Science Mathematics I F/T (4cp)

Stage 2

Spring semester

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

Stage 3

Autumn semester

31871 Computing for Science (3cp)
33221 Engineering Mathematics IIA (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 I (3cp)
68402 Applied Mechanics (3cp)
68404 Electronics II (3cp)

Autumn semester

68996 Industrial Training I

Spring semester

68997 Industrial Training II

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 II (3cp)
68602 Physical Optics (3cp)
68508 Project A (2 sem) (3cp)
68608 Project B (3cp)
and
Elective (3cp)

With the agreement of the Head of Department up to 6 credit points may be varied to allow students to develop individual interests.

PART-TIME PROGRAM

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

Stage 1

Autumn semester

33175 Science Mathematics I P/T (2 sem) (2cp)
62412 Chemistry I P/T (2 sem) (3cp)
63212 Physics I P/T (2 sem) (3cp)
62312 Geology I P/T (2 sem) (3cp)
or
91378 Concepts in Biology P/T (2 sem) (3cp)

Spring semester

31870 Introduction to Microcomputers (2cp)
33175 Science Mathematics I P/T (2 sem) (2cp)
62412 Chemistry I P/T (2 sem) (3cp)
63212 Physics I P/T (2 sem) (3cp)
62312 Geology I P/T (2 sem) (3cp)
or
91378 Concepts in Biology P/T (2 sem) (3cp)

Stage 2

Autumn semester

33172 Science Mathematics II (3cp)
51368 Written and Oral Reporting (2cp)
62422 Chemistry II P/T (2 sem) (3cp)
63222 Physics II P/T (2 sem) (3cp)

Spring semester
33173 Science Mathematics III (3cp)
62422 Chemistry II P/T (2 sem) (3cp)
63222 Physics II P/T (2 sem) (3cp)
67202 Introduction to Crystallography (2cp)

Stage 3

Autumn semester
31871 Computing for Science (3cp)
33221 Engineering Mathematics IIA (3cp)
68302 Applied Optics (3cp)
67201 Materials Science I (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 III(3cp)
68303 Electrotechnology (3cp)
68304 Electronics I (6cp)
Spring semester
68401 Quantum Physics I (3cp)
68404 Electronics II (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 I
Spring semester
68503 Materials Physics (3cp)
68603 Applied Thermodynamics (3cp)
68604 Principles of Instrumentation (3cp)
68605 Transducers and Devices (3cp)
68997 Industrial Training II

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 II (3cp)
68602 Physical Optics (3cp)
68508 Project A (2 sem) (3cp)
68608 Project (Pass) B (3cp)

With the agreement of the Head of Department up to 6 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 a WAM (weighted 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 a WAM of at least 65 in both the academic component and the industrial Honours project. Students who do not maintain this standard, or who 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* (3cp)
68502 Field Theory* (3cp)
68504 Microprocessors in Instrumentation* (3cp)
63395 Industrial Training (Honours)

Spring semester

68603 Applied Thermodynamics* (3cp)
68601 Quantum Physics II* (3cp)
68602 Physical Optics* (3cp)
68997 Industrial Training II

Year 4

Autumn semester

68035 Communication Physics (3cp)
68501 Nuclear Physics* (3cp)
68505 Solid State Physics* (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* (3cp)
68655 Advanced Solid State Physics (4cp)
68604 Principles of Instrumentation* (3cp)
68553 Computer Modelling of Physical Systems (3cp)
68858 Project (Honours) (2 sem) (12cp)

Subjects marked * are taken in common with pass students.

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* (3cp)
68505 Solid State Physics* (3cp)
68557 Advanced Electron Microscopy Techniques (4cp)
68995 Industrial Training (Honours)

Spring semester

68503 Materials Physics* (3cp)
68603 Applied Thermodynamics* (3cp)
68605 Transducers and Devices* (3cp)
68997 Industrial Training II

Year 6

Autumn semester

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

Spring semester

68601 Quantum Physics II* (3cp)
68655 Advanced Solid State Physics (4cp)
68604 Principles of Instrumentation* (3cp)
68602 Physical Optics* (3cp)

Year 7

Autumn semester

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

Spring semester

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

Subjects marked * are taken in common with pass students.

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.

Attendance Patterns

The 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 courses consists of six years of part-time study whilst

employed in a relevant industry. Students have the 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 degree course are required to undertake one calendar year of full-time, or the part-time equivalent, industrial training of an approved nature. This industrial training is an integral and compulsory part of the degree program. A program of this type is called a cooperative education or sandwich program.

Under a full-time pattern of attendance, involving 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.

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.

The basic award for successful completion of the course is Bachelor of Applied Science, but the award of honours may be made to any student who has performed meritoriously in formal coursework and has submitted a project report of high standard. (A new Honours degree in Materials Science is planned. Details of the program have still to be approved.)

SANDWICH PROGRAM

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 I F/T (6cp)
or
91388 Concepts in Biology F/T (6cp)
65011 Chemistry I F/T (6cp)
68101 Physics I F/T (6cp)
31870 Introduction to Microcomputers (2cp)
33170 Basic Science Mathematics (3cp)
or
33171 Science Mathematics I F/T (4cp)

Stage 2

Spring semester

65021 Chemistry II F/T (6cp)
68201 Physics II F/T (6cp)
65024 Introductory Organic Chemistry (3cp)
67202 Introduction to Crystallography (2cp)
67201 Materials Science I (4cp)
33171 Science Mathematics I F/T (4cp)
or
33172 Science Mathematics II (3cp)

Stage 3

Autumn semester

51368 Written and Oral Reporting (2cp)
60301 Treatment of Scientific Data (3cp)
65031 Thermodynamics (3cp)
67302 Polymers I (3cp)
67303 Mechanical Properties of Materials (6cp)
67301 Materials Science II (4cp)
33172 Science Mathematics II (3cp)
or
33173 Science Mathematics III (3cp)

Stage 4

Spring semester

31871 Computing for Science (3cp)
67404 Physical Metallurgy I (4cp)
67402 Polymers II (4cp)
67401 Materials Science III (3cp)
67405 Physical Metallurgy II (4cp)
67403 Ceramics I (4cp)
33173 Science Mathematics III (3cp)
or
21139 Business Organisation (2cp)

Autumn semester

67996 Industrial Training I

Spring semester

67997 Industrial Training II

Stage 5

Autumn semester

68071 Applied Physics (Materials) (4cp)
67504 Physical Metallurgy III (4cp)
67501 Ceramics II (4cp)
67502 Polymers III (4cp)
67503 Ceramics III (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

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

Stage 1

Autumn semester

62312 Geology I P/T (2 sem) (3cp)
or
91378 Concepts in Biology P/T (2 sem) (3cp)
62412 Chemistry I P/T (2 sem) (3cp)
63212 Physics I P/T (2 sem) (3cp)
33170 Basic Science Mathematics (3cp)
or
33175 Science Mathematics I P/T (2 sem) (2cp)

Spring semester

62312 Geology I P/T (2 sem) (3cp)
or
91378 Concepts in Biology P/T (2 sem) (3cp)
62412 Chemistry I P/T (2 sem) (3cp)
63212 Physics I P/T (2 sem) (3cp)
31870 Introduction to Microcomputers (2cp)
33175 Science Mathematics I P/T (2 sem) (2cp)

Stage 2

Autumn semester

62422 Chemistry II P/T (2 sem) (3cp)
63222 Physics II P/T (2 sem) (3cp)
67201 Materials Science I (4cp)
33175 Science Mathematics I P/T (2 sem) (2cp)
or
33172 Science Mathematics II (3cp)

Spring semester

65024 Introductory Organic Chemistry (3cp)
62422 Chemistry II P/T (2 sem) (3cp)
63222 Physics II P/T (2 sem) (3cp)
67202 Introduction to Crystallography (2cp)
33175 Science Mathematics I P/T (2 sem) (2cp)

Stage 3

Autumn semester

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

Spring semester

67404 Physical Metallurgy I (4cp)
67401 Materials Science 3 (3cp)
67403 Ceramics I (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 II (3cp)
or
33173 Science Mathematics III (3cp)

Spring semester

67402 Polymers II (4cp)
67405 Physical Metallurgy II (4cp)
31871 Computing for Science (3cp)
33173 Science Mathematics III (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 III (4cp)
67501 Ceramics II (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 III (4cp)
67503 Ceramics III (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

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 (i.e. *3cp*), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (i.e. *four 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); three hpw; prerequisites 33171 or 33175 Science Mathematics I, 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.

62312 **GEOLOGY I P/T** *(6cp); three hpw; two semesters*

Equivalent to 66011.

62412 **CHEMISTRY I P/T** *three hpw; two semesters; prerequisite HSC Science (any course) or equivalent*

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

62417 **CHEMISTRY I P/T (LS)** *(6cp); three hpw; two semesters; prerequisite HSC science (any course) or equivalent; subject coordinator Mr R Armstrong*

Introduction to basic concepts. Atomic structure. Periodic table. Bonding. Heat changes. Structure of matter, solutions.

62422 **CHEMISTRY II P/T** *(6cp); three hpw; two semesters; prerequisites 65011 Chemistry I F/T or 62412 Chemistry I P/T*

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

63212 **PHYSICS I P/T** *(6cp); three hpw; two semesters*

Equivalent to 68101 Physics I F/T.

63222 **PHYSICS II P/T** *(6cp); three hpw*

Equivalent to 68201 Physics II F/T.

65011 **CHEMISTRY I F/T** *(6cp); six hpw*

See 62412.

65012 **CHEMISTRY I F/T (LIFE SCIENCES)** *(6cp); six hpw.* See 62417.

65021 **CHEMISTRY II F/T** *(6cp); six hpw*

See 62422.

65022 **CHEMISTRY II (LIFE SCIENCES)** *(6cp); six 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 steorchemistry.

65023 **ENGINEERING CHEMISTRY** *(6cp); six 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); three hpw; prerequisite 65011 Chemistry I F/T or 62412 Chemistry I P/T; corequisite 65021 Chemistry II F/T or 62422 Chemistry II 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, kentones, nitriles, acids and derivatives, benzene and derivatives. Qualititative 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); three hpw; prerequisites 67201 Materials Science I, 33172 Science Mathematics II, 62422 Chemistry II P/T or 65021 Chemistry II 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); four hpw; prerequisite 67405 Physical Metallurgy II; 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); six hpw; prerequisites 65406 Physical Chemistry I plus all Stage 1, 2 and 3 subjects; subject coordinator Dr A Cameron*

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

65071 CORROSION TECHNOLOGY FOR ENGINEERS *(3cp); three 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 IM F/T *(6cp); six 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 IIM F/T *(6cp); six 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 I (6cp); six hpw

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

65301 SPECTROSCOPY AND STRUCTURE *(7cp); six hpw; prerequisites 65021 Chemistry II or 65201 Chemistry IIM; subject coordinator Dr R Ashby*

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

65302 INORGANIC CHEMISTRY *(7cp); six hpw; prerequisites 65101 Chemistry IM, 65201 Chemistry IIM; 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 I *(8cp); six hpw; prerequisites all Stage 3 subjects; subject coordinator Dr M Dawson*

Lecture and laboratory topics selected from: separation techniques – solvent extraction; distillation; precipitation; chromatograpy, 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 II (NEW) *(8cp); six hpw; prerequisites 65202 Organic Chemistry I, 65301 Spectroscopy and Structure; subject coordinator Dr 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); three hpw; prerequisites all Stage 1 subjects, 33172 Science Mathematics II, 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); three hpw; prerequisites 65301 Spectroscopy and Structure, 33172 Science Mathematics II; 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 II *(8cp); six 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, voltammetric 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); six hpw; prerequisites all Stage 2 subjects, Stage 3 chemistry subjects; subject coordinator Mr 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 (NEW) *(5cp); four 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 voltammetric analyses, spectrometers, chromatographic instrumentation, vacuum technology.

65504 CHEMICAL SAFETY *(3cp); two 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 1-4 subjects*

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

65601 ENVIRONMENTAL CHEMISTRY *(8cp); six 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); three hpw; prerequisites 65406 Physical Chemistry I, 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); three hpw; prerequisites 65406 Physical Chemistry I, 60301 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects; subject coordinator Dr G Draper*

Interfacial phenomena, surface active agents, catalysis, rheology.

65701 APPLIED ORGANIC CHEMISTRY I *(8cp); six hpw; prerequisites all Stages 1, 2 and 3 subjects and 65405 Organic Chemistry II; subject coordinator Dr 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 II *(8cp); six hpw; prerequisites 65405 Organic Chemistry II 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); six 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); six 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. Co-ordination chemistry and catalysis.

65705 CORROSION SCIENCE *(8cp); six hpw; prerequisites 65406 Physical Chemistry I 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.

65990 THESIS (APPLIED CHEMISTRY) F/T

65991 THESIS (APPLIED CHEMISTRY) F/T and EXT

65996 INDUSTRIAL TRAINING I (APPLIED CHEMISTRY) *First six months full-time*

65997 INDUSTRIAL TRAINING II (APPLIED CHEMISTRY) *Second six months full-time*

65998 INDUSTRIAL TRAINING P/T (APPLIED CHEMISTRY)

66011 GEOLOGY I F/T *(6cp); six 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 1/2-day field excursions in the Sydney area.

66032 GEOLOGY FOR ENGINEERS *(3cp); three hpw; subject coordinator Ms S Border*

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 F/T *(6cp); six 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); four hpw; prerequisite 66011 or 62312 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); two hpw; prerequisite 66011 or 62312 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, metamorphoric and volcanic rocks. Includes origin and types of deposits. Practical includes hand specimen examination of common minerals and rocks.

66203 GEODYNAMICS *(3cp); three 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); eight 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); six 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; petrograhic and textural analysis of sediments; nature and identification of clay minerals; introduction to palaeontological techniques. Fieldwork.

66303 GEOCHEMISTRY *(3cp); three 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); four 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); six 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); four 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); three 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); three 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); four 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 on-going exploration programs. Fieldwork.

66501 ENGINEERING AND ENVIRONMENTAL GEOLOGY *(5cp); six hpw and four-day field excursion; corequisite 66402 Structural Geology; subject coordinator Associate Professor B Marshal 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); four 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); four 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); three hpw; corequisite 66403 Economic Geology; subject coordinator D 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); four 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-speciment, 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); three 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); three 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.

66601 EXPLORATION AND MINING GEOLOGY *(4cp); four hpw; prerequisites 66402 Structural Geology, 66403 Economic Geology; subject coordinator Ms S Border*

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); three 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); four 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 infrared imagery; traditional black and white, and colour air-photography; multi-spectral 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); nine 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); four 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); four 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); four 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); two hpw; subject coordinator Associate Professor B Franklin*

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

66990 THESIS (APPLIED GEOLOGY) F/T

66991 THESIS (APPLIED GEOLOGY) P/T and EXT

66996 INDUSTRIAL TRAINING I (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 Department of Applied Geology.

66997 INDUSTRIAL TRAINING II (APPLIED GEOLOGY) *prerequisite Stage 4 Applied Geology Course*

66998 INDUSTRIAL TRAINING P/T (APPLIED GEOLOGY)

67011 MATERIALS I *(3cp); three hpw*

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

67021 MATERIALS ENGINEERING I *(3cp); three 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); three 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); three hpw; prerequisite 68031 Engineering Physics I (Elec)*

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 the emphasis is placed on the properties and selection of metals ceramics, polymers and composites in electronic devices and instruments.

67061 MATERIALS ENGINEERING II *(3cp); three hpw; prerequisites 33222 Engineering Mathematics IIB, 42631 Mechanics III*

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 I *(4cp); four hpw; prerequisites 65011 Chemistry I, 68101 Physics I; corequisites 65021 Chemistry II, 68201 Physics II, 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) two 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 II *(4cp); four hpw; prerequisites 67201 Materials Science I, 33172 Science Mathematics II, 68201 Physics II, 65021 Chemistry II; 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 I *(3cp); three hpw; prerequisites 67201 Materials Science I, 65024 Introductory Organic Chemistry; corequisite 67301 Materials Science II; 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); six hpw; prerequisite 67201 Materials Science I; corequisite 33172 Science Mathematics II; 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 III *(3cp); three hpw; prerequisite 67301 Materials Science II; 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 II *(4cp); four hpw; prerequisite 67302 Polymers I; 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 I *(4cp); four hpw; prerequisite 67201 Materials Science I; 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 I *(4cp); four hpw; prerequisites 67201 Materials Science I, 67301 Materials Science II, 65031 Themodynamics, 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 II *(4cp); four hpw; prerequisite 67303 Mechanical Properties of Materials; corequisite 67404 Physical Metallurgy I; 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); two hpw; prerequisite 68201 Physics II; 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 II *(4cp); four hpw; prerequisites 67403 Ceramics I, 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 glass manufacture of commercial glasses. Industrial excursions.

67502 POLYMERS III *(4cp); four 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 III *(4cp); four hpw; prerequisites 67301 Materials Science II, 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 III *(4cp); four 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

67601 MATERIALS DEGRADATION *(2cp); two hpw; prerequisites 67403 Ceramics I, 67402 Polymers II; 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); four hpw; prerequisites 65031 Thermodynamics, 67402 Polymers II, 67405 Physical Metallurgy II, 67403 Ceramics I; subject coordinator Dr M Stevens*

Basic surface properties, themodynamics 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); two hpw; prerequisites 67405 Physical Metallurgy II, 67403 Ceramics I, 67402 Polymers II; 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, inservice performance, aesthetic and economic factors, and other matters that must be considered in the design process. Various case histories are studied.

67604 COMPOSITES *(2cp); two hpw; prerequisites 67405 Physical Metallurgy II, 67504 Physical Metallurgy III, 67402 Polymers II, 67502 Polymers III, 67501 Ceramics II, 67503 Ceramics III; 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, co-polymers 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.

67990 THESIS (MATERIALS SCIENCE) F/T

67991 THESIS (MATERIALS SCIENCE) P/T and EXT

67996 INDUSTRIAL TRAINING I (MATERIALS SCIENCE)

67997 INDUSTRIAL TRAINING II (MATERIALS SCIENCE)

67998 INDUSTRIAL TRAINING P/T (MATERIALS SCIENCE)

68011 ENGINEERING PHYSICS (MECHANICAL) *(3cp); three 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 I (MECHANICAL) *(3cp); three 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); six 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 I (ELECTRICAL) *(6cp); six 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 II (ELECTRICAL) *(3cp); three 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 III (ELECTRICAL) *(3cp); three hpw; prerequisites 68032 Engineering Physics II (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); three 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); three hpw; subject coordinator Professor A Moon*

Basic aspects of electromagnetic wave propagation and attentuation 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 I (LIFE SCIENCES) *(6cp); six 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); four hpw; prerequisite 68201 Physics II*

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 I F/T *(6cp); six 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 II F/T *(6cp); six hpw; prerequisites 68101 or 63212 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 III *(3cp); three hpw; prerequisites 68201 Physics II, 33171 Science Mathematics I*

Classical Physics: law of Universal Gravitation, Doppler effect, introduction to statistical analysis. 20th century Physics: discovery of charged particles, concept of quantisation. Nature of the atom, Rutherford experiment, Bohr theory, extension of Bohr theory, atomic structure. Special Theory of Relativity. X-rays nature and diffraction. Nature of nucleus, radioactivity, particle detectors. Introduction to elementary particles.

68302 APPLIED OPTICS *(3cp); three hpw; prerequisite 68201 or 63222 Physics II; corequisites 33172 Science Mathematics II, 33173 Science Mathematics III; 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); three hpw; prerequisite 68201 or 63222 Physics II; corequisites 33172 Science Mathematics II, 33173 Science Mathematics III; subject coordinator Mrs S Hogg*

Basic electrostatics, magnetism and electro-magnetism. Magnetic materials. Integral form of Maxwell's equations. Alternating currents using complex impedence. Electrical measurements and machinery, transformers, three-phase. AC/DC generators and motors.

68304 ELECTRONICS I *(6cp); six hpw; prerequisites 68201 or 63222 Physics II, 33172 Science Mathematics II*

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 I *(3cp); three hpw; prerequisite 68301 Physics III, 33172 Science Mathematics II, 33173 Science Mathematics III; 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); three hpw; prerequisites 68201 Physics II, 33221 Engineering Mathematics IIA; 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); three hpw; prerequisite 68201 or 63222 Physics II; 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 II *(3cp); three hpw; prerequisite 68304 Electronics I*

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); three hpw; prerequisite 68201 Physics II; 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); four hpw; prerequisites 60301 Treatment of Scientific Data, 31871 Computing for Science, 68201 Physics II, 33221 Engineering Mathematics IIA; subject coordinator Dr M Braun*

Introduction to digital techniques in applied physics; data analysis, numerical modeling. Techniques for writing and testing large programs. Use of computer packages.

68501 NUCLEAR PHYSICS *(3cp); three 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); three 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); three hpw; prerequisite 68301 Physics III, 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); three 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); three 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); three hpw; prerequisites 68301 Physics III, 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); three hpw; prerequisites 68301 Physics III, 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) two semesters*

68553 COMPUTER MODELLING OF PHYSICAL SYSTEMS *(3cp); three hpw; prerequisites 68406 Computational Physics, 68505 Solid State Physics, 68502 Field Theory, 68601 Quantum Physics II*

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); three hpw; prerequisites 68301 Physics III, 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); three hpw; prerequisites 68301 Physics III, 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 II *(3cp); three 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. Electrochemical potential. Fermi and Bose distribution functions. Irreversible thermodynamics of linear processes.

68602 PHYSICAL OPTICS *(3cp); three 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); three hpw; prerequisites 68403 Thermodynamics and Energy, 33221 Engineering Mathematics IIA*

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); three hpw; prerequisites 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); three 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 *(3cp); three 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 I S *(8cp); for computing submajor students*

Details are as for 68041.

68712 ENGINEERING PHYSICS (CIVIL) S *(8cp); for computing submajor students*

Details are as for 68021.

68713 PHYSICS FOR ELECTRONICS S *(6cp); six 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 *(3cp); three hpw; prerequisite 68101 Physics I*

Introduction to electrostatics, electromagnetism and circuit analysis.

68721 PHYSICS II S *(8cp); for computing submajor students*

Details are as for 68201.

68731 PHYSICS III S *(4cp); for computing submajor students*

Details are as for 68301.

68732 APPLIED OPTICS S *(4cp); for computing submajor students*

Details are as for 68302.

68733 ELECTROTECHNOLOGY S *(4cp); for computing submajor students*

Details are as for 68303.

68734 ELECTRONICS I S *(8cp); for computing submajor students*

Details are as for 68304.

68741 QUANTUM PHYSICS I S *(4cp); for computing submajor students*

Details are as for 68401.

68742 APPLIED MECHANICS S *(4cp); for computing submajor students*

Details are as for 68402.

68743 THERMODYNAMICS AND ENERGY S *(4cp); for computing submajor students*

Details are as for 68403.

68744 ELECTRONICS II S *(4cp); for computing submajor students*

Details are as for 68404.

68751 NUCLEAR PHYSICS S *(4cp); for computing submajor students*

Details are as for 68501.

68753 MATERIALS PHYSICS S *(4cp); for computing submajor students*

Details are as for 68503.

68754 MICROPROCESSORS IN INSTRUMENTATION S *(4cp); for computing submajor students*

Details are as for 68504.

68755 SOLID STATE PHYSICS S *(4cp); for computing submajor students*

Details are as for 68505.

68761 QUANTUM PHYSICS II S *(4cp); for computing submajor students*

Details are as for 68601.

68763 APPLIED THERMODYNAMICS S *(4cp); for computing submajor students*

Details are as for 68603.

68764 PRINCIPLES OF INSTRUMENTATION S *(4cp); for computing submajor students*

Details are as for 68604.

68858 PROJECT (HONOURS) *(24cp); two semesters; prerequisite 68997 Industrial Training II (Honours, Applied 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 I (PHYSICS)

68997 INDUSTRIAL TRAINING II (PHYSICS)

SUBJECTS OFFERED BY OTHER FACULTIES

21139 BUSINESS ORGANISATION *(2cp); two 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); two 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) three 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); three hpw*

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

33171 SCIENCE MATHEMATICS I F/T *(4cp); four 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 II *(3cp); three hpw; prerequisite 33171 Science Mathematics I*

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 III *(3cp); three hpw; prerequisite 33171 Science Mathematics I; corequisite 33172 Science Mathematics II*

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.

33175 SCIENCE MATHEMATICS I P/T *(4cp); two hpw; two semesters*

Equivalent to 33171.

33221 ENGINEERING MATHEMATICS IIA *(3cp); three hpw; prerequisites 33172 Science Mathematics II, 33173 Science Mathematics III*

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); three hpw; prerequisite 33221 Engineering Mathematics IIA*

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.

51357 ORAL COMMUNICATION *(2cp); two hpw*

This is a practical, workshop subject. Speaking and presentation skills are developed in several contexts: popular, academic and industrial. In any one semester these may include the communication of science on radio and television, seminar presentations and conferences, interviewing and formal presentations. The focus is on the oral presentation of scientific and technical information.

51368 WRITTEN AND ORAL REPORTING *(2cp); two 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.

CENTRES AND INSTITUTES WITHIN THE FACULTY

There are seven centres and institutes within the faculty, namely, the Centre for Environmental Toxicology (run jointly with the EPA), the Centre for Science Communication (funded in part by DEET), the Institute for Coastal Resource Management, the Centre for Materials Technology, 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 multi-disciplinary 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 multi-disciplinary 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 of Technology, Sydney, 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, visiting scientists and a toxicological testing service for industry. EPA staff of the Centre are involved in teaching aspects of the Masters 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 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 Physical and Health Education 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 of Technology, Sydney. A further 10 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, Mathematics and Computing Science 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 inter-relationships 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 which involves training new generations of scientists and engineers at the interface of academia and industry with opportunities for international exchanges. Links with leading cardiac research groups at Duke University, USA, Imperial College, London and the University of Liverpool, UK have been arranged.

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 aim of researching groundwater problems of strategic national importance and of coordinating and developing postgraduate courses and continuing education programs, and of 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. Details are given in the section below. For further enquiries please contact

Associate Professor Michael Knight
Director
National Centre for Groundwater Management
Room 2/429
Tel (02) 330 1984

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 multi-disciplinary perspective to issues of groundwater management.

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 exception of the 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*
44155	Groundwater Modelling
66015	Hydrogeochemistry
44151	Surface Hydrology and Groundwater
	Elective 1
	Elective 2

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

*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 the 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*
44155	Groundwater Modelling
66015	Hydrogeochemistry
44151	Surface Hydrology and Groundwater
	Elective 1
	Elective 2

Spring semester	
44152/44152	Project

Electives

As for Master of Science.

*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 (i.e. *3cp*), the duration of the subject, indicated as semester weeks, if applicable, and the number of formal contact hours each week (i.e. *four 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.

44150 COMPUTING FOR GROUNDWATER SPECIALISTS *three 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); three 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); three 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); three 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); three hpw*

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

66015 HYDROGEOCHEMISTRY *(5cp); three 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); three 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); three 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); three hpw*

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

FACULTY BOARD IN SCIENCE

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Associate Professor P Bryce
Associate Professor R T Buckney
Associate Professor M D Burchett
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Professor J Unsworth
Dr D C Waters
Dr R L S Woolcott
Mr B Young

* Professor A R Moon will take up appointment as Dean early in 1993.

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

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Deputy Dean and Head, Immunobiology Unit
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Head of School
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Head, Dept of Microbiology
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Mr I Smalls
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Director, Royal Botanic Gardens
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

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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

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Director, McMahon Associates Pty Limited
Dr D Hobday
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Mr N Crothers
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* Professor A R Moon will take up appointment as Dean early in 1993.

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J Hook, BAppSc (UTS)
G Shoebridge, BSc (Hons) (Macq)
C Woodlands BSc (Hons) (Syd)

Centre for Environmental Toxicology

Joint UTS/Environmental Protection Agency (EPA)

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Manager
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R Krassoi, BAppSc (UTS)
R Sunderam, BSc (Hons) (Sri Lanka) MAppSc (UTS)

Gore Hill Research Laboratories Animal House

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Electron Microscope Unit

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Secretaries
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J Micheli

Word Processor Operator
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R Ward, BSc (Syd), DipEd (CSU)
B Young, BE (Hons) (Cant)

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C G Skilbeck, BSc, PhD (Syd)

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B T Cornwell, BAppSc (UTS)
T Rannard, BAppSc (UTS)

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G M Renwick, BSc (St And), PhD (Monash), MRACI, CChem
M G Stevens, MSc, PhD (Syd), MRACI
M Wilson, BSc (N'cle), PhD (NSW), MIEAust

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Senior Laboratory Craftsperson, Grade 1
C McDonald

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J Edgington

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R Peters

National Centre for Groundwater Management

(in conjunction with the Faculty of Engineering)

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N P Merrick, BSc, MSc (Syd), GradDipDataProc (NSWIT)

Research Fellow
R G McLaughlan, BSc (Melb), GradDipCivEng, MAppSc, PhD (NSW)

Administrative Assistant
R Peters, BA (Ramkhamhaeng)

PRINCIPAL DATES FOR 1993

AUTUMN SEMESTER

JANUARY

11	Release of HSC results
11	School of Legal Practice enrolment day at St Leonards
18	Closing date for changes of preference to the Universities Admissions Centre (UAC) from 1992 NSW HSC applicants (by 4.30 pm)
21-29	Enrolment of students at City campus
26	Australia Day
29	Public School Holidays end

FEBRUARY

1 – 26	Enrolment of students at City campus
3 – 5	Enrolment of new undergraduate students at City campus – includes UAC and direct applicants
4 – 5	Enrolment of all Faculty of Nursing students at Kuring-gai campus
10 – 11	Enrolment of all School of Teacher Education students at Kuring-gai campus
22	Enrolment of School of Biological and Biomedical Science students at St Leonards campus

MARCH

1	Classes begin
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 financial penalty
31	HECS Census Date

APRIL

8	Last day to drop a subject without academic penalty*
8	Last day to withdraw from a course without academic penalty*
9	Public School Holidays begin
9	Good Friday
12	Easter Monday
13	Graduation period begins
13 – 16	Vice-Chancellors' Week (non-teaching)
16	Public School Holidays end
25	Anzac Day
30	Graduation period ends
30	Last day to apply to graduate in Spring 1993

MAY

28	Closing date for undergraduate applications for Spring semester

JUNE

14	Formal examination period begins
28	Public School Holidays begin

SPRING SEMESTER

JULY

2	Formal examination period ends
5	School of Legal Practice enrolment day at St Leonards campus
5 – 9	Vice-Chancellors' Week (non-teaching)
9	Public School Holidays end
21	Release of Autumn Semester examination results
26 – 30	Confirmation of Spring programs
27 – 28	Enrolment of new students

AUGUST

2	Classes begin
5	Last day to withdraw form full year subjects without failure*
13	Last day to enrol in a course or add subjects
13	Last day to change to upfront HECS payment
27	Last day to apply for leave of absence
31	HECS Census Date
31	Last day to apply to graduate in Autumn 1994

SEPTEMBER

10	Last day to drop a subject without academic penalty*
10	Last day to withdraw from a course without academic penalty*
27	Public School Holidays begin
27	Vice-Chancellors' Week (non-teaching) begins
27	Graduation period begins
27-29	Conference on Cultural Diversity
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

OCTOBER

1	Vice-Chancellors' Week (non-teaching) ends
1	Graduation period ends
8	Public School Holidays end
29	Closing date for postgraduate research and course award applications
29	Closing date for undergraduate applications via UAC (with late fee)
29	Closing date for undergraduate applications direct to UTS (without late fee)

NOVEMBER

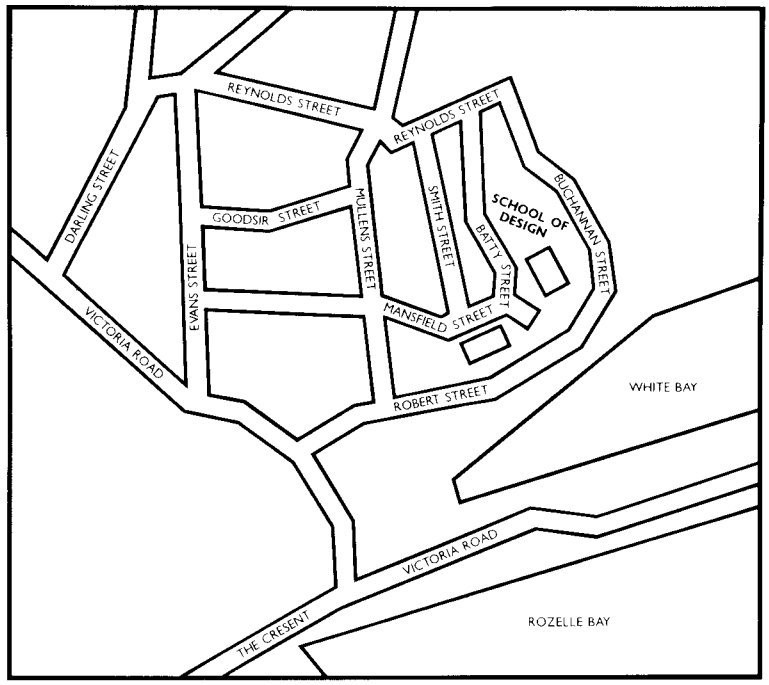
15	Formal examinations begin

DECEMBER

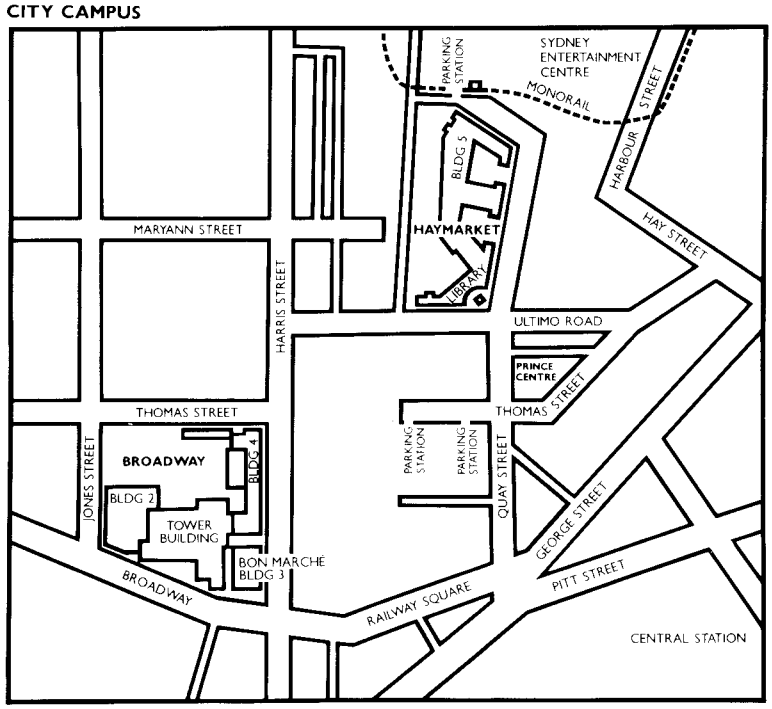
3	Formal examinations end
20	Public School Holidays begin
24	Release of Spring Semester examination results

* HECS or Postgraduate Course Fees still apply after the HECS Census date.

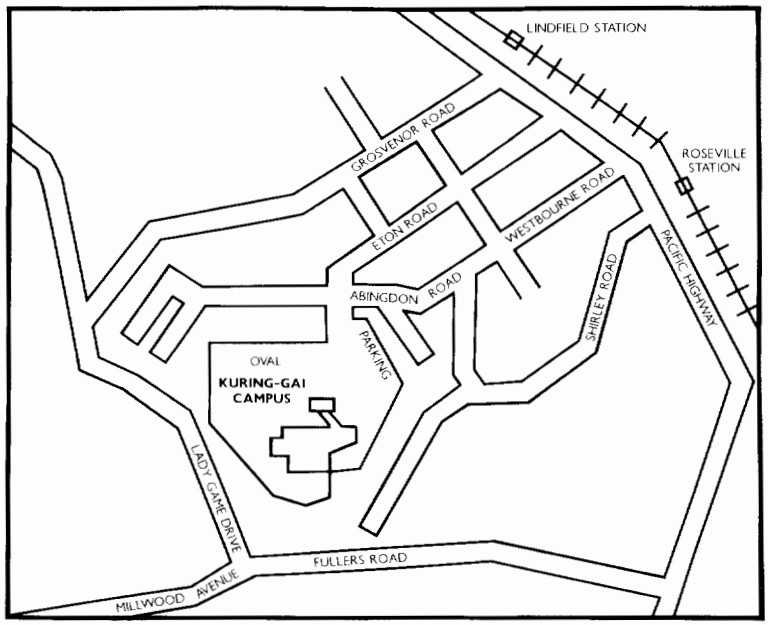
BALMAIN CAMPUS



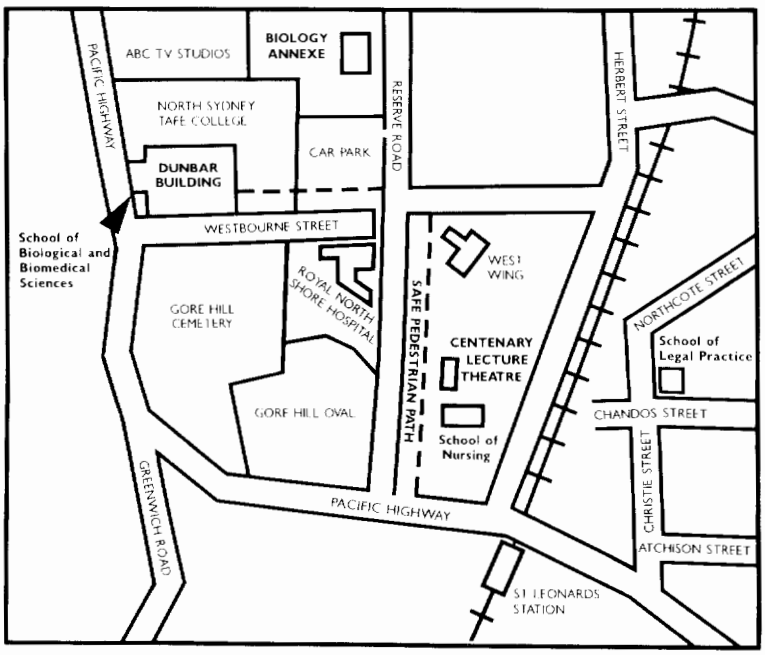
CITY CAMPUS



KURING-GAI CAMPUS



ST LEONARDS CAMPUS



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