The University of New South Wales

Applied Science

1977 Faculty Handbook

Arms of
The University of
New South Wales

Granted by the College of Heralds, London
3 March 1952

Heraldic Description of Arms

Argent on a Cross Gules a Lion passant guardant between four Mullets of eight points Or a Chief Sable charged with an open Book proper thereon the word SCIENTIA in letters also Sable.

The lion and the four stars of the Southern Cross on the Cross of St George have reference to the State of New South Wales which brought the University into being; the open book with SCIENTIA across its page reminds us of its original purpose. Beneath the shield is the motto 'Manu et Mente', which is the motto of the Sydney Technical College, from which the University has developed. The motto is not an integral part of the Grant of Arms and could be changed at will; but it was the opinion of the University Council that the relationship with the parent institution should in some way be recorded.

The University of New South Wales

Applied Science

1977 Faculty Handbook

The address of the University of New South Wales is:

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New South Wales, Australia 2033

Telephone: (02) 6630351

Telegraph: UNITECH, SYDNEY

Telex AA26054

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Contents

General Information

To obtain the maximum benefit from your studies you should make an effort to learn what facilities the University offers, to investigate the best methods of study and to discover as much as possible about the course for which you are enrolled.

This Handbook has been specially designed as a detailed source of reference for you in all matters related to your Faculty. The General Information Section is intended to help you put the Faculty into perspective with the University as a whole, to introduce you to some of the services available to students and to note some of the most important rules and procedures.

For fuller details about the University and its activities you should consult the University Calendar.

Now, see the following pages for other general information which may be of value to you.

Some people who can help you

Note: All phone numbers below are University extension numbers. If you are outside the University, dial 663 0351 and ask for the extension or dial 662—and then the extension number.

If you are experiencing difficulties in adjusting to the requirements of the University, you will probably need advice. The best people to talk to on matters relating to progress in studies are your tutors and lecturers. If your problem lies outside this area, there are many other people with specialized knowledge and skills who may be able to help you.

The Deputy Registrar (Student Services), Mr Peter O'Brien, and his Administrative Assistant, Mr Stephen Briand, are located on the first floor of the Chancellery. They will see students who need advice and who have problems and are not sure whom they should see about them. Mr Briand looks after financial assistance matters. Enquire at room 148A, phone 2482 or 3164.

The Assistant Registrar (Examinations and Student Records), Mr John Warr, is located on the ground floor of the Chancellery. For particular enquiries regarding *Student Records* (including matters related to *illness affecting study)* contact Mr Jack Morrison (phone 2141), and regarding *Examinations,* Mr John Grigg (phone 2143). This section can also advise on matters relating to *discontinuation of subjects* and *termination of courses.* General enquiries should be directed to 3711.

The Assistant Registrar (Admissions and Higher Degrees), Mr Jack Hill, is located on the ground floor of the Chancellery. For particular enquiries regarding *undergraduate courses* phone Mr John Beauchamp on 3319. General enquiries should be directed to 3711.

The Adviser for Prospective Students, Mrs Fay Lindsay, is located on the ground floor of the Chancellery and is available for personal interview. For an appointment phone 3453.

The Assistant Registrar (Student Employment and Scholarships), Mr Jack Foley, is located on the ground floor of the Chancellery. Enquiries should be directed to 2086 (undergraduate scholarships), 2525 (graduate scholarships), and 3259 (employment).

The Housing Officer, Mrs Judy Hay, is located in the Student Amenities and Recreation Unit in Hut B at the foot of Basser Steps. For assistance in obtaining *suitable lodgings* phone 3260.

The Student Health Unit is located in Hut E on College Road. The Director is Dr Max Napthali. For *medical aid* phone 2679 or 3275.

The Student Counselling and Research Unit is located at the foot of Basser Steps. The Head is Mr George Gray. For assistance with educational or vocational problems ring 3681, 3685 or 2696 for an appointment.

The University Librarian is Mr Allan Horton. Library enquiries should be directed to 2048.

The Chaplaincy Centre is located in Hut F at the foot of Basser Steps. For spiritual aid consult Rev Phillip Jensen (Anglican)—2684; Rev Father Michael Fallon (Catholic)—2379; Dr Allen Elliott (Church of Christ)—2683; Rev Peter Holden (Methodist)—2683; Mr Glen Weare (Seventh Day Adventist)—2683; Mr Ze'ev Dar (Jewish)—3273; Rev Barry Waters (Baptist)—398 4065.

The Students' Union is located on the second floor of Stage III of the University Union where the SU full-time President or Education Vice-President are available to discuss any problems you might have. In addition the SU offers a range of diverse services including legal advice (full-time solicitor available), clubs and societies services, second-hand bookshop (buy or sell), new records/tapes at discount, food shop (The Nuthouse), a professional nursery/kindergarten *House at Pooh Corner*, a typesetting service, electronic calculators (bulk purchasing), health insurance and AUS insurance, an information referral centre (the Infakt Bus), a bail fund and publications such as Tharunka, Orientation Magazine, Concessions Book and counter-course handbooks. For information about these phone 2929.

Calendar of Dates

1977

Session 1	7 March to 14 May.
(14 weeks)	*May Recess:* 16 May to 21 May
	23 May to 18 June
	Midyear Recess: 20 June to 23 July
Session 2	25 July to 27 August
(14 weeks)	*August Recess:* 29 August to 3 September
	5 September to 5 November
	Study Recess: 7 November to 12 November
Monday 14 November	Annual examinations begin
Tuesday 6 December	Annual examinations end

January

Monday 3	New Year's Day—Public Holiday
Friday 7	Last day for application for review of results of *annual* examinations Last day for application for permission to re-enrol by students who infringed re-enrolment rules at *annual* examinations
Monday 10	Timetables for *deferred* examinations available
Friday 14	Last day for acceptance of applications by Admissions Office for transfer to another course within the University
Monday 24	*Deferred* examinations begin
Monday 31	Australia Day—Public Holiday

February

Saturday 5	*Deferred* examinations end
Monday 14	Enrolment period begins for new students and students repeating first year
Tuesday 15	Last day for appeal against exclusion by students who infringed re-enrolment rules at *annual* examinations
Friday 18	*Deferred* examination results available
Monday 21	Enrolment period begins for second and later year students
Tuesday 22	Last day for application for review of *deferred* examination results

Friday 25	Last day for application for permission to re-enrol by students who infringed re-enrolment rules at *deferred* examinations
March	
Monday 7	**Session 1 commences**
Friday 11	Last day for acceptance of enrolments by new students (late fee payable)
Thursday 17	Last day for appeal against exclusion by students who infringed re-enrolment rules at *deferred* examinations
April	
Friday 1	Last day for acceptance of enrolments by students re-enrolling in second and later years (late fee payable) Last day for students other than those attending the University for the first time to discontinue without failure subjects which extend over Session 1 only Last day to enrol in additional subjects
Friday 8 to Monday 11	Easter
Monday 25	Anzac Day—Public Holiday
Friday 29	Last day for students attending the University for the first time to discontinue without failure subjects which extend over Session 1 only
May	
Tuesday 10	Publication of provisional timetable for June/July examinations
Thursday 12	Last day for acceptance of corrected enrolment details forms Last day for applications from students completing requirements at end of Session 1 for admission to University degrees and diplomas
Monday 16	**May Recess begins**
Friday 20	Last day for students other than those attending the University for the first time to discontinue without failure subjects which extend over the whole academic year
Saturday 21	**May Recess ends**
Monday 23	Last day for students to advise of examination timetable clashes
June	
Tuesday 7	Publication of timetable for June/July examinations
Monday 13	Queen's Birthday—Public Holiday
Sunday 19	**Session 1 ends**
Monday 20	**Midyear Recess begins**
Tuesday 21	Midyear examinations begin
July	
Tuesday 5	Midyear examinations end
Saturday 23	**Midyear Recess ends**
Monday 25	**Session 2 begins**
Thursday 28	Foundation Day
August	
Friday 5	Last day for students attending the University for the first time to discontinue without failure subjects which extend over the whole academic year
Friday 19	Last day for students other than those attending the University for the first time to discontinue without failure subjects which extend over Session 2 only
Monday 29	**August Recess begins**
Wednesday 31	Last day for acceptance of applications for re-admission in 1978 after exclusion under the re-enrolment rules
September	
Saturday 3	**August Recess ends**
Monday 12	Last day for applications from students completing requirements at end of Session 2 for admission to University degrees and diplomas
Wednesday 14	Last day for return of corrected enrolment details forms
Friday 16	Last day for students attending the University for the first time to discontinue without failure subjects which extend over Session 2 only
Tuesday 27	Publication of provisional timetable for annual examinations
Friday 30	Last day to apply to MUAC for transfer to another university in Sydney metropolitan area and Wollongong
October	
Monday 3	Eight Hour Day—Public Holiday
Friday 7	Last day for students to advise of examination timetable clashes
Tuesday 25	Publication of timetable for annual examinations
November	
Saturday 5	**Session 2 ends**
Monday 7	**Study Recess begins**
Monday 14	Annual examinations begin
December	
Tuesday 6	Annual examinations end
Sunday 25	Christmas Day
Monday 26	Boxing Day
Tuesday 27	Public Holiday

1978

Session 1	6 March to 14 May
	May Recess: 15 May to 21 May 22 May to 18 June
	Midyear Recess: 19 June to 23 July
Session 2	24 July to 27 August
	August Recess: 28 August to 3 September
	4 September to 5 November
	Study Recess: 6 November to 12 November
Monday 13 November	Annual examinations begin
Tuesday 7 December	Annual examinations end
January	
Monday 2	Public Holiday
Friday 6	Last date for application for review of results of *annual* examinations
Monday 9	Publication of timetable for *deferred* examinations
Friday 13	Last day for acceptance of applications by Admissions Office for transfer to another course within the University
Tuesday 24	*Deferred* examinations begin
Monday 30	Australia Day—Public Holiday
February	
Saturday 4	*Deferred* examinations end
Monday 13	Enrolment period begins for new students and students repeating first year
Friday 17	Results of *deferred* examinations available
Monday 20	Enrolment period begins for second and later year students
Tuesday 21	Last day for applications for review of *deferred* examination results

The Academic Year

The academic year is divided into two sessions, each containing 14 weeks for teaching. There is a recess of five weeks between the two sessions as well as short recesses of one week within each of the sessions.

Session 1 commences on the first Monday of March.

Organization of the University

Rapid development has been characteristic of the University of New South Wales since it was first incorporated by an Act of Parliament in 1949, under the name of the New South Wales University of Technology.

In 1976 the University had 18,378 students and 4000 staff who worked in more than eighty buildings. These figures include staff and students at Broken Hill (W. S. and L. B. Robinson University College), Duntroon (the Faculty of Military Studies) and Jervis Bay.

The Council

The chief governing body of the University is the Council which has the responsibility of making all major decisions regarding its policy, conduct and welfare.

The Council consists of 42 members representative of the professions, commerce and industry, the legislature, employee organizations, rural, pastoral and agricultural interests, and the academic staff of the University, its graduates and students.

The Council meets six times per year and its members also serve on special committees dealing with such matters as academic matters, finance, buildings and equipment, personnel matters, student affairs and public relations.

The Chairman of the Council is the Chancellor, the Hon. Mr. Justice Samuels, and the Deputy Chancellor is Dr F. M. Mathews.

The Professorial Board

The Professorial Board is one of the two chief academic units within the University and includes all the professors from the various faculties. It deliberates on all questions such as matriculation requirements, the content of courses, the arrangement of syllabuses, the appointment of examiners and the conditions for graduate degrees. Its recommendations on these and similar matters are presented to Council for its consideration and adoption.

The Faculties

The Dean, who is also a professor, is the executive head of the Faculty. Members of each Faculty meet regularly to consider matters pertaining to their own areas of study and research, the result of their deliberations being then submitted to the Professorial Board.

The term "faculty" is used in two distinct senses in the University. Sometimes it is used to refer to the group of Schools comprising the Faculty, and at others to the deliberative body of academic members of the Schools within the Faculty.

The eleven Faculties are Applied Science, Architecture, Arts, Biological Sciences, Commerce, Engineering, Law, Medicine, Military Studies, Professional Studies, Science together with the Australian Graduate School of Management. In addition, the Board of Studies in General Education fulfils a function similar to that of the faculties. The Board of Studies in Science and Mathematics, which was established to facilitate the joint academic administration of the Science and Mathematics degree course by the Faculties of Biological Sciences and Science, considers and reports to the Professorial Board on all matters relating to studies, lectures and examinations in the science course.

The Schools

Once courses of study have been approved they come under the control of the individual Schools (eg the School of Chemistry, the School of Mathematics). The professorial Head of the School in which you are studying is the person in this academic structure with whom you will be most directly concerned.

Executive Officers

As chief executive officer of the University the Vice-Chancellor, Professor Rupert Myers, is charged with managing and supervising the administrative, financial and other activities of the University.

He is assisted in this task by three Pro-Vice-Chancellors, Professor John Thornton, Professor Rex Vowels and Professor Albert Willis; the Deans and the three heads of the administrative divisions.

General Administration

The administration of general matters within the University comes mainly within the province of the Registrar, Mr Keith Jennings, the Bursar, Mr Tom Daly, and the Business Manager (Property), Mr Bob Fletcher.

The Registrar's Division is concerned chiefly with academic matters such as the admission of students, and the administration of examinations as well as the various student services (health, employment, amenities, and counselling).

The Bursar's Division is concerned with the financial details of the day-to-day administration and matters to do with staff appointments, promotions, etc.

The Property Division is concerned with the maintenance of buildings and grounds and equipment, and includes the University Architect's office.

Student Representation on Council and Faculties

Three members of the University Council may be students elected by students. All students who are not full-time members of staff are eligible to stand for a two-year term of office. The students who are elected to the Council are eligible for election to the Committees of Council.

Students proceeding to a degree or a graduate diploma may elect one of their number to a Faculty for each 500 registered students, with a minimum of three students per Faculty. Elections are for a one-year term of office. New provisions for student membership of faculties and boards of studies have been approved by Council, providing for each faculty/board to recommend its own formula for determining the number of students eligible.

Open Faculty Meetings

If you wish you may attend a Faculty meeting. You should seek advice at the office of the Faculty whose meeting you wish to attend, as different faculties have their own rules for the conduct of open meetings.

Award of the University Medal

The University may award a bronze medal to the students who have most distinguished themselves in their final year.

Identification of Subjects by Numbers

For information concerning the identifying number of each subject taught in this faculty as well as the full list of identifying numbers and subjects taught in the University, turn to the first page of the section below **Subject Descriptions and Textbooks.** This is also published in the Calendar.

General Studies Program

Almost all undergraduates in Faculties other than Arts and Law are required to complete a General Studies program. The Department of General Studies within the Board of Studies in General Education publishes its own Handbook which is available free of charge. All enquiries about General Studies should be made to the General Studies Office, Room G54, Morven Brown Building (663 0351 Extn. 3478).

Student Services and Activities

The University Library

The University Libraries are mostly situated on the upper campus. The library buildings house the Undergraduate Library on Level 3, the Social Sciences and Humanities Library on Level 4, the Physical Sciences Library on Level 7 and the Law Library on Level 8. The Biomedical Library is in the western end of the Sciences Building and is closely associated with libraries in the teaching hospitals of the University.

There are also library services at other centres:

The Water Reference Library situated at Manly Vale (Phone 948 0261) which is closely associated with the Physical Sciences Library.

The library at the Broken Hill Division in the W. S. and L. B. Robinson University College building. Phone 6022/3/4.

The library at the Royal Military College, Duntroon, ACT, serving the Faculty of Military Studies.

Each library provides reference and lending services to staff and students and each of the libraries on the Kensington campus is open throughout the year during day and evening periods. The exact hours of opening vary during the course of the academic year.

Staff and students normally use a machine-readable identification card to borrow from the University libraries. For students, a current union card is acceptable. Staff must apply to the library for a library card.

Accommodation

Residential Colleges

There are seven residential colleges on campus. Each college offers accommodation in a distinctive environment which varies from college to college, as do facilities and fees. A brief description of each college is given below, and further information may be obtained directly from the individual colleges. In addition to basic residence fees, most colleges make minor additional charges for such items as registration fees, caution money or power charges. Intending students should lodge applications before the end of October in the year prior to the one in which they seek admission. Most colleges require a personal interview as part of the application procedure.

The Kensington Colleges

The Kensington Colleges comprise Basser College, Goldstein College, and Philip Baxter College. They house 450 men and women students, as well as staff members. Fees are payable on a session basis. Apply in writing to the Master, PO Box 24, Kensington, NSW 2033.

International House

International House accommodates 154 students from Australia and up to twenty other countries. Preference is given to more senior undergraduates and graduate students. Apply in writing to the Warden, International House, PO Box 88, Kensington, NSW 2033.

New College

This Church of England College is open to all students without regard to race or religion. It has accommodation for approximately 220 students and is co-educational. Enquiries should be addressed to the Master, New College, Anzac Parade, Kensington, NSW 2033.

Shalom College

Shalom College provides accommodation for 86 men and women students. Non-resident membership is available to students who wish to avail themselves of the Kosher dining room and tutorial facilities. Apply in writing to the Master, Shalom College, The University of New South Wales, PO Box 1, Kensington, NSW 2033.

Warrane College

Warrane College provides accommodation for 200 men and is open to students of all ages, backgrounds and beliefs. A comprehensive tutorial program is offered along with a wide variety of activities and opportunities to meet informally with members of the University staff. Non-resident membership is available to male students who wish to participate in College activities and make use of its facilities. Warrane is directed by the International Catholic lay association Opus Dei. Apply in writing to the Master, Warrane College, PO Box 123, Kensington, NSW 2033. Phone: 663 6199.

Creston Residence

Creston, associated with Warrane College, offers residence for 25 full-time undergraduate and graduate women students of all nationalities and denominations. It is directed by the Women's Section of Opus Dei, a Catholic lay association. Further information: The Principal, 36 High Street, Randwick, NSW 2031.

Other Accommodation

Off-campus Accommodation

Students requiring other than College accommodation may contact the Housing Officer in the Student Amen-

ities and Recreation Unit for assistance in obtaining suitable lodging in the way of full board, room with cooking facilities, flats, houses, share flats, etc. Extensive listings of all varieties of housing are kept up-to-date throughout the year and during vacations.

No appointment is necessary but there may be some delay in February and March. The Housing staff are always happy to discuss any aspect of accommodation.

Special pamphlets on accommodation, lists of estate agents and hints on house-hunting are available on request.

Location: The Student Accommodation Service is located in Hut B, near the foot of Basser Steps. Phone 663 0351, extension 3260.

Student Employment and Scholarships

The Student Employment and Scholarships Unit offers assistance with career employment for final year students and graduates of the University. This service includes the mailing of regular job vacancy notices to registered students and a campus interview program for final year students.

Careers advice and assistance is also available to undergraduates. Assistance is offered in finding vacation employment which gives either course-related experience or industrial training experience, where this is a course requirement. Information and advice regarding cadetships, undergraduate and graduate scholarships is also available.

The service is located in the Chancellery on the ground floor.

Phone extension 3259 for employment and careers advice, or extension 2086 for cadetships and industrial training information.

Student Health

A student health clinic and first aid centre is situated within the University. It is staffed by three qualified medical practitioners, assisted by two nursing sisters. The medical service, although therapeutic, is not intended to entirely replace private or community health services. Thus, where chronic or continuing conditions are revealed or suspected, the student may be referred to a private practitioner or to an appropriate hospital for specialist opinion and/or treatment. The health service is not responsible for fees incurred in these instances. The service is confidential and students are encouraged to attend for advice on matters pertaining to health.

The service is available to all enrolled students by appointment, free of charge, between 9 am and 5 pm Mondays to Fridays. For staff members, immunizations are available, and first aid service in the case of injury or illness on the campus.

The centre is located in Hut E on the northern side of the campus in College Road at the foot of the Basser Steps.

Appointments may be made by calling at the centre or by telephoning extension 2679 or 3275 during the above hours.

The Family Planning Association of NSW conducts clinics at the Student Health Unit and at the adjacent Prince of Wales Hospital. These clinics are open to staff and students and appointments may be made for the Student Health Unit clinic by telephoning 698 9499, or for The Prince of Wales Hospital clinics by telephoning 399 0111.

Student Counselling and Research

The Student Counselling and Research Unit provides individual and group counselling for all students—prospective, established and graduate. Self-help programs are also available. Opportunities are provided for parents and others concerned with student progress to see members of the counselling staff.

The service which is free, informal and personal is designed to help students with planning and decision making, and a wide variety of concerns and worries which may be affecting personal, educational and vocational aspects of their lives.

The Unit pursues research into factors affecting student performance, and the published results of its research and experience are helpful in improving University and other counselling services, and the quality of student life.

Counselling appointments may be arranged during sessions and recesses between 9 am and 7 pm. Phone 663 0351, extension 3681, 3685 and 2696, or call at the Unit which is located at the foot of Basser Steps. Urgent interviews are possible on a walk-in basis between 9 am and 5 pm. Group counselling programs are offered both day and evening between 9 am and 9 pm by special arrangement. Self-help programs are arranged to suit the student's time and convenience.

Student Amenities and Recreation

In general the Student Amenities and Recreation Unit seeks ways to promote the physical, social and educational development of students through their leisure time activities. The Unit provides, for example, a recreational program for students and staff at the Physical Education and Recreation Centre; negotiates with the Public Transport Commission of NSW on student travel concessions and supplies concession forms for bus, rail, ferries and

planes; assists students with off-campus housing; and, in consultation with the Sports Association, assists various recognized clubs.

The Unit is located in Hut B at the foot of Basser Steps. The various services may be contacted by phone on the following extensions: Recreation Program 3271; Travel 2617; Accommodation 3260; Sports Association 2673.

Physical Education and Recreation Centre

The Student Amenities and Recreation Unit provides a recreational program for students and staff at the Physical Education and Recreation Centre. The Centre consists of eight squash courts and a main building, the latter containing a large gymnasium and practice rooms for fencing, table tennis, judo, weight-lifting, karate and jazz ballet, also a physical fitness testing room. The recreational program includes intramurals, teaching/coaching, camping, and fitness testing. The Centre is located on the lower campus adjacent to High Street. The Supervisor of PERC may be contacted on extension 3271.

The Sports Association

The Sports Association caters for a variety of competitive sports for both men and women. Membership is compulsory at $6 per year for all registered students and is open to all members of staff and graduates of the University.

The Sports Association office is situated in Hut G, near the bottom of Basser Steps, and the control of the Sports Association is vested in the General Committee. The Executive Officer of the Sports Association may be contacted on extension 2673.

The University Union

The University Union provides the facilities students, staff and graduates require in their daily University life and thus an opportunity for them to know and understand one another through associations outside the lecture room, the library and other places of work.

The Union is housed in three buildings near the entrance to the Kensington Campus from Anzac Parade. These are the Roundhouse, the Blockhouse and the Squarehouse. Membership of the Union is compulsory at $45 per year for all registered students and is open to all members of staff and graduates of the University.

The full range of facilities provided by the Union includes a cafeteria service and other dining facilities, a large shopping centre, cloak room, banking and hairdressing facilities, showers, a women's lounge, common, games, reading, meeting, music, practice, craft and dark rooms. Photocopying, sign printing, and stencil cutting services are also available. The Union also sponsors special concerts (including lunchtime concerts) and conducts courses in many facets of the arts including weaving, photography, creative dance and yoga. Exhibitions are held in the John Clark Gallery.

Full information concerning courses is contained in a booklet obtainable from the Union's Program Department. The University Union should not be confused with the Students' Union or Students' Representative Council as it is known in some other universities. This latter body has a representative function and is the instrument whereby student attitudes and opinions are crystallized and presented to the University and the community.

The Students' Union

The Students' Union is run by students and represents them on and off campus. Presidential elections are by popular vote and all students who have completed two years at the University are eligible for election.

A full-time President, elected each year by popular ballot, directs the entire administration of the Students' Union and its activities, through the permanent Administrative Officer.

Other full-time officers include the **Education Vice-President** who works towards the implementation of Student Union education policy and in assisting students with problems they may encounter in the University; **Director of Overseas Students** who deals with specific problems these students may encounter while in Australia.

Both are elected by students with the latter elected by overseas students.

Membership is compulsory at $10 per annum*.

The activities of the Students' Union include:

1. Infakt: a student-run information referral service. If you want someone to talk to or need help of any kind see the people at Infakt located in the bus at the foot of Basser Steps.

2. A casual employment service.

3. Organization of Orientation Week.

4. Organization of Foundation Day.

5. A nursery/kindergarten, *The House at Pooh Corner.*

6. Publication of the student paper *Tharunka.*

* A rise in Students' Union fees may occur in 1977.

7. A free legal service run by a qualified lawyer employed by the Students' Union Council.

8. Students' Union Record Shop which gives an 18% discount.

9. The Nuthouse which deals in bulk and health foods.

10. Secondhand Bookshop for cheap texts.

11. Clubs and societies receive money from the Students' Union through CASOC (Clubs and Societies on Campus).

The Students' Union is affiliated with the Australian Union of Students (AUS) which represents students on the national level.

The Students' Union is located on the second floor, Stage III, the Union.

Chaplaincy Centre

This service is provided for the benefit of students and staff by various religious and spiritual beliefs. Chaplains are in attendance at the University at regular times. A Chapel is also available for use by all denominations. For further details, turn to page 2.

Other Services and Activities

CASOC All clubs and societies on campus (except sporting clubs) are loosely organized under the umbrella of CASOC, which is a committee of the Students' Union. Some of these clubs are: the Motor Cycle Club; Chess Club; Dramsoc; Opunka; Kite Club and the Jazz Society.

School and Faculty Associations Many schools and faculties have special clubs with interests in particular subject fields. Enquire at your Faculty Office for information.

University Co-operative Bookshop Limited Membership is open to all students, on initial payment of a fee of $10, refundable when membership is terminated. Members receive an annual rebate on purchases of books.

Cashier's Hours The University cashier's office is open from 9.30 am to 1.00 pm and from 2.00 pm to 4.30 pm, Monday to Friday. It is open for additional periods at the beginning of Session 1. Consult notice boards for details.

Australian Armed Forces Enquiries should be directed to:

Royal Australian Navy: Royal Australian Naval Liaison Officer, Professor J. S. Ratcliffe, Commander, RANR, at the School of Chemical Engineering. Phone extension 2406.

University of New South Wales Regiment: The Adjutant, Regimental Depot, Day Avenue (just west of Anzac Parade). Phone 663 1212.

Royal Australian Air Force: Undergraduates interested in the RAAF Undergraduate Scheme should contact The Recruiting Officer, Defence Forces Recruiting Centre, 320 Castlereagh Street, Sydney.

Financial Assistance to Students

Tertiary Education Assistance Scheme

Under this scheme, which is financed by the Australian Government, assistance is available for full-time study in approved courses, to students who are not bonded and who are permanent residents of Australia, subject to a means test on a non-competitive basis.

Students in the following types of university courses are eligible for assistance:

- Undergraduate and graduate degree courses
- Graduate diplomas
- Approved combined Bachelor degree courses
- Master's qualifying courses if the course is the equivalent of an honours year and the student has not attempted an honours year.

Benefits (as at 30 June 1976)

Means-tested Living Allowance The maximum rates of living allowances are $1,000 per annum for students living at home and $1,600 per annum for students living away from home. The maximum rates of living allowance will be paid where the adjusted family income is equal to or less than $7,600 per annum. The adjusted family income is assessed by subtracting from the gross income of both parents their business expenses and an amount of $450 for each dependent child other than the student.

When the adjusted family income exceeds $7,600 pa the amount of living allowance will be reduced by $2 for every $10 of income until the family income exceeds $15,200 per annum. After this level, the living allowance will be reduced by $3 for every $10 of income.

A concession may be made where there are other children in the family undertaking tertiary education with scholarship assistance from schemes other than the Tertiary Education Assistance Scheme of less than $600 pa.

Students qualifying for living allowance will also receive the following allowances where appropriate:

Incidentals Allowance The Incidentals Allowance of $100 is designed to help the student meet the cost of those fees which have not been abolished—the Students' Union, University Union and Sports Association fees, and other expenses associated with their studies.

Travel Allowance Students whose home is in the country may be reimbursed the cost of three return trips per year, during vacation time.

Dependants' Allowance This is made up of allowances of $15 per week for a dependent spouse and $7 per week for each child.

How to Apply 1976 Higher School Certificate candidates and tertiary students receiving an allowance were sent forms last October. Other students may obtain forms from the Admissions Section *or* the Student Employment and Scholarships Unit, *or* from the Regional Director, Department of Education, 323 Castlereagh Street, Sydney, NSW 2000 (Phone 218 8800). The administrative closing date for 1977 applications was 31 October 1976.

Scholarships, Cadetships, Prizes

1. *Undergraduate Scholarships* In addition to finance provided under the Australian Government's Tertiary Education Assistance Scheme there are a number of scholarships, cadetships, prizes and other forms of assistance available to undergraduate students. Details of procedures for application for these awards are contained in the Calendar.

There are also special scholarships not administered by the University, information about which may be obtained from the School office.

Further information and advice regarding scholarships is available from the Student Employment and Scholarships Unit in the Chancellery Building.

2. *Graduate Awards* An honours degree is generally an essential requirement for gaining one of the many graduate scholarships which are available at the University. Therefore gifted students should not neglect the opportunity to qualify for honours and thus become eligible for an award.

Details of graduate awards are contained in the University Calendar.

Other Financial Assistance

In addition to the Tertiary Education Assistance Scheme financed by the Australian Government the following forms of assistance are available:

1. *Deferment of Payment of Fees* Deferments may be granted for a short period, usually one month, without the imposition of a late fee penalty, provided the deferment is requested prior to the due date for fee payments.

2. *Short Term Cash Loans* Donations from the Students' Union, the University Union and other sources have made funds available for urgent cash loans not exceeding $100. These loans are normally repayable within one month.

3. Early in 1973 the Australian Government made funds available to the University to provide loans to students in financial difficulty. The loans are to provide for living allowances and other approved expenses associated with attendance at University. Repayment usually commences after graduation or upon withdrawal from the course. Students are required to enter into a formal agreement with the University to repay the loan.

From the same source students who are in extremely difficult financial circumstances may apply for assistance by way of a non-repayable grant. In order to qualify for a grant a student must generally show that the financial difficulty has arisen from exceptional misfortune.

In all cases assistance is limited to students with reasonable academic records and whose financial circumstances warrant assistance.

Inquiries about all forms of financial assistance should be made at the office of the Deputy Registrar (Student Services), Room 148A, in the Chancellery.

Financial Assistance to Aboriginal Students

Financial assistance is available from a number of sources to help Aboriginal students. Apart from the Australian Government's Tertiary Education Assistance Scheme there is a Commonwealth Aboriginal Study Grant Scheme. Furthermore, the University may assist Aboriginal students with some essential living expenses in exceptional circumstances.

All inquiries relating to this scheme should be made at the office of the Deputy Registrar (Student Services), Room 148A, in the Chancellery.

Fund for Physically Handicapped and Disabled Students

The University has a small fund (started by a generous gift from a member of staff who wishes to remain anonymous) available for projects of benefit to handicapped and disabled students. Inquiries should be made at the office of the Deputy Registrar (Student Services), Room 148A, in the Chancellery.

Rules and Procedures

The University, in common with other large organizations, has some agreed ways of doing things in order to operate for the benefit of all members. The rules and procedures listed below will affect you at some time or another. In some cases there are penalties (eg fines or exclusion from examinations) for failure to observe these procedures and therefore they should be read with care.

Admission

Where can I get information about admission?

The Admissions Office, located in the Chancellery on the upper campus, provides information for students on admission requirements, undergraduate and graduate courses and enrolment procedures. The Admissions Office is open from 9 am to 5 pm Monday to Friday (excluding the lunch hour 1 pm to 2 pm). During enrolment the office is also open for some part of the evening.

Applications for special admission, admission with advanced standing and from persons relying for admission on overseas qualifications should be lodged with this office. The Office also receives applications from students who wish to transfer from one course to another, resume their studies after an absence of twelve months or more, or seek any concession in relation to a course in which they are enrolled. It is essential that the closing dates for lodgment of applications are adhered to. For further details see the sections below on Enrolment and Fees.

Applications for admission to undergraduate courses from students who do not satisfy the requirements for admission (see section on Requirements for Admission), from students seeking admission with advanced standing, and from students who have a record of failure at another university, are referred by the Admissions Office to the Admissions Committee of the Professorial Board.

Students seeking to register as higher degree candidates should first consult the Head of the School in which they wish to register. An application is then lodged on a standard form and the Admissions Office, after obtaining a recommendation from the Head of School, refers the application to the appropriate Faculty or Board of Studies Higher Degree Committee.

Details of the procedure to be followed by students seeking entry to first year courses at the University may be obtained from the Admissions Office or the Metropolitan Universities Admissions Centre.

How do I qualify for admission?

In order to enter an undergraduate course you must qualify for matriculation to the University; satisfy requirements for admission to the course of subjects chosen; and be selected for admission to the faculty or course you wish to enter. Full details of matriculation and admission requirements are contained in a pamphlet obtainable at the Admissions Office and in the Calendar.

Enrolment

How do I enrol?

All students, except those enrolling in graduate research degrees (see below), must lodge an authorized enrolment form with the Cashier on the day the enrolling officer signs the form or on the day their General Studies electives are approved if their course requires this.

All students, except those enrolling in graduate research degrees and those exempted (see below), should on that day also either pay the required fees or lodge an enrolment voucher or other appropriate authority.

What happens if I am unable to pay fees at the time of enrolment?

If you are unable to pay fees by the due date you may apply in writing to the Deputy Registrar (Student Services) for an extension of time which may be granted in extenuating circumstances.

If a student is unable to pay the fees the enrolment form must still be lodged with the Cashier and the student will be issued with a 'nil' receipt. The student is then indebted to the University and must pay the fees by the end of the second week of the Session for which enrolment is being effected. Penalties apply if fees are paid after that time (see "Fees" below). Payment may be made through the mail in which case it is important that the student registration number be given accurately.

New Undergraduate Enrolments

Persons who are applying for entry in 1977 must lodge an application for selection with the Metropolitan Universities Admissions Centre, PO Box 7049, GPO, Sydney 2001, by 1 October 1976.

Those who are selected will be required to complete enrolment at a specified appointment time before the start of Session 1. Compulsory fees must be paid on the day of the appointment. In special circumstances, however, and provided class places are still available, students may be allowed to complete enrolment after the prescribed week, subject to the payment of a penalty (see below).

Application forms and details of the application procedures may be obtained from the Admissions Office.

First Year Repeat Students

First year students who failed more than half the program at the 1976 Annual Examinations and who were not granted any deferred examinations should NOT follow the above procedure. They are required to *show cause* why they should be allowed to continue in the course, and should await instructions in writing from the Registrar as to the procedure.

Later Year Enrolments

Students should enrol through the appropriate School in accordance with the procedures set out in the current year's booklet, *Enrolment Procedures*, available from the Admissions Office and from School offices.

New Research Students

Students enrolling for the first time in graduate research degrees will receive an enrolment form by post. They have two weeks from the date of offer of registration in which to lodge the enrolment form with the Cashier and pay the appropriate fees. Completion of enrolment after this time will incur a penalty (see below).

Re-enrolling Research Students

Students re-enrolling in research degrees should lodge the enrolment form with the Cashier as soon as possible but no later than the end of the second week of Session 1. Completion of enrolment after that date will incur a penalty (see below).

Submission of Graduate Thesis or Project Report at Commencement of Session 1

A candidate who has completed all the work for a graduate degree except for the submission of a thesis or project report is required to re-enrol and pay fees as outlined above *unless* the thesis or project report is submitted by the end of the second week of Session 1 in which case the candidate is not required to re-enrol. Those required to re-enrol may claim a refund of fees if able to withdraw (see below).

Miscellaneous Subject Enrolments

Students may be permitted to enrol for miscellaneous subjects (ie as students not proceeding to a degree or diploma) provided the Head of the School offering the subject considers it will be of benefit and there is accommodation available. Only in exceptional cases will subjects taken in this way count towards a degree or diploma. Students who are under exclusion may not be enrolled in miscellaneous subjects which may be counted towards courses from which they have been excluded.

Students seeking to enrol in miscellaneous subjects should obtain a letter of approval from the Head of the appropriate School or his representative permitting them to enrol in the subject concerned. The letter should be given to the enrolling officer at the time of enrolment.

Students who have obtained written permission to enrol may attend the Unisearch House enrolment centre on:

Friday 4 March
9.30 am to 12.30 pm

or they may attend the Admissions Office, Chancellery, at the times shown below.

Week Commencing	Monday to Friday
7 March	9.30 am to 1.00 pm
	2.00 pm to 4.30 pm
	5.30 pm to 7.00 pm
Week Commencing	Monday to Friday
14 March	9.30 am to 1.00 pm
	2.00 pm to 4.30 pm
	Wednesday and Friday
	5.30 pm to 7.00 pm

Final Dates for Completion of Enrolments

No enrolments for courses extending over the whole year or for Session 1 only will be accepted from new students after the end of the second week of Session 1 (18 March 1977) except with the express approval of the Deputy Registrar (Student Services) and the Heads of the Schools concerned; no later year enrolments for courses extending over the whole year or for Session 1 only will be accepted after the end of the fourth week of Session 1 (1 April 1977) except with the express approval of the Deputy Registrar (Student Services) and the Heads of Schools concerned. No enrolments for courses in Session 2 only will be accepted after the end of the second week of Session 2 (5 August 1977) except with the express approval of the Deputy Registrar (Student Services) and the Heads of Schools concerned.

How do assisted students (eg scholarship holders) enrol?

Scholarship holders or sponsored students who have an enrolment voucher or letter of authority from their sponsor should present it at the time of enrolment. Such vouchers and authorities are generally issued by the NSW Department of Education and the NSW Public Service. They are not always issued in time and students who expect to receive an enrolment voucher or other appropriate authority but have not done so must pay the fees (and arrange a refund later). Such vouch-

ers and authorities are not the responsibility of the University and their late receipt is not to be assumed as automatically exempting a student from the requirements of enrolling and paying fees.

What special rules apply if I wish to be considered for admission with advanced standing?

If you make application to register as a candidate for any degree or other award granted by the University you may be admitted to the course of study with such standing on the basis of previous attainments as may be determined by the Professorial Board. For complete details regarding "Admission with Advanced Standing" consult the University Calendar.

Can I transfer from one course to another?

To transfer from one course to another you must apply on an application form obtainable from the Admissions Office by 16 January. If your application is successful you are required to comply with the enrolment procedures for the year/stage of the new course and, unless otherwise instructed, you should present the letter granting transfer to the enrolling officer. You should also inform the enrolling officer of the school in which you are enrolled of your intention to transfer.

Can I change my course program?

If you wish to seek approval to substitute one subject for another, add one or more subjects to your program or discontinue part or all of your program, you must make application to the Registrar through the Head of the School responsible for the course on forms available from the School office. The Registrar will inform you of the decision. Application to enrol in additional subjects must be submitted by the end of the fourth week of Session 1.

It is emphasized that failure to sit for examinations in any subject in which you are enrolled will be regarded as failure to satisfy the examiners in that subject unless written approval to withdraw without failure has been obtained from the Registrar.

Withdrawal from subjects

Students are permitted to withdraw from subjects without being regarded as having failed, provided they apply by the dates indicated.

First Year Students

1. one-session subjects: the end of the eighth week of session;

2. double-session subjects: the end of the second week of Session 2.

For the purpose of this rule a first-year student is defined as one who is attending the University for the first time either on a full- or part-time basis and is enrolled in the first year or first stage of a course.

Other Students

1. one-session subjects: the end of the fourth week of session;

2. double-session subjects: the end of the May Recess.

How do I enrol after an absence of twelve months or more?

If you have had a leave of absence for twelve months and wish to resume your course you should follow the instructions about re-enrolling given in the letter granting your leave of absence. If you do not fully understand or have lost these instructions, then you should contact the Admissions Office *either* in December of the preceding year *or* before October in the year preceding the one in which you wish to resume your course.

If you have not obtained leave of absence from your course and have not been enrolled in the course over the past twelve months or more, then you should apply for admission to the course through the Metropolitan Universities Admission Centre before 1 October in the year preceding that in which you wish to resume studies.

Are there any restrictions upon students re-enrolling?

The University Council has adopted the following rules governing re-enrolment with the object of requiring students with a record of failure to show cause why they should be allowed to re-enrol and retain valuable class places.

First-year Rule

1. A student enrolled for the first time in any undergraduate course in the University shall be required to show cause why he/she should be allowed to continue the course if that student fails more than half the program in which he/she is enrolled. In order that students may calculate half their program, the weighting of subjects in each course is defined in *Schedule A*,* which may be varied from time to time by the Professorial Board.

Repeated-failure Rule

2. A student shall be required to show cause why he/she should be allowed to repeat a subject which that student has failed more than once. *Where the subject is prescribed as part of the student's course he/she shall also be required to show cause why he/she should be allowed to continue that course.* Failure in a deferred examination as well as in the initial examination counts for the purposes of this rule as one failure.

*For details of Schedule A see Restrictions upon Students Re-enrolling in the University Calendar.

General Rule

3. The Re-enrolment Committee may, on the recommendation of the relevant faculty or board of studies, review the academic progress of any student. If that student's academic record seems to demonstrate, in the opinion of the Committee, the student's lack of fitness to pursue a subject or subjects and/or a course or courses, the Committee may require that student to show cause why he/she should be allowed to re-enrol in such subject(s) and/or course(s).

The Session-unit System

4. A A student who infringes the provisions of Rules 1 or 2 at the end of Session 1 of any year will not be required to *show cause* at that time but will be allowed to repeat the subject(s) (if offered) and/or continue the course in Session 2 of that year, subject to the rules of progression in that course.

B Such a student will be required to *show cause* at the end of the year, except that a student who has infringed Rule 2 at the end of Session 1, repeats the subject(s) in question in Session 2, and passes it/them, will not be required to *show cause* on account of any such subject.

Exemption from Rules by Faculties

5. A A faculty or board of studies examination committee may, in special circumstances, exempt a student from some or all of the provisions of Rules 1 and 2.

B Such a student will not be required to *show cause* under such provisions and will be notified accordingly by the Registrar.

'Showing Cause'

6. A A student wishing to *show cause* must apply for special permission to re-enrol. Application should be made on the form available from the Examinations and Student Records Section and must be lodged with the Registrar by the dates published annually by the Registrar. A late application may be accepted at the discretion of the University.

B Each application shall be considered by the Re-enrolment Committee which shall determine whether the cause shown is adequate to justify the granting of permission to re-enrol.

Appeal

7. A Any student who is excluded by the Re-enrolment Committee from a course and/or subject(s) under the provisions of the Rules may appeal to an Appeal Committee constituted by Council for this purpose with the following membership†:

A Pro-Vice-Chancellor nominated by the Vice-Chancellor who shall be Chairman.

The Chairman of the Professorial Board, or if he is unable to serve, a member of the Professorial Board, nominated by the Chairman of the Professorial Board, or when the Chairman of the Professorial Board is unable to make a nomination, nominated by the Vice-Chairman.

One of the category of members of the Council elected by the graduates of the University, nominated by the Vice-Chancellor.

The decision of the Committee shall be final.

B The notification to any student of a decision by the Re-enrolment Committee to exclude him/her from re-enrolling in a course and/or subject(s) shall indicate that the student may appeal against that decision to the Appeal Committee. In lodging such an appeal with the Registrar the student should provide a complete statement of all grounds on which the appeal is based.

C The Appeal Committee shall determine the appeal after consideration of the student's academic record, his/her application for special permission to re-enrol, and the stated grounds of appeal. In exceptional circumstances, the Appeal Committee may require the student to appear in person.

Exclusion

8. A A student who is required to *show cause* under the provisions of Rules 1 or 3 and either does not attempt to *show cause* or does not receive special permission to re-enrol from the Re-enrolment Committee (or the Appeal Committee on appeal) shall be excluded from re-enrolling in the subject(s) and course(s) on account of which he was required to *show cause*. Where the subjects failed are prescribed as part of any other course (or courses) he/she shall not be allowed to enrol in any such course.

B A student who is required to *show cause* under the provisions of Rule 2 and either does not attempt to *show cause* or does not receive special permission to re-enrol from the Re-enrolment Committee (or the Appeal Committee on appeal) shall be excluded from re-enrolling in any subject he/she has failed twice. *Where the subject failed is prescribed as part of the student's course he/she shall also be excluded from that course.* Where the subject failed is prescribed as part of any other course (or courses) he/she shall not be allowed to enrol in any such course.

C A student excluded from a course or courses under the provisions of A or B may not enrol as a miscellaneous student in subjects which may be counted towards any such course.

† It is proposed that under this arrangement, the membership of the Appeal Committee will be Pro-Vice-Chancellor J. B. Thornton (Chairman), Professor D. M. McCallum, Chairman of the Professorial Board, and a member of Council in the category of members elected by the graduates of the University, nominated by the Vice-Chancellor.

Re-admission after Exclusion

9. A An excluded student may apply to the Re-enrolment Committee for re-admission after two academic years.

B An application for re-admission after exclusion should be made on the form available from the Examinations and Student Records Section and should be lodged with the Registrar not later than 31 August in the year prior to that for which re-admission is sought. A late application may be accepted at the discretion of the University.

C An application should include evidence that the circumstances which were deemed to operate against satisfactory performance at the time of exclusion are no longer operative or are reduced in intensity and/or evidence of appropriate study in the subject(s) (or the equivalent) on account of which the applicant was excluded.

Restrictions and Definitions

10. A These rules do not apply to students enrolled in programs leading to a higher degree or graduate diploma.

B A subject is defined as a unit of instruction identified by a distinctive subject number.

How do I apply for admission to degree or diploma?

Applications for admission to a degree or diploma of the University must be made on the appropriate form by 12 September, in a student's final year. Forms are mailed to all final year students. Don't forget to inform the University if you subsequently change your address so that correspondence related to the ceremony will reach you without delay. Applicants should ensure that they have completed all requirements for the degree or diploma, including industrial training where necessary. Any variation such as cancelling of application in order to proceed to an honours degree or submission of an application following discontinuation of honours program, must be submitted in writing to the Registrar no later than 30 January.

Fees*

Fees and penalties quoted are current at the time of publication but may be amended by the University Council without notice.

Do I have to pay fees for tuition?

As a result of a decision by the Commonwealth Government, no tuition fees are charged in 1977.

What other fees and charges are payable?

Apart from the tuition fees (above) there are other fees and charges which include those charges raised to finance the expenses incurred in operating student activities such as the University Union, the Students' Union, the Sports Association and the Physical Education and Recreation Centre. Penalties are also incurred if a student fails to complete procedures as required. Charges may also be payable, sometimes in the form of a deposit, for the hiring of kits of equipment which are lent to students for their personal use during attendance in certain subjects. Accommodation charges, costs of subsistence on excursions, field work etc, and for hospital residence (medical students) are payable in appropriate circumstances.

How much is my contribution to student activities and services on campus?

All students (with the exceptions noted below) will be required to pay the following fees if enrolling for a program involving two sessions. Those enrolling for only one session will pay one-half of the Student Activities Fees, but the full University Union entrance fee, if applicable.

Student Activities Fees

University Union—$25 entrance fee, payable on first enrolment

University Union—$45 annual subscription

Sports Association—$6 annual subscription

Students' Union:

Students enrolling in full-time courses—$10 annual subscription

Students enrolling in part-time courses—$8 annual subscription

Miscellaneous—$25 annual fee.

The miscellaneous fee is used to finance expenses generally of a capital nature relating to student activities. Funds are allocated to the various student bodies for projects recommended by the Student Affairs Committee and approved by the University Council.

Are fees charged for examinations?

Generally there are no charges associated with examinations; however, two special examination fees are applied:

Examinations conducted under special circumstances—for each subject $11

Review of examination result—for each subject $11

What penalties exist for late payment of fees?

The following additional charges will be made in 1977 when fees are paid late:

Failure to lodge enrolment form according to enrolment procedure $20

* Fees quoted are current at the time of publication and may be amended by the Council without notice.

Payment of fees after end of second week of session $20
Payment of fees after end of fourth week of session $40

Locations and Hours of Cashier

Cashier's Offices are open during the enrolment periods referred to in this booklet. The locations and hours are shown below:

Unisearch House
221 Anzac Parade

Week Commencing 21 February

Monday and Thursday
10.00 am to 1.00 pm
2.00 pm to 5.00 pm
6.00 pm to 9.00 pm

Wednesday
10.00 am to 1.00 pm
2.00 pm to 5.00 pm

Friday
9.30 am to 1.00 pm

Week Commencing 28 February

Monday to Thursday
9.30 am to 1.00 pm
2.00 pm to 5.00 pm
6.00 pm to 9.00 pm

Friday
9.30 am to 5.00 pm

Chancellery

Week Commencing 21 February

Monday to Friday
9.30 am to 1.00 pm
2.00 pm to 4.30 pm

Friday
6.00 pm to 8.30 pm

Week Commencing 28 February

Monday to Friday
9.30 am to 1.00 pm
2.00 pm to 4.30 pm
6.00 pm to 9.00 pm

First Week of Session 1 Commencing 7 March

Monday to Friday
9.30 am to 1.00 pm
2.00 pm to 4.30 pm
5.30 pm to 8.00 pm

Third Week of Session 1 Commencing 21 March

Monday to Friday
9.30 am to 1.00 pm
2.00 pm to 4.30 pm

Second Week of Session 1 Commencing 28 March

Monday to Friday
9.30 am to 1.00 pm
2.00 pm to 4.30 pm

Wednesday and Friday
5.30 pm to 8.00 pm

Fourth Week of Session 1 Commencing 14 March

Monday to Friday
9.30 am to 1.00 pm
2.00 pm to 4.30 pm

Friday 26
5.30 pm to 8.00 pm

Who is exempt from payment of fees?

1. Life members of University Union, Sports Association, and Students' Union are exempt from the relevant fee or fees.

2. Students enrolled in courses classified as *External* are exempt from all Students Activities Fees and the University Union entrance fee.

3. University Union fees and subscriptions may be waived by the Deputy Registrar (Student Services) for students enrolled in graduate courses in which the academic requirements require no attendance on the Kensington campus.

4. Students who while enrolled at and attending another university (or other tertiary institution as approved by the Vice-Chancellor) in a degree or diploma course are given approval to enrol at the University of New South Wales but only in a miscellaneous subject or subjects to be credited towards the degrees or diplomas for which they are enrolled elsewhere are exempt from all Student Activities Fees and the University Union entrance fee.

5. Undergraduate students of a recognized university outside Australia who attend the University of New South Wales with the permission of the Dean of the appropriate faculty and of the Head of the appropriate school or department to take part as miscellaneous students in an academic program relevant to their regular studies and approved by the authorities of their own institution are exempt from all Student Activities Fees and the University Union entrance fee.

6. Graduate students not in attendance at the University and who are enrolling in a project only, other than for the first time, are exempt from all Student Activities Fees.

7. Graduate students resubmitting a thesis or project only are exempt from all Student Activities Fees.

8. All Student Activities Fees, for one or more sessions may be waived by the Deputy Registrar (Student Services) for graduate students who are given permission to pursue their studies away from the Kensington campus for one or more sessions.

How much will textbooks and special equipment (if any) cost?

You must allow quite a substantial sum for textbooks. This can vary from $200 to $600 depending on the course taken. These figures are based on the cost of new books. The Students' Union operates a second-hand bookshop. Information about special equipment costs, accommodation charges and cost of subsistence on excursions, field work, etc., and for hospital residence (medical students) are available from individual schools.

Will I receive any refund if I withdraw from a course?

Yes. The following rules apply:

1. If you withdraw from courses you are required to notify the Registrar in writing.

2. Where notice of withdrawal from a course is received by the Registrar before the first day of Session 1 a refund of all fees paid will be made. After that time only a partial refund will be made. See the Calendar for details.

What happens if I fail to pay the prescribed fees or charges?

If you fail to pay prescribed fees or charges or become otherwise indebted to the University and you fail to make a satisfactory settlement of your indebtedness upon receipt of due notice then you cease to be entitled to the use of University facilities. You will not be permitted to register for a further session, to attend classes or examinations, or be granted any official credentials. In the case of a student enrolled for Session 1 only or for Sessions 1 and 2 this disbarment applies if any portion of fees is outstanding after the end of the eighth week of Session 1 (29 April 1977). In the case of a student enrolled for Session 2 only this disbarment applies if any portion of fees is outstanding after the end of the sixth week of Session 2 (2 September 1977).

In special cases the Registrar may grant exemption from disqualifications referred to in the preceding paragraph upon receipt of a written statement setting out all relevant circumstances.

Can I get an extension of time to pay?

If you apply before the due date and extenuating circumstances exist, an extension of time may be granted. Apply to the Deputy Registrar (Student Services).

Examinations

When are examinations held?

Examinations for Session 2 and for Full Year subjects are held in November/December. Examinations for Session 1 subjects are held during the Midyear Recess. Provisional timetables indicating the dates and times of examinations and notices of the location of examinations are posted on the central notice boards in the Biological Sciences Building, the Chancellery, Central Lecture Block, Dalton Building (Chemistry), Main Building (Mining and Physics), and in the Western Grounds Area on 10 May and 27 September. You must advise the Examinations Unit (Chancellery) of a clash in examinations by 23 May and 7 October. Final timetables are displayed and individual copies are available for students on 7 June and 25 October.

Misreading of the timetable is not an acceptable excuse for failure to attend an examination.

In the assessment of your progress in University courses, consideration is given to work in laboratory and class exercises and to any term or other tests given throughout the year as well as to the results of written examinations.

How are examination passes graded?

Passes are graded: High Distinction, Distinction, Credit and Pass. A Pass Conceded may be granted to a student whose mark in a subject is slightly below the standard required for a pass but whose overall satisfactory performance warrants this concession.

A Terminating Pass may be granted where the mark for the subject is below the required standard. A terminating pass will not permit a student to progress further in the subject or to enrol in any other subject for which a pass in the subject is a co-requisite or pre-requisite. A student given a terminating pass may attempt a deferred examination, if available, to improve his performance but should he fail in such attempt, the terminating pass shall stand.

When are examination results available?

Final examination results will be posted to your term address (which can be altered up to 30 November) or to your vacation address (fill in a form obtainable at the Information Desk, Chancellery, also by 30 November). Results are also posted on School notice boards and in the foyer of the Sir John Clancy Auditorium. No examination results are given by telephone.

Can examination results be reviewed?

Examination results may be reviewed for a fee of $11 a subject, which is refundable in the event of an error being discovered. This review consists mainly of ensuring that all questions attempted have been marked and checking the total of the marks awarded. Applications for review must be submitted on the appropriate form to the Examinations and Student Records Section together with the necessary fee by the dates printed on the reverse side of *Notification of Results.*

Are allowances made if students are sick before or during an examination?

A student who through serious illness or other cause outside his control *is unable to attend an examination* is required to bring the circumstances (supported by a medical certificate or other evidence) to the notice of the Registrar *not later than seven days after the date of the examination,* and may be required to submit to medical examination.

A student who believes that his performance in a subject has been affected by serious illness *during the year* or by other cause outside his control, and who desires these circumstances to be taken into consideration in determining his standing, is required to bring the circumstances (supported by a medical certificate or other evidence) to the notice of the Registrar as soon as the circumstances are known but not later than seven days after the date of the examination.

All medical certificates should be as specific as possible concerning the severity and duration of the complaint and its effect on the student's ability to take the examinations.

A student who attempts an examination, yet claims that his performance is prejudiced by sickness *on the day of the examination* must notify the Registrar or Examination Supervisor *before, during, or immediately after the examination*, and may be required to submit to medical examination.

A student suffering from a physical disability which puts him at a disadvantage in written examinations should apply to the Registrar in writing for special provision when examinations are taken. The student should support his request with medical evidence.

Use of electronic calculators

Where the use of electronic calculators has been approved by a faculty or school, examiners may permit their use in examinations. Authorized electronic calculators are battery operated with the minimum operations of addition, subtraction, multiplication and division and are of a type in common use by university students. They are not provided by the University, although some schools may make them available in special circumstances.

How are examinations conducted?

Examinations are conducted in accordance with the following rules and procedure:

1. Candidates are required to obey any instruction given by an examination supervisor for the proper conduct of the examination.

2. Candidates are required to be in their places in the examination room not less than ten minutes before the time for commencement.

3. No bag, writing paper, blotting paper, manuscript or book, other than a specified aid, is to be brought into the examination room.

4. No candidate shall be admitted to an examination after thirty minutes from the time of commencement of the examination.

5. No candidate shall be permitted to leave the examination room before the expiry of thirty minutes from the time the examination commences.

6. No candidate shall be re-admitted to the examination room after he has left it unless during the full period of his absence he has been under approved supervision.

7. A candidate shall not by any improper means obtain, or endeavour to obtain, assistance in his work, give, or endeavour to give, assistance to any other candidate, or commit any breach of good order.

8. Smoking is not permitted during the course of examinations.

9. All answers must be in English unless otherwise directed. Foreign students who have the written approval of the Officer-in-Charge of Examinations may use standard translation dictionaries.

10. A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination, to immediate expulsion from the examination room, and to such further penalty as may be determined in accordance with the By-laws.

Under what circumstances are deferred examinations granted?

Deferred examinations may be granted in the following cases:

1. When a student through illness or some other acceptable circumstance has been prevented from taking the annual examination or has been placed at a serious disadvantage during the annual examinations.

2. To help resolve a doubt as to whether a student has reached the required standard in a subject.

3. To allow a student by further study to reach the required standard in a subject.

4. Where a student's progression or graduation is inhibited by his failure in one subject only, a deferred examination may be granted notwithstanding his failure otherwise to qualify for this concession.

In the Faculties of Arts, Commerce and Law special circumstances apply in the granting of deferred examinations. Details in each circumstance are given in the section *Faculty Information* in the respective handbooks for these faculties, or in the Calendar.

Deferred examinations must be taken at the centre at which the student is enrolled, unless he has been sent on compulsory industrial training to a remote country centre or interstate. In this case the student must advise the Registrar, on a form available from his school or the Information Desk, the Chancellery, of relevant particulars, before leaving for his destination, in anticipation that deferred examination papers may have to be forwarded to him. Normally, the student will be directed to the nearest university for the conduct of the deferred examination.

Can I buy copies of previous examination papers?

Yes—for 5c each from the Union Shop in the University Union.

Essays

Should I list my sources?

Students are expected to acknowledge the sources of ideas and expressions that they use in essays. To provide adequate documentation is not only an indication of academic honesty but also a courtesy enabling the marker to consult your sources with ease. Failure to do so may constitute plagiarism which is subject to a charge of academic misconduct.

Student Conduct on Campus

Is there a detailed code of rules related to the general conduct of students?

No. The University has not considered it necessary to formulate a detailed code of rules relating to the general conduct of students.

However, now that you have become a member of the University you should understand that this involves an undertaking on your part to observe its rules, by-laws and other requirements, and to pay due regard to any instructions conveyed by any officer of the University.

What are the rules related to attendance at classes?

You are expected to be regular and punctual in attendance at all classes in the course or subject in which you are enrolled. All applications for exemption from attendance at lectures or practical classes must be made in writing to the Registrar.

In the case of illness or of absence for some other unavoidable cause you may be excused by the Registrar for non-attendance at classes for a period of not more than one month or, on the recommendation of the Dean of the appropriate Faculty, for a longer period.

Applications for exemption from lectures (leave of absence) should be addressed to the Registrar and, where applicable, should be accompanied by a medical certificate. If examinations have been missed, state this in your application.

If you fail a subject at the annual examinations in any year and re-enrol in the same course in the following year, you must include in your program of studies for that year the subject in which you failed. This requirement will not be applicable if the subject is not offered the following year; is not a compulsory component of a particular course; or if there is some other cause which is acceptable to the Professorial Board, for not immediately repeating the failed subject.

If you attend less than eighty per cent of your possible classes, you may be refused permission to sit for the examination in that subject.

Why is my University Union card important?

All students enrolled for courses leading to degrees and/or diplomas, except those exempt from fees, are issued with a University Union membership card. Your card must be carried during attendance at the University and shown on request.

The number appearing on the front of the card above your name is your student registration number used in the University's records. This number should be quoted in all correspondence.

The card must be presented when borrowing from the University libraries, when applying for travel concessions and when notifying a change of address. It must also be presented when paying fees on re-enrolment each year when it will be made valid for the year and returned. Failure to present the card could result in some inconvenience in completing re-enrolment.

If you lose your Union card it is important to notify the University Union as soon as possible.

New students will be issued with University Union cards on enrolment.

Why should I inform the University if I change my address?

If you change your address you should notify the Student Records Section of the Registrar's Division as soon as possible. Failure to do this could lead to important correspondence (including examination results) not reaching you. The University cannot accept responsibility if official communications fail to reach students who have not notified their change of address. Change of Address Advice Forms are available at Faculty and School offices and at the Information Counters on the Ground Floor of the Chancellery Building.

These will be accepted up to 30 November, except for final year students who may advise changes up to four weeks before their graduation ceremony.

Will the University release information to third parties without my permission?

In general, no. The University treats examination results and information it receives from a student as confidential and will not reveal such information to third parties without the permission of the student except at the discretion of senior officers in circumstances considered of benefit to the student and when it is either impossible or impracticable to gain the student's prior permission. This happens rarely. This policy is considered so important that it often involves officers of the University in very difficult situations, for example, when they must refuse to reveal the address of a student to parents or other relatives.

In spite of the policy, there are sometimes accusations made that the University has revealed information, including addresses (especially to insurance companies).

All students should be aware that students' addresses are eagerly sought by various commercial agents and that sometimes tricks are used to obtain them. For example, from time to time people claiming to be from the University telephone students or their families and ask for information (usually another student's address) which is often given, unsuspectingly. There is evidence that this is a technique used by commercial agents.

It would be generally helpful if students (and their families and friends) are cautious in revealing information, making it a practice to ask the name, position, and telephone extension of any caller claiming to be from the University and, if suspicious, returning the call to the extension given.

How are student records kept up to date?

Enrolment details forms will be sent to all students on 30 April and 30 August. It is not necessary to return these forms unless any information recorded thereon is incorrect. Amended forms must be returned to the Examinations and Student Records Section within fourteen days. Amendments notified after the closing date will not be accepted unless exceptional circumstances exist and approval is obtained from the Registrar. Amended forms returned to the Registrar will be acknowledged in writing within fourteen days.

Is there any rule related to the ownership of students' work?

Yes. The University reserves the right to retain at its own discretion the original or one copy of any drawings, models, designs, plans and specifications, essays, theses or other work executed by you as part of your courses, or submitted for any award or competition conducted by the University.

Can I get a permit to park on campus?

Only a limited amount of parking is available on campus. Copies of the University's parking rules may be obtained on application to Room 240, Chancellery Building.

Lost Property?

All enquiries concerning lost property should be made to the Superintendent on extension 3580 or to the Lost Property Office at the Union.

Further Information

Where can I get further information concerning courses, admission requirements, scholarships and enrolment procedure?

General

Any student who requires information on the application of these rules or any service which the University offers, may make enquiries from the Admissions Office, the Student Counselling Unit or the Registrar.

Notices

Official University notices are displayed on the notice boards and students are expected to be acquainted with the contents of those announcements which concern them. These boards are in the Biological Sciences Building, the Sciences Building, the Chancellery (lower ground floor), Central Lecture Block, Dalton Building (Chemistry), Electrical Engineering Building, Main Building (foyer, Mining), Main Building (Physics) and in the Western Grounds Area.

Appeals

Section 5 (c) of Chapter III of the By-laws provides: 'Any person affected by a decision of any member of the Professorial Board (other than the Vice-Chancellor) in respect of breach of discipline or misconduct may appeal to the Vice-Chancellor, and in the case of disciplinary action by the Vice-Chancellor, whether on appeal or otherwise, to the Council'.

The Calendar

Please consult the Calendar if you want a more detailed account of the information contained in this section.

Vice-Chancellor's Official Welcome to New Students

All students initially enrolling in the University are officially welcomed by the Vice-Chancellor, at the following times:

Full-time Students

In the Faculties of Architecture, Arts, Biological Sciences, Commerce, Law:

Monday 28 February 1977
11 am in the Clancy Auditorium

In the Faculties of Applied Science, Engineering, Medicine, Professional Studies, Science, and the Board of Studies in Science and Mathematics:

Tuesday 1 March 1977
11 am in the Clancy Auditorium

Part-time Students

Tuesday 1 March 1977
6.30 pm in the Clancy Auditorium

Foreword

The importance of the Applied Sciences in this University's development has always been recognized, and is especially referred to in our Act of Incorporation.

Undergraduate courses in the fields of Applied Geography, Applied Geology, Chemical Engineering, Chemical Technology, Food Technology, Metallurgy, Mining Engineering, Textile Technology and Wool and Pastoral Sciences are well established. Many of the Faculty's research contributions have achieved international recognition.

It is hoped that students who enter the Faculty will share the enthusiasm and the dedication of those who have taken part in its development. It is of the greatest importance that students should acquire, from the very beginning, the right approach to their studies, and that they should achieve a proper balance between their work and their extra-curricular activities.

In addition to this Handbook, pamphlets and brochures issued in conjunction with the enrolment period and Orientation Week are available. These should be consulted, together with the Calendar, for further information.

It is hoped that this Handbook will be of value to present and prospective students in the Faculty and to employers.

Students seeking information of a general nature about the Faculty of Applied Science should contact the Assistant to the Dean, Dr J. Collins.

Enquiries of a specific nature should be directed to the representative of the School concerned. These representatives are listed below:

School of Applied Geology ..... G. Baldwin
School of Chemical Engineering ..... R. Starr
School of Chemical Technology ..... J. Gatenby
School of Food Technology ..... Professor R. Edwards
School of Geography ..... R. Prior
School of Metallurgy ..... R. Ball
School of Mining Engineering ..... W. Huisman
School of Textile Technology ..... Dr T. Hickie
School of Wool and Pastoral Sciences ..... J. Lawrence

M. CHAIKIN
Dean
Faculty of Applied Science

Faculty of Applied Science

Staff

Comprises Schools of Applied Geology, Chemical Engineering, Chemical Technology, Food Technology, Geography, Metallurgy, Wool and Pastoral Sciences, Textile Technology, and Mining Engineering.

Dean
Professor M. Chaikin

Chairman
Professor R. T. Fowler

Senior Administrative Officer
John David Collins, BSc PhD *N.S.W.*, ATI

Professional Officers
Gisela Barbel Chorley, BSc DipEd *Syd.*
Endel Nomm, BA *Macq.*
Vivian Noel Edward Robinson, BSc PhD *W.Aust.*
Dante Somin Santea, Dipling *T.I.lassy*

School of Applied Geology

Professor of Engineering Geology and Head of School
Francis Clifford Beavis, MA *Cant.*, BSc PhD *Melb.*,FGS

Professor of Geology
Vacant

Associate Professors
Laric Villier Hawkins, MSc *Syd.*, FGS
Laurence James Lawrence, DSc DipCom *Syd.*, PhD *N.S.W.*, DIC, MAusIMM
Frederick Charles Loughnan, BSc *Syd.*, PhD DSc *N.S.W.*, AMAusIMM
John Roberts, BSc *N.E.*, PhD *W.Aust.*

Senior Lecturers
Alberto Albani, DrGeolSc *Fiorence*,MSc PhD *N.S.W.*
Alfred Denis Mervyn Bell, BSc *Lond.*, MSc *N.S.W.*, FGS, MAusIMM
Alan Norval Carter, BSc PhD *Melb.*, MSc *Adel.*
Michael Barry Katz, BS *Mich. T.U.*, MSc *McG.*, PhD *Tor.*
Peter Cyril Rickwood, BSc *Lond.*, PhD *Cape T.*, ARIC, FGS
Bryce Leslie Wood, MSc DSc *Otago*, MAusIMM

Lecturers
John Craig Cameron, MA BSc *Edin.*, DIC, MAAPG, AMAusIMM
Philip Richard Evans, BA *Oxon.*, PhD *Brist.*, FGS
Bastiaan Jan Hensen, MSc *Ley.*, PhD *A.N.U.*
Michael John Knight, BSc PhD *Melb.*
Iftikhar Rasul Qureshi, MSc *Panj.*, PhD *Glas.*, FGS

Senior Tutors
Maren Krysko von Tryst, BSc GradDip *N.S.W.*, AMAusIMM
Ivan Pauncz, BSc *N.S.W.*
Robert James Whiteley, MSc *Syd.*

Tutors

Edward Peter Ambler, BA *Macq.*

Alistair Chisholm Dunlop, BSc *N.E.*, PhD *Lond.*, DIC, MIMM

David Ross Gray, BSc *N'cle.(N.S.W.)*

Abhi Sankar Ray, MSc *Calc.*

Honorary Associates

John Ringis, BE PhD *N.S.W.*, MGSA

Dalway John Swaine, MSc *Melb.*, PhD *Aberd.*, FRACI

Administrative Officer

Graham John Baldwin, BA *A.N.U.*

Professional Officer

Richard John Francis Haren, BSc *N.S.W.*

School of Chemical Engineering

Professor of Chemical Engineering and Head of School

Robert Thomas Fowler, BSc *Wales*, PhD *Lond.*, DScEng *Syd.*, CEng, FIEAust, FIChemE, MInstF, MIM, ARIC, AIM

Professor of Chemical Engineering

John Spurgeon Ratcliffe, MSc PhD *N.S.W.*, ASTC, CEng, FIREE, FIEAust, FIChemE

Professor of Fuel Technology

Vacant

Administrative Officer

Robert Frederick Starr, ASTC

Department of Biological Process Engineering

Senior Lecturer

Peter Munro Linklater, RDA, BAgrSc *Adel.*, MAgrSc *N.Z.*, PhD *Wis.*

Lecturer

Robert James Hall, BSc PhD *N.S.W.*

Department of Chemical Engineering

Associate Professors

Ian Dracup Doig, BSc(Eng) *Lond.*, PhD *N.S.W.*, CEng, MIMechE, MIChemE

Robert George Robins, MSc PhD *N.S.W.*, CEng, ARACI, AMAusIMM

Senior Lecturers

Ronald Graham Bowrey, BE PhD *N.S.W.*, MIEAust

John Buchanan, ME *Syd.*, PhD *N.S.W.*

Douglas Christopher Dixon, BE MEngSc *Syd.*, PhD *N.S.W.*, MIEAust

Anthony Gordon Fane, BSc PhD *Lond.*

Peter Craig Farrell, BE *Syd.*, SM *M.I.T.*, PhD *Wash.*, MASAIO

Christopher Joseph Dalzell Feil, BSc *N.S.W.*, PhD *Camb.*, CEng, MIChemE

Lecturers

Franklin Owen Howard, BE *Syd.*, CEng, MIEAust

Phillip Souter, MSc *Syd.*, ARACI

Robert Marsden Wood, BSc *Leeds*, PhD *Camb.*, CEng, MIChemE

Honorary Visiting Fellow

Keith Barton, BE PhD *N.S.W.*

Teaching Fellow

Michael Wenzel Chudacęk, Dipling *Prague*

Professional Officer

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Department of Fuel Technology

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Senior Lecturers

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Senior Tutor

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Professional Officer
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Honorary Visiting Fellow
David Iverach, BE GradDip PhD *N.S.W.*

School of Chemical Technology

Professor of Chemical Technology and Head of School
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Department of Ceramic Engineering

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Department of Polymer Science

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Lecturer
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School of Food Technology

Professor of Food Technology and Head of School
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Senior Lecturers
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Professor of Chemical and Extraction Metallurgy
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Mineral Processing

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Lecturer
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School of Mining Engineering

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School of Textile Technology

Professor of Textile Technology and Head of School
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Professor of Textile Physics
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Michael Thomas Pailthorpe, BSc PhD *N.S.W.*

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School of Wool and Pastoral Sciences

Professor of Wool Technology and Head of School
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Lecturer
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Teaching Fellow
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Professional Officer
Edgar Devaud, IngAgr *Concepcion*

Broken Hill Division

Staff

Director
Professor J. E. Andersen

W.S. and L.B. Robinson University College

Director and Head of Department of Science
Professor John Everard Andersen, BE *Melb.*, PhD *N.S.W.*, FIEAust, MAusIMM, ARACI

Head of Department of Mining and Mineral Sciences
Professor Leon John Thomas, BSc PhD *Birm.*, CEng, FIEAust, MAusIMM, MIMinE

Administrative Officer
Peter Francis Hern, AASA

Professional Officer
Boyd Parker Watson, BSc(Tech) *N.S.W.*

Department of Mining and Mineral Sciences

Mechanical Engineering

Lecturers
Llewellyn Ramsay Jones, BSc *N.Z.*, DipAm MEng *Sheff.*, PhD *Wales*, MIEAust, MIMechE
Ian Lachlan Maclaine-cross, BE *Melb.*, MIEAust, MAIRAH, MSES
Chakravarti Varadachar Madhusudana, BE *Mys.*, ME *B'lore*, PhD *Monash*, MIEAust

Professional Officer
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Mining Engineering

Lecturer
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Mineral Science

Senior Lecturer
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Geology

Senior Lecturer
Gerrit Neef, BSc *Lond.*, PhD *Well.*, FGS, AMAusIMM

Lecturers
Ian Rutherford Plimer, BSc *N.S.W.*, PhD *Macq.*, AMAusIMM, AMIMM
Kevin David Tuckwell, BSc PhD *N.S.W.*, AMAusIMM

Tutor
Alaster Carlile Edwards, BSc *Melb.*, GSA, AMAusIMM

Department of Science

Chemistry

Associate Professor
Keith George O'Brien, MSc *Syd.*, PhD *N.S.W.*, FRACI, AMAusIMM

Lecturer
Derek Richard Smith, BSc PhD *Wales*

Senior Tutor
Robert Edward Byrne, MSc *N.S.W.*, ARACI, AMAusIMM

Mathematics

Lecturers
David Charles Guiney, BSc PhD *Adel.*
Zdenek Kviz, Dip Phys *Brno*, CSc RerNatDr *Charles*, PhD *Prague*
Dennis William Trenerry, BSc PhD *Adel.*

Physics

Lecturers
Robert John Stening, MSc *Syd.*, PhD *Qld.*, MAIP
Kenneth Reid Vost, BSc *Glas.*, MSc *N.S.W.*, AMAusIMM

Fowlers Gap Research Station

Officer-in-Charge
Ian Hugh Auldist, BAgSc *Melb.*, MAIAS

Faculty Information

Faculty of Applied Science Enrolment Procedures*

Preliminary Enrolment

School of Geography

Re-enrolment forms will be obtainable from the School Office, Room 1009, Applied Science Building, from early October. Students re-enrolling in units in the School of Geography are required to lodge completed re-enrolment forms with the School no later than Friday 7 January 1977.

Enrolment Timetable

Students are required to attend Unisearch House in accordance with the following timetable.

1. Full-time Courses

Year 2 and Year 1 repeats	Thursday 3 March 9.30 am to 12.30 pm
Year 3	Tuesday 1 March 9.30 am to 12.30 pm
Year 4	Monday 28 February 9.30 am to 12.30 pm

2. Part-time Courses

Stage 1 repeats and Stage 2, 3, 4, 5, 6, and later stage students	Thursday 3 March 2.00 pm to 4.30 pm

* As a result of a decision by the Commonwealth Government, no tuition fees are charged in 1977. Details are not available at the time of publication.

3. New Students with Advanced Standing

Friday 4 March
9.30 am to 12.30 pm

Geography Subjects

Students enrolling or re-enrolling in Geography subjects are to attend Hut 7 on one of the following dates:

Monday 28 February
10.00 am to 12.00 noon, 2.00 pm to 4.00 pm

Wednesday 2 March
10.00 am to 12.00 noon, 2.00 pm to 4.00 pm, 6.00 pm to 8.00 pm

Friday 4 March
10.00 am to 12.00 noon, 2.00 pm to 4.00 pm

Monday 7 March
10.00 am to 12.00 noon, 2.00 pm to 4.00 pm

in order to obtain class admission cards and to be allocated places in tutorials and laboratories.

General Studies

Students enrolling in general studies electives after completing enrolment in their own Faculty and BEFORE GOING TO THE CASHIER, should proceed to the General Studies enrolment centre in Unisearch House where they will obtain places in electives, complete class admission cards and finalize enrolment forms.

Enrolment Centre

Unisearch House
221 Anzac Parade
(across from Main Campus)

Late Enrolments

Students are strongly advised to attend for enrolment *during Enrolment Week* as those who fail to do so not only miss initial classes but disrupt lecture, tutorial and practical work programs and cause considerable inconvenience to lecturers and the punctual students.

There are two late enrolment sessions:

First Late Enrolment Period

Wednesday 9 March

Second Late Enrolment Period

Wednesday 16 March
(not applicable to Applied Science)

The time and location for late enrolment is:

Wednesday 9 March only
Administrative Office
of appropriate School
5.00 pm to 7.00 pm

Applied Sciences Library Facilities

Although any of the university libraries may meet specific needs, the staff and students of the Faculty of Applied Science are served mainly by the Physical Sciences Library and the Undergraduate Library.

The Physical Sciences Library

This Library serves the information needs of senior undergraduate students, graduate students and members of the academic staff. It contains books, a large collection of journals, and guides to the literature in the form of abstracting and indexing journals in the subject areas of pure and applied science, technology, engineering and architecture. The library also houses a growing map collection and some micro film material. All material housed in the library bears the prefix 'P' and is indexed in the central catalogue on Level 2. There is also a catalogue in the Physical Sciences Library. There is seating for approximately 300 people, and a number of room carrels and seminar rooms are available for use. Photocopying facilities are provided. Journals may not be borrowed from the collection. Staff on Level 7 are ready to assist readers with their enquiries.

The Undergraduate Library

This library caters for the library needs of first and second year students and other groups where large numbers require mass teaching.

The Undergraduate Library provides a reader education program and reader assistance service aimed at teaching students the basic principles of finding information.

Services of particular interest to undergraduates and academic staff are:

- **The Open Reserve Section,** housing books and other material which are required reading.
- **The Audio-Visual Section,** containing cassette tapes, mainly lectures and other spoken word material. The Audio-Visual Section has wired study carrels and cassette players for student use.

Physical Sciences Librarian — Janine Schmidt
Undergraduate Librarian — Pat Howard

Conditions for the Award of the Degrees of Bachelor of Science (Technology) and Bachelor of Science (Engineering)

The courses leading to the award of the degrees of Bachelor of Science (Technology) and Bachelor of Science (Engineering) are normally programmed over six years of part-time study in the University whilst the student is employed in industry. The regulations governing the award of this degree are as follows:

1. A candidate for the degrees of BSc(Tech) or BSc(Eng) shall:

A comply with the requirements for admission;

B follow the prescribed course of study in the appropriate school and pass the necessary examinations;

C complete an approved program of industrial training over such period as is prescribed. In general, this training must be completed before 31 January in the year in which the degree is to be recorded.

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations and excursions to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty, and, in addition, undertake industrial training as approved by the Head of the School.

3. A student may be granted advanced standing by the Professorial Board on the recommendation of the appropriate Faculty but in each case a student must follow an approved course for at least three years with such period of approved industrial training as is prescribed before being eligible for admission to the degree.

4. The degrees of BSc(Tech) and BSc(Eng) shall be awarded in the pass grade only but in the case of superior performance throughout the course the degree shall be conferred 'with merit'.

5. Students shall be required to conform with the general rules relating to progression in University courses.

Conditions for the Award of the Degree of Bachelor of Engineering

1. A candidate for the degree of Bachelor of Engineering shall:

A comply with the requirements for admission;

B follow the prescribed course of study in the appropriate School, and satisfy the examiners in the necessary subjects;

C complete an approved program of industrial training for such periods as are prescribed. In general, this training must be completed before 31 January in the year in which the degree is to be awarded.

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations and excursions to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty.

3. A student shall be required to complete the first year of the course in not more than two years. Re-enrolment thereafter will be governed by the general regulations of the Professorial Board.

4. A student may be granted advanced standing by the Professorial Board on the recommendation of the appropriate Faculty, but in each case must complete an adequate period of approved industrial training before being eligible for the degree except for students in the School of Electrical Engineering, where such training is recommended but not required. In addition to the above requirements a student coming from another institution must follow an approved course of study in this University for at least two years.

5. The degree shall be awarded in the pass or honours grade. Honours may be awarded in the following categories:
Honours Class I
Honours Class II, Division I
Honours Class II, Division II

General Rules for Progression

1. Course programs will be stated and timetabled by year and by stage.

2. Students must satisfy the rules governing re-enrolment, particularly those requiring that all first-year subjects must be completed by the end of two years' full-time or four years' part-time study.

3. Before being permitted to enrol in any subject, students must satisfy the relevant prerequisite subject requirements. Normally this will necessitate students attempting to satisfy requirements of subjects of a particular year or stage before proceeding to subjects in the next part of the course. Details of prerequisite subjects, co-requisite subjects and any special rules governing progression in particular courses should be obtained from the relevant School.

4. Only in exceptional circumstances will students be permitted to enrol in subjects extending over more than two years of a full-time course, or two stages of a part-time course, or for more than 28 hours of course work per week if full-time or 14 hours per week if part-time. Students repeating subjects are required to select a program with the approval of the Head of School which limits their hours of course work to 24 hours per week if full-time and 12 hours per week if part-time. Extension of these hours will need the special permission of the Head of School.

5. Students shall enrol in courses as full-time students or in those Schools offering part-time courses as part-time students. Transference between full-time and part-time courses will be permitted once only. Students who transfer will be expected to remain in their new course until the completion of all academic and practical requirements of that course.

6. Notwithstanding the above, students can enrol in any non-standard program only with permission of the Head of School. A non-standard program is one that involves enrolment in subjects from more than one year, or two stages, or which comprises subjects which do not normally constitute a particular year's course work.

General Studies Program

Almost all undergraduates in Faculties other than Arts and Law are required to complete a General Studies program. The only course in the Faculty of Applied Science which does not have this requirement is the Bachelor of Science course in Economic Geography.

For further details, consult **General Information** earlier in this handbook.

Financial Assistance to Students

The scholarships and prizes listed below are available to students whose courses are listed in this handbook.
A similarly oriented list appears in the **Faculty Information** section of each of the faculty handbooks.
The complete list of University scholarships and prizes appears in the **General Information** section of the Calendar.

Scholarships

Undergraduate Scholarships

As well as the assistance mentioned earlier in this handbook (See General Information: Financial Assistance to Students) there are a number of scholarships available to students. What follows is an outline only. Full information may be obtained from the Student Employment and Scholarships Unit, located on the Ground Floor of the Chancellery.

Unless otherwise indicated in footnotes, applications for the following scholarships should be made to the Registrar by 14 January each year.

Donor	Value	Year/s of Tenure	Conditions
General			
Bursary Endowment Board*	$300 pa if living at home; $400 pa if living away from home	7 years	Merit in HSC and total family income not exceeding $4000
Sam Cracknell Memorial	$1000 to $1500 pa payable in fortnightly instalments	1 year	Prior completion of a least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport either directly or administratively; and financial need
Air Force Association Memorial Scholarship	$250 pa	1 year renewable for the duration of the course subject to satisfactory progress	Child of member or former member of Royal Australian Air Force undertaking a full-time degree course
Applied Science			
Applied Geology			
Esso Australia Ltd	$600 pa	1 year	Permanent residence in Australia and eligibility for admission to Year 4 or honours year of full-time Applied Science or Science Course in Geology or Geophysics

* Apply to The Secretary, Bursary Endowment Board, Box 460, PO. North Sydney 2060 immediately after sitting for HSC.

Undergraduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
Chemical Engineering			
Shell Refining (Australia) Pty Ltd	$300 pa plus $100 book and equipment allowance	1 year renewable for the duration of the course subject to satisfactory progress	Eligibility for admission to the second year of the full-time course in Chemical Engineering
Dow Chemical (Australia)	$500 pa		Permanent residence in Australia and eligibility for admission to the full-time degree course in Chemical Engineering
University of New South Wales Chemical Engineering Association	$200 pa		Eligibility for admission to the first or second year of the full-time degree course in Chemical Engineering
Western Mining Corporation*	$1000 pa		Eligibility for admission to the second or later years of the full-time degree course in Chemical Engineering
Ceramic Engineering			
Australian Ceramic Society	$600 pa	1 year renewable for the duration of the course subject to satisfactory progress	Permanent residence in Australia and eligibility for admission to the first or second year of the full-time degree course in Ceramic Engineering
Australian Consolidated Industries Ltd	$600 pa		
The Brick Manufacturers' Association of New South Wales	$900 pa		
Gallard & Robinson Pty Ltd	$600 pa		
Harbison-ACI Pty Ltd	$200 pa	2 years subject to satisfactory progress	Permanent residence in Australia and completion of the equivalent of the first two years of the Ceramic Engineering course at the Wollongong University
The State Brickworks	$900 pa	1 year renewable for the duration of the course subject to satisfactory progress	Permanent resident status in Australia and eligibility for admission to the first or second year of the full-time degree course in Ceramic Engineering
Wunderlich Limited	$600 pa		

*Applications close with the Registrar, 31 December.

Undergraduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
Food Technology			
Alfa Laval Pty Ltd	$4000 over 4 years	1 year renewable for the duration of the course subject to satisfactory progress	Not more than 22 years of age on 1 December preceding the year in which the award commences and eligibility for admission to the full-time degree course in Food Technology
Arnotts Biscuits Pty Ltd	$1000 pa		
Bush-Boake-Allen Pty Ltd	$4000 over 4 years		Permanent residence in Australia and eligibility for admission to the first year of the full-time degree course in Food Technology
Coca-Cola Export Corporation	$1000 pa		
Food Technology Association	$1000 pa		Not more than 22 years of age on 1 December preceding the year in which the award commences and eligibility for admission to the full-time degree course in Food Technology
George Weston Foods Ltd	$4000 over 4 years		
Gillespie/White Wings	$1000 pa		
Marrickville Holdings	$1000 pa		
Unilever Aust. Pty Ltd	$4000 over 4 years		
Fuel Technology			
Australian Waste Disposal Conference Committee	$300 pa	1 year with possibility of further extension subject to satisfactory progress	Permanent residence in Australia and eligibility for admission to the full-time degree course in Fuel Technology
Metallurgy			
CIG-EMF	$600 pa	1 year renewable for the duration of the course, subject to satisfactory progress	Eligibility for admission to the full-time degree course in Metallurgy
School of Metallurgy	$500 pa		Eligibility for admission to the first year of the full-time course in Metallurgy
Western Mining Corporation*	$1000 pa		Eligibility for admission to the first or second year of the full-time degree course in Metallurgy
Mining Engineering			
Stan Sawyer Memorial Scholarship to Coal Mining Students	$200 pa	1 year renewable for the duration of the course, subject to satisfactory progress	Eligibility for admission to the third or fourth year of the full-time degree course in Mining Engineering
Western Mining Corporation*	$1000 pa		Eligibility for admission to the second or later years of the full-time degree course in Mining Engineering

* Applications close with the Registrar, 31 December.

Undergraduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
Textile Technology			
The Australian Wool Corporation	$1000 pa	1 year renewable for the duration of the course, subject to satisfactory progress	Permanent residence in Australia and eligibility for admission to the full-time degree course in Textile Technology
Bonds Industries Ltd	$4000 over 4 years		
Bradmill Industries Ltd	$1000 pa		
Wool and Pastoral Sciences			
The Australian Estates Co Ltd	$1000 pa	1 year renewable for the duration of the course, subject to satisfactory progress	Permanent residence in Australia and eligibility for admission to the full-time degree course in Wool and Pastoral Sciences
The Australian Wool Corporation	$1000 pa		
Commercial Banking Company of Sydney Limited	$1000 pa		
Dalgety Australia Limited	$4000 over 4 years		
Merck Sharp & Dohme (Aust) Pty Ltd	$1000 pa		
National Council of Wool Selling Brokers of Australia	$1000 pa		

Graduate Scholarships

Applications for scholarships should be made in triplicate on the required form, and sent to the Registrar by 31 October. Eligibility depends on such factors as the applicant holding an honours degree *or* equivalent qualification, *or* having relevant experience. Students completing the final year of a course may apply. Those under bond should disclose this fact. Awards are tenable for one year, and may be renewed for a maximum of two years for a Masters and 3 to 4 years for a PhD degree. Renewal each year is subject to satisfactory progress. Any exceptions from these requirements are indicated.

Application forms and further information are available from the Student Employment and Scholarships Unit, which is located on the ground floor of the Chancellery. This Unit produces the booklet *Graduate Awards*, and also provides information on additional scholarships which may become available from time to time, mainly from funds provided by organizations sponsoring research projects.

Where possible, the scholarships are listed in order of faculty.

Graduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
General			
University of New South Wales Research Awards	Living allowance of $3250 pa. Other allowances may also be paid.	1-2 years for a Masters and 3-4 years for a PhD degree	Applicants must be honours graduates (or equivalent)
Australian Government (Research Awards)		As above	Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia.
Australian Government (Course Awards)		1-2 years; minimum duration of course	Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held an Australian Government Postgraduate Award. Applications to Registrar by 30 September.
Australian American Educational Foundation Travel Grant*			Applicants must be graduates, senior scholars or post-doctoral Fellows. Graduate applications close 31 December. Other applications by mid-November.
Australian Federation of University Women	A total of $500/$3200	Up to 1 year	Applicants must be female graduates from any accredited Australian or overseas university.
The British Council Commonwealth University Interchange Scheme	Cost of travel to UK or other Commonwealth country university		Applicants must be: **1.** University staff on study leave. Applications close with Registrar by 30 November. For visits to commence during ensuing financial year 1 April to 31 March. **2.** Graduate research workers holding research grants. Applications close with Registrar by 28 February for visits to commence during ensuing 1 April to 31 March.
Canadian Pacific Airlines Award for Travel to Canada for University Graduates	One free economy class return flight a year to Canada		Graduates of an Australian University who are Australian citizens or permanent residents. Candidates must have been accepted by a Canadian University, be able to support themselves on a full-time basis, and intend to return to Australia. Applications close with Registrar by 31 May.
Commonwealth Scholarship and Fellowship Plan	Varies for each country. Generally covers travel, living, tuition fees, books and equipment, approved medical expenses. Marriage allowance may be payable.	Usually 2 years, sometimes 3	Graduates who are Commonwealth citizens or British Protected Persons, and who are not older than 35 years of age. Applications close with Registrar by 1 October.

Application forms are available from: The Secretary, Department of Education, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.

Graduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
General (continued)			
General Motors Holden's Research Fellowship	Living allowance and other allowances	Maximum of 3 years	Graduates qualified to undertake research program for Masters or PhD degree.
Gowrie Graduate Research Travelling Scholarship	Maximum $2000 pa	2 years	Applicants must be members of the Forces or children of members of the Forces who were on active service during the 1939-45 War.
Harkness Fellowships of the Commonwealth Fund of New York*	Living and travel allowances, tuition and research expenses, book and equipment and other allowances	Between 12 to 21 months	Candidates must be either: **1.** Members of the Commonwealth or a State Public Service or semi-government Authority. **2.** Staff or graduate students at an Australian university. **3.** Individuals recommended for nomination by the Local Correspondents. The candidate will usually have an honours degree and be between 21-30 years of age. Applications close 23 July.
IBM Graduate Scholarship Plan	A maximum of $1200 pa	A maximum of 2 years for a degree of Master and 4 years for a PhD	Graduates must already hold a scholarship such as an Australian Government Post-graduate Research Award and be studying computer science or its applications. Applications close with Registrar by 30 November.
Frank Knox Memorial Fellowships at Harvard University	Stipend of $3400 plus tuition fees pa	2 years	Applicants must be British subjects and Australian citizens, who are graduates or near graduates of an Australian University.
Nuffield Foundation Commonwealth Travelling Fellowships†	Approximately £2240 stg pa for married fellow and wife. Approximately £1760 stg pa in other cases plus travelling costs.	1 year	Australian citizens usually between 25 and 35 who are graduates preferably with higher degrees and who have at least a year's teaching or research experience at a university. Applications close by February.
The Rhodes Scholarship**	£1650 stg pa	2 years, may be extended for a third year	Unmarried male and female British subjects, between the ages 19 and 25 who have been domiciled in Australia at least 5 years and have completed at least 2 years of an approved university course. Applications close in July each year.
Rothmans Fellowships Award‡	$12000 pa	Up to 3 years	The field of study is unrestricted. Applications close early September each year.

* Application forms must be obtained from the Australian representative of the Fund, Mr L. T. Hinde, Reserve Bank of Australia, Box 3947, GPO, Sydney, N.S.W. 2001. These must be submitted to the Registrar by 24 July.

† Applications to the Secretary, The Nuffield Foundation Australian Advisory Committee, Chemistry Laboratory, Barry Building, University of Melbourne, Parkville Victoria 3052.

** Applications to Mr H. McCredie, Secretary of the NSW Committee, University of Sydney, NSW 2006.

‡ Applications to The Secretary, Rothmans University Endowment Fund, University of Sydney, NSW 2006.

Graduate Scholarships (continued)

Donor	Value	Year/s of Tenure	Conditions
Applied Science			
The Clean Air Society of Australia and New Zealand Scholarship in Environmental Pollution Control	$600. May be held in conjunction with another award.	1 year full-time. At the Society's discretion it may be held for 2 years' part-time study.	Candidates must proceed to a Master of Applied Science degree in Environmental Pollution Control in the School of Chemical Engineering. They must hold a degree in an appropriate field of science, engineering or their equivalent. Applications close with the Registrar by 31 December.
Lever & Kitchen Pty Ltd Scholarship in Environmental Pollution Control	A maximum of $2000	1 year full-time. Continuation dependent upon progress in each session.	
Australian Wool Corporation Research Scholarship in Textile Technology	$3250 pa plus allowances	1 year subject to satisfactory progress. Renewable annually; maximum tenure of 2 years for a Masters candidate or 3 to 4 years for a PhD	Applicants must be graduates in textile physics, textile chemistry, or textile engineering.
Australian Wool Corporation Research Scholarship in Wool and Pastoral Sciences			Applicants must be graduates in applied science, agricultural science or veterinary science.
Australian Meat Research Committee Award*	$3600 pa plus allowances	Minimum 2 years. Maximum 3 to 4 years.	Awarded for research into the beef and cattle industry leading to the Masters or PhD degree. Applications close by 31 July.

Prizes

Undergraduate University Prizes

The following table summarizes the undergraduate prizes awarded by the University. Prizes which are not specific to any School are listed under 'General'. All other prizes are listed under the Faculty or Schools in which they are awarded.

Donor/Name of Prize	Value $	Awarded for
General		
Sydney Technical College Union Award	50.00	Leadership in the development of student affairs, and academic proficiency throughout the course.
University of New South Wales Alumni Association	Statuette	Achievement for community benefit — students in their final or graduating year.

* Application forms from Executive Officer, Australian Meat Research Committee, Box 4129, GPO, Sydney 2001.

Undergraduate University Prizes (continued)

Donor/Name of Prize	Value $	Awarded for
School of Chemical Engineering		
Abbott Laboratories Pty. Ltd	50.00	Bachelor of Engineering in Chemical Engineering — Year IV
Borden Chemical Co (Aust) Pty Ltd	50.00	3.124 Chemical Engineering Design and Practice
Chamber of Manufactures of New South Wales	15.00	Subject selected by Head of School
Esso Australia Ltd	75.00	Best performance in Year 2 Chemical Engineering
Simon-Carves Australia	21.00	3.122 Chemical Engineering, Thermodynamics and Reaction Engineering
The North Shore Gas Co Ltd	10.50	Subject selected by Head of School
The Shell Co of Aust Ltd	75.00	3.121 Chemical Engineering Principles II and 3.123 Chemical Engineering Design IA and IB
School of Chemical Technology		
Australian Paper Manufacturers Ltd	21.00	Subject selected by Head of School
Chemical Technology Society	20.00	Bachelor of Science in Industrial Chemistry
	20.00	Bachelor of Science in Industrial Chemistry, Years I and II or Stages 3 to 4
CSR Limited	30.00	Subject within the discipline of Industrial Chemistry, selected by Head of School
Stauffer Chemical Co (Aust) Pty Ltd	21.00	Subject selected by Head of School
School of Food Technology		
Wilfred B. S. Bishop	20.00	General proficiency throughout Bachelor of Science course in Food Technology
Department of Fuel Technology		
Institute of Fuel	50.00	For a fuel subject or allied course project
The Shell Co of Aust Ltd	75.00	Subject selected by Head of School

Undergraduate University Prizes (continued)

Donor/Name of Prize	Value $	Awarded for
School of Metallurgy		
Alcan Australia Ltd	50.00	Subject selected by Head of School
Austral Crane Ltd	100.00	
Australian Institute of Metals	30.00	
Australian Welding Institute	20.00 (book order)	
Chamber of Manufactures of New South Wales	15.00	
The Broken Hill Proprietary Co Ltd	50.00	
The Eagle & Globe Steel Co Ltd	20.00	
The Electrolytic Refining and Smelting Co of Australia Ltd	20.00	
Zinc Corp Ltd	30.00	
School of Mining Engineering		
Joint Coal Board	50.00	Bachelor of Engineering Course in Mining Engineering, Year II
	50.00	Bachelor of Engineering Course in Mining Engineering, Year III
	100.00	Bachelor of Engineering Course in Mining Engineering — general proficiency throughout course
Southern Cross Exploration NL Award	100.00	Bachelor of Engineering Course in Mining Engineering — General proficiency throughout the course
Western Mining Corporation Ltd	75.00	
School of Textile Technology		
J. B. Speakman	20.00	Undergraduate thesis
R. J. Webster	100.00	General proficiency throughout the Bachelor of Science Course in Textile Technology

Undergraduate University Prizes (continued)

Donor/Name of Prize	Value $	Awarded for
School of Wool and Pastoral Sciences		
Bayer Australia Ltd — Auntol Sheep Dips	50.00	General proficiency — Wool and Pastoral Sciences Course, Years II and III
Parkes — Wool Promotion Committee	A shield held in the School of Wool and Pastoral Sciences on which the successful student's name is engraved each year.	Bachelor of Science Course in Wool and Pastoral Sciences, Year III
Samuel Clive Graham	50.00	Bachelor of Science Course in Wool and Pastoral Sciences, Year IV — Thesis

Graduate University Prizes

The following table summarizes the graduate prizes awarded by the University.

Donor/Name of Prize	Value $	Awarded for
School of Chemical Engineering		
The Clean Air Society of Australia and New Zealand	100.00	3.391G Atmospheric Pollution and Control, or a subject of an equivalent nature, taken by students in graduate courses in the School of Chemical Engineering.

Undergraduate Study

Course Outlines

The Faculty of Applied Science consists of the Schools of Applied Geology, Chemical Engineering, Chemical Technology, Food Technology, Geography, Metallurgy, Mining Engineering, Textile Technology and Wool and Pastoral Sciences. These Schools offer full-time undergraduate courses leading to the degree of Bachelor of Science or Bachelor of Engineering, and some of the Schools also offer part-time courses leading to the degree of Bachelor of Science (Technology) or Bachelor of Science (Engineering).

Full-time Courses

Full-time courses of four years' duration leading to the degree of Bachelor of Science are offered in Applied Geography, Applied Geology, Ceramic Engineering, Food Technology, Industrial Chemistry, Metallurgy, Textile Technology and Wool and Pastoral Sciences. Four-year courses leading to the degree of Bachelor of Engineering are offered in Chemical Engineering, Metallurgical Process Engineering and Mining Engineering.

Honours: Candidates for honours are required to undertake special reading and other assignments as directed by the Head of the School concerned. In considering the award of Honours special attention is paid to the performance of a candidate in the final research project, for which a thesis describing a theoretical or experimental study is required. Honours are awarded in Class I; Class II Division I; and Class II Division II.

Industrial Training Requirements: In the scientific and technological courses close association with industry is maintained on the practical aspects of the professions. This is achieved in most of the courses of the Faculty by expecting students to complete an approved industrial training program prior to graduation. This is normally carried out during the Summer Recess. In the case of Wool and Pastoral Sciences, students are required to complete twenty-four weeks' approved practical work. In Mining Engineering students will undertake a program of practical training of at least 100 days.

Part-time Courses

Six-year, part-time courses leading to the degree of Bachelor of Science (Technology) are offered by the School of Food Technology; in Ceramics and Industrial Chemistry by the School of Chemical Technology; in Metallurgy by the School of Metallurgy; and in Mineral Processing by the School of Mining Engineering (at Broken Hill only). The part-time Mining Engineering course leading to the degree of Bachelor of Science (Engineering) is available at Broken Hill.

The BSc(Tech) courses are intended for students who are employed in relevant industries and who wish to prepare for a degree mainly by part-time attendance. As part of the requirements for the BSc(Tech) degree, students are required to complete an approved program of industrial training of not less than one year prior to the award of the degree. Industrial training should normally be completed concurrently with attendance in the course, but with the approval of the Head of School, may be completed after completion of the prescribed course of study.

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

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

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

BSc(Eng) Courses With Partial Full-time Attendance

BSc(Eng) courses may be completed by a combination of full-time and part-time study. The first two stages are to be completed part-time; in the following two years students complete the second and third years of the corresponding full-time course; and in the fifth stage a special program is prepared. Full details are set out below under the Schools which provide the courses.

School of Applied Geology

The development of natural resources and national development necessitates a type of training for geologists which embraces basic geological instruction and various features of its application in practice. The structure and syllabus of the course in Applied Geology are designed to enable graduates to enter immediately into various aspects of applied geology and to play an effective part in associated engineering and technological practice.

In the early part of the course students receive instruction in the allied fundamental sciences, as well as in introductory geology. Later, geological instruction is developed and emphasis is placed progressively on engineering applications and on economic aspects of geology.

The applied nature of the course is indicated by the inclusion of subjects such as Mining and Mineral Process Engineering. Courses in exploration geophysics, mineral exploration, petroleum geology and engineering geology are offered in the later stages of the program.

Attendance at the University for students taking the full-time professional course in Applied Geology is for twenty-eight weeks per year on the basis of two sessions of fourteen weeks each. The second session of the fourth year is devoted essentially to work on a project.

A three-year course (full-time) is available to students in the Faculty of Science, and some provision is made for part-time study in geology within that Faculty. Selected students in the Faculty of Science may read for an Honours Degree in Geology. Master of Applied Science courses in Hydrogeology-Engineering Geology, in Applied Geophysics, and in Mineral Exploration are offered by the School. These courses are designed to provide specialist training in these areas of Applied Geology.

300
Applied Geology—Full-time Course

Bachelor of Science
BSc

Year 1		**Hours per week**
25.011	Geology 1*	6
1.001	Physics I *or*	
1.011	Higher Physics I	6
2.121	Chemistry 1A *and*	
2.131	Chemistry 1B	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I	6

* Three field tutorials, involving up to five days in all are an essential part of the course. Attendance is compulsory.

Year 2		S1	S2
25.012	Geology 2A*†	6	6
25.022	Geology 2B*†	3	3
2.002A	Physical Chemistry		
2.002C	Analytical/Inorganic Chemistry	7	5
	General Studies Elective	1½	1½

* Field work of up to six days in each case is a compulsory part of the course.
† Prerequisites: 25.011 Geology I and 2.001 Chemistry I.

Students are required to take one of the following groups of subjects:

Group A			
1.022	Electromagnetism and Modern Physics	0	5
1.012	Thermal Physics and Mechanics	5	0
10.211A	Mathematical Methods	2	2

or

Group B			
1.922	Electronics	3	0
1.932	Introduction to Solid State	0	3
10.111A	Linear Algebra *and*	2	2
10.111B	Analysis	2	2

or

Group C			
1.922	Electronics	3	0
1.932	Introduction to Solid State	0	3
5.010	Engineering A *and*	6	0
5.020	Engineering B	0	6

or

Group D			
1.922	Electronics	3	0
1.932	Introduction to Solid State	0	3
17.011	Biology of Mankind *and*	6	0
17.021	Comparative Functional Biology	0	6

Year 3		Hpw
25.013	Geology IIIA†	6
25.023	Geology IIIB*†	6
25.033	Geology IIIC*§‡	12
	Two General Studies Electives	3

† Prerequisites: 25.012, 25.022.
* A geological survey camp of 10 days' duration is a compulsory part of this course.
§ Field tutorials constitute an essential part of this course.
‡ Co-requisites: 25.013, 25.023.

Year 4		S1	S2
7.013	Principles of Mining	2	0
7.023	Mineral Process Engineering	2	0
or			
25.074	Special Project	4	0
plus			
25.014	Geology IV: Advanced Applied Geology*†	6	0
25.024	Geology IV: Project†	0	24
	One General Studies Elective	3	0
Plus *one* of the following subjects:			
25.034	Geology IV: Engineering Geology†	11	0
25.044	Geology IV: Mineral Exploration†§	11	0
25.054	Geology IV: Sedimentary Basins†	11	0
25.064	Geology IV: Applied Geophysics†	11	0

* Field work up to seven days' duration is a compulsory part of this course.
† Prerequisites: 25.013, 25.023 and 25.033.
§ Students taking this option must take 7.023.

School of Chemical Engineering

The School of Chemical Engineering consists of the Departments of Biological Process Engineering, Chemical Engineering and Fuel Technology. The course in Chemical Engineering contains a number of electives in technical areas, including Biological Process Engineering and Fuel Engineering.

Chemical Engineering is the application of the principles of the physical sciences, together with the principles of economics and human relations, to fields in which matter undergoes a change in state, energy content or composition. The chemical engineer is generally responsible for the design, construction and operation of plant and equipment used in the chemical processing industries.

Biological Process Engineering is the extension of chemical engineering principles to systems involving biological materials. Typical areas of interest are: the manufacture of antibiotics; the fermentation industries; bacterial mineral extraction; and the production of industrially useful materials by the growth and utilization of micro-organisms.

Fuel Engineering is primarily concerned with the practical and economic applications of scientific knowledge and engineering experience to the production, processing and utilization of fuels and energy.

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

It is recommended that before graduation students in the full-time courses obtain a minimum of twelve weeks' professionally oriented, or industrial experience. Students in the part-time courses must complete three years of industrial training concurrently with their University work.

Department of Chemical Engineering

304
Chemical Engineering—Full-time Course

Bachelor of Engineering
BE

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

Successful completion of the BE course is accepted by the Council of Engineering Institutions, UK, the Institution of Engineers, Australia, and the Royal Australian Chemical Institute as sufficient qualification for corporate membership.

Year 1		Hours per week S1	S2
1.001	Physics I	6	6
2.121	Chemistry IA *and*		
2.131	Chemistry IB	6	6
5.010	Engineering IA	6	0
5.030	Engineering IC (includes 3.001 Introduction to Chemical Engineering)	0	6
10.001	Mathematics I	6	6
		24	24

Year 2			
2.002A	Physical Chemistry	6	0
2.002C	Inorganic/Analytical Chemistry*	0	6
3.111	Chemical Engineering IA	3	3
3.112	Chemical Engineering IB	2	3
3.311	Fuel Engineering I*	2	2
4.961	Materials and Corrosion	2	0
6.832	Electrical Machines	3	0
8.112	Structures	0	3
10.031	Mathematics	2	2
10.331	Statistics	2	2
	Two General Study Electives	3	3
		25	24

* In certain cases this subject may be replaced by another elective with approval of the Head of School.

Year 3

		Hpw S1	S2
2.002B	Organic Chemistry	6	0
3.121	Chemical Engineering IIA	4	5½
3.122	Chemical Engineering IIB	4	4
3.123	Chemical Engineering IIC	2	5½
3.124	Chemical Engineering Laboratory	2	3
10.032	Mathematics	2	2
	General Study Elective	1½	1½
		21½	21½

Plus *one* of the following electives:

3.321	Fuel Engineering II	3	3
7.313	Minerals Engineering Processes	3	3
18.121	Production Management	3	3
22.113	Industrial Chemistry (Processes)	3	3
44.111	Microbiology	3	3
	Any other elective approved by Head of School		

Year 4

3.131	Chemical Engineering IIIA	4	0
3.132	Chemical Engineering IIIB	4	0
3.133	Chemical Engineering IIIC	5	0
3.134	Chemical Engineering Laboratory	3	0
3.135	Advanced Chemical Engineering Electives	0	6
	Project*	1	11
	General Study Elective	1½	1½
		18½	18½

Plus *one or more* of the following to a total of 6 hrs/week for 28 weeks:

3.135	Advanced Chemical Engineering Electives	6	6
3.136	Oil and Gas Engineering	3	3
3.140	Chemical Engineering Design Project	6	6
3.150	Chemical Engineering Experimental Project	6	6
3.211	Biological Process Engineering	6	6
3.331	Fuel Engineering III	6	6
4.121	Principles of Metal Extraction	3	3
7.314	Mineral Process Technology	3	3
18.551	Operations Research	3	3
23.051	Nuclear Engineering	3	3
	Any other elective approved by Head of School		

* The project is to be selected from:

3.140	Chemical Engineering Design Project
3.150	Chemical Engineering Experimental Project
3.240	Biological Process Engineering Project
3.340	Fuel Engineering Project

304
Chemical Engineering—Subjects and Units

		Hours per week S1	S2
3.001	**Introduction to Chemical Engineering**	0	2
3.111	**Chemical Engineering IA**		
Unit 1	Flow of Fluids	2	0
2	Dimensions	1	0
3	Heat Transfer I	0	2
4	Pumps and Pumping	0	1
		3	3
3.112	**Chemical Engineering IB**		
Unit 1	Material Balances	2	0
2	Thermodynamics I	0	2
3	Computations I	0	1
		2	3
3.121	**Chemical Engineering IIA**		
Unit 1	Mass Transfer I	2	0
2	Heat Transfer II	1	0
3	Solids Handling	1	0
4	Multicomponent Separation	0	1
5	Mass Transfer I (Design)	0	1½
6	Heat Transfer II (Design)	0	1
7	Fluid Particles Systems	0	2
		4	5½
3.122	**Chemical Engineering IIB**		
Unit 1	Thermodynamics II	2	0
2	Reaction Engineering I	2	0
3	Thermodynamics III	0	1
4	Reaction Engineering II	0	1
5	Computations II	0	1
6	Process Dynamics I	0	1
		4	4
3.123	**Chemical Engineering IIC**		
Unit 1	Process Engineering I	1	0
2	Process Report	1	0
3	Process Vessels	0	1½
4	Plant Layout I	0	1
5	Economics I	0	1
6	Design Report	0	1
7	Instrumentation	0	1
		2	5½

		Hpw S1	S2
3.124	Chemical Engineering Laboratory		
	Unit 1	2	0
	2	0	3
		2	3
3.131	Chemical Engineering IIIA		
	Unit 1 Convective Mass Transfer	1	0
	2 Simultaneous Heat and Mass Transfer	1	0
	3 Surface Separation Processes	1	0
	4 Transport Phenomena	1	0
		4	0
3.132	Chemical Engineering IIIB		
	Unit 1 Process Dynamics II	1	0
	2 Control I	2	0
	3 Optimization	1	0
		4	0
3.133	Chemical Engineering IIIC		
	Unit 1 Safety and Failure Engineering	1	0
	2 Economics II	2	0
	3 Atmospheric Pollution Control	1	0
	4 Water Pollution Control	1	0
		5	0
3.134	Chemical Engineering Laboratory	3	0
3.135	Advanced Chemical Engineering Electives		
	Unit 1 Principles	0	3
	2 Process Dynamics II	0	3
	3 Plant Layout	0	3
	4 Control II	0	3
	5 Reactor Engineering	0	3
	6 Solids Processing	0	3
	7 Chemical and Phase Equilibria	0	3
	8 Process Engineering II	0	3

Students are to select *6 session hours only.* It is hoped that some of the above electives will be offered in *Session 1.*

3.136	Oil and Gas Engineering	3	3
3.211	Biological Process Engineering	6	6

304
Chemical Engineering—Full-time/Part-time Course

Bachelor of Engineering
BE

The BSc(Tech) course in Chemical Engineering was replaced in 1975 by a part-time/full-time course leading to a BE degree to be normally completed in seven years. The preferred course pattern is as follows:

Stages 1 and 2 or Year I
Stages 3 and 4 or Year II
Stages 5 and 6 or Year III
Stage 7 or Year IV

Various course patterns involving full-time/part-time study may be approved by the Head of the School.

Candidates presently enrolled in the BSc(Tech) degree are allowed to complete their degrees as outlined in the 1974 Calendar.

Preferred course pattern for BSc(Tech) and BE—Full-time/Part-time Courses

For variations to this course pattern students should contact the School.

		Hours per week S1	S2
Stage 1			
1.001	Physics I	6	6
10.001	Mathematics I	6	6
		12	12
Stage 2			
2.121	Chemistry IA *and*		
2.131	Chemistry IB	6	6
5.010	Engineering IA	6	0
5.030	Engineering IC Includes 3.001 Introduction to Chemical Engineering	0	6
		12	12
Stage 3			
2.002A	Physical Chemistry	6	0
2.002C	Inorganic/Analytical Chemistry	0	6
10.031	Mathematics	2	2
10.331	Statistics	2	2
	General Study Elective	1½	1½
		11½	11½

Stage 4

		Hpw S1	S2
3.111	Chemical Engineering IA	3	3
3.112	Chemical Engineering IB	2	3
3.311	Fuel Engineering I*	2	2
4.961	Materials and Corrosion	2	0
6.832	Electrical Machines	0	3
8.112	Structures	3	0
	General Study Elective	1½	1½
		13½	12½

* In certain cases this subject may be replaced by another elective with approval of Head of School.

Stage 5

3.121	Chemical Engineering IIA	4	5½
3.122	Chemical Engineering IIB	4	4
10.032	Mathematics	2	2
	General Study Elective	1½	1½
		11½	13

Stage 6

2.002B	Organic Chemistry	6	0
3.123	Chemical Engineering IIC	2	5½
3.124	Chemical Engineering Laboratory	2	3
		10	8½

Plus *one* of the following electives:

3.321	Fuel Engineering II	3	3
7.313	Minerals Engineering Processes	3	3
18.121	Production Management	3	3
22.113	Industrial Chemistry (Processes)	3	3
44.111	Microbiology	3	3
	Any other elective approved by Head of School		

Stage 7

As per Year 4 of full-time course.

Department of Biological Process Engineering

Biological Process Engineering at the undergraduate level is a course in Chemical Engineering with electives in the areas of microbiology and biological process engineering.

304
Chemical Engineering with Biological Process Engineering Electives—Full-time Course

Bachelor of Engineering
BE

Year 1 is the same as for the Chemical Engineering course; Years 2, 3 and 4 are also the same as for the corresponding years in Chemical Engineering, but in Year 3 the appropriate elective is 44.111 Microbiology; and in Year 4, 3.211 Biological Process Engineering, plus 3.240 Biological Process Engineering Project.

Successful completion of this course is sufficient qualification for corporate membership of the Institution of Engineers, Australia, the Royal Australian Chemical Institute, and the Institution of Chemical Engineers, UK.

Department of Fuel Technology

This department, the first of its kind to be established in Australia, offers a course designed to meet the need of Australian industrial and research establishments for graduates trained in the science and technology of fuels and their utilization.

One constant problem of industries is that of developing and improving methods of processing and using solid, liquid and gaseous fuels to suit the continuously shifting patterns of demand. It is in this field of activity that the university-trained fuel technologist has a most important part to play.

In Australia, there is a growing need for people trained in the technology of fuels, and opportunities for employment and advancement of fuel engineers are therefore good.

Many exciting and revolutionary possibilities are apparent in the fuel and energy conversion industries, and there is a wide and varied field of activity which offers opportunity and challenge in the application of science and engineering to the problems of fuel and energy conversion, combustion engineering and environmental pollution control. Opportunities for graduate studies and research for higher degrees in these areas are wide-ranged and interesting.

The Institute of Fuel has accepted the degree courses in Chemical Engineering with the fuel electives as providing exemption from the examination required for admission to corporate membership of the Institute.

Successful completion of the BE course in Chemical Engineering with fuel electives is accepted by the Council of Engineering Institutions, UK, the Royal Australian Chemical Institute, and the Institution of Engineers, Australia, as sufficient academic qualification for corporate membership.

304
Chemical Engineering with Fuel Electives —Full-time Course

Bachelor of Engineering
BE

Fuel Engineering is essentially a course in Chemical Engineering with an orientation to the fuel and energy conversion and utilization industries. This course is available as an elective strand in the Chemical Engineering BE degree. Years 1 and 2 are the same as for the Chemical Engineering course, and all students take the subject 3.311 Fuel Engineering I in their second year; Years 3 and 4 are also the same as for the corresponding years in Chemical Engineering, but in Year 3 the appropriate elective is 3.321 Fuel Engineering II, and in Year 4, 3.331 Fuel Engineering III, and 3.340 the Fuel Engineering Project.

The final year electives are devoted to professional subjects covering the broad areas of constitution, processing, and utilization of fossil fuels. Topics include studies of the design and performance evaluation of furnaces and boilers, radiation, flames, air pollution, carbonization, refractories, and progress in fuel science and fuel processing.

School of Chemical Technology

Chemical Technology is the discipline in which the scientific work of the research chemist is translated into the activities of the chemical industry. The thermodynamic feasibility of a reaction in inorganic or organic chemistry, the conditions under which the reaction might proceed, the kinetics of the reaction and the means whereby the reaction might be controlled to produce the desired product are the fundamentals of chemical technology. There are two major specializations: Ceramic Engineering (full-time course) and Ceramics (part-time course) and Industrial Chemistry (full-time and part-time).

It is recommended that before graduation students in the full-time courses obtain a minimum of eight weeks' professionally oriented or industrial experience. Students in the part-time courses must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.

Department of Industrial Chemistry

The courses in Industrial Chemistry are concerned with the study of the development, manufacture and use of inorganic and organic industrial chemicals and macromolecules—that special class of materials comprising surface coatings, plastics, elastomers and adhesives. Graduates from these courses are expected to play an effective role in research and development, production control, quality control and technical sales and service

Arrangements have been made with the University of Wollongong for students who have completed a specified program to be admitted with advanced standing to Year 3 of the Industrial Chemistry course at the University of New South Wales.

Department of Ceramic Engineering

The Department of Ceramic Engineering offers courses designed to provide scientists and engineers fitted for service in industries and organizations concerned with the development, manufacture and use of materials in the fields of: whitewares, structural ceramic products, high-temperature materials, electrical ceramics, glass, ceramic surface coatings, abrasives, cermets and nuclear ceramics. Graduates from these courses would find employment in the general field of ceramics in such capacities as ceramist or ceramic engineer on research and development, production control, quality control, product evaluation or technical sales and service.

Arrangements have been made with the University of Newcastle and the University of Wollongong for students who have completed a specified program at these institutions to be admitted with advanced standing to Year 3 of the Ceramic Engineering course at the University of New South Wales.

Department of Polymer Science

The Department of Polymer Science provides instruction in polymer science in the full-time and part-time courses in Industrial Chemistry. These subjects provide a sound treatment of the principles of polymer chemistry and polymer physics, giving Industrial Chemistry students a familiarity with the surface coatings, plastics and rubber industries.

310
Industrial Chemistry—Full-time Course

Bachelor of Science
BSc

Year 1

		Hours per week
1.001	Physics I	6
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I	6
Plus one of:		
5.010	Engineering A*† *and*	6
5.030	Engineering C*†	6
17.011	Biology of Mankind* *and*	6
17.021	Comparative Functional Biology*	6
25.011	Geology I	6

* One session only.
† Chemical Technology students take 4.001 Introduction to Materials Science in 5.010 and 22.101 Introduction to Chemical Technology in 5.030.

Year 2

		S1	S2
1.922	Physics (Electronics)	3	0
2.002A	Physical Chemistry	6	0
2.042C	Inorganic Chemistry	0	6
2.002B	Organic Chemistry	1½	4½
10.031	Mathematics	2	2
10.331	Statistics SS	2	2
22.112	Chemical Process Equipment	1	1
22.122	Instrumental Analysis	3	3
22.132	Industrial Chemistry Calculations	1	1
	General Studies Elective	1½	1½
		21	21

Year 3*

2.003B	Organic Chemistry	6	0
3.111	Chemical Engineering Principles I	3	3
22.113	Industrial Chemistry Processes	3½†	3½†
22.123	Chemical Thermodynamics and Kinetics	3	3
22.133	Data Processing	3	4
22.153	Material and Energy Balances	3	0
22.163	Instrumentation and Process Control I	0	3§
22.303	Polymer Science	2	4†
	Two General Studies Electives	3	3
		26½	23½

* Students who have completed a specified program at the University of Wollongong are admitted with advanced standing to Year 3 at this University.
† Laboratories operate for 4 hour periods in alternate weeks.
§ Laboratories operate for 3 hour periods in alternate weeks.

Year 4

		Hpw S1	Hpw S2
18.121	Production Management	3	3
22.114	Processes	0	2
22.124	Applied Kinetics	3	0
22.134	Applied Thermodynamics	2	0
22.154	Process Simulation	0	4
22.164	Instrumentation and Process Control II	5	0
22.174	Seminars	3	3
22.184	Process Analysis	1	2
22.194	Project	6	8
	General Studies Elective	1½	1½
		24½	23½

With the approval of the Head of School, students may substitute either 22.314 Polymer Chemistry and 22.324 Physical Chemistry of Polymers II or 22.334 Polymer Physics II for 22.114 Processes.

311
Industrial Chemistry—Part-time Course

Bachelor of Science (Technology)
BSc(Tech)

Stages 1 and 2*

		Hours per week
1.001	Physics I	6
2.001	Chemistry I	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I†	6
Plus *one* of:		
5.010	Engineering A‡§ *and*	6
5.030	Engineering C‡§	6
17.011	Biology of Mankind‡ *and*	6
17.021	Comparative Functional Biology‡	6
25.011	Geology I	6

* Two of the first four subjects listed are taken in the first year, the other two in second year (as directed).
† There are no evening lectures in this subject.
‡ One session only.
§ Chemical Technology students take 4.001 Introduction to Materials Science in 5.010 and 22.101 Introduction to Chemical Technology in 5.030.

Stage 3

		S1	S2
1.922	Physics (Electronics)	3	0
2.002A	Physical Chemistry	0	6
10.031	Mathematics	2	2
10.331	Statistics SS	2	2
22.112	Chemical Process Equipment	1	1
	General Studies Elective	1½	1½
		9½	12½

Stage 4		Hpw S1	S2
2.002B	Organic Chemistry	6	0
2.042C	Inorganic Chemistry	0	6
22.122	Instrumental Analysis	3	3
22.132	Industrial Chemistry Calculations	1	1
	General Studies Elective	1½	1½
		11½	11½

Stage 5			
3.111	Chemical Engineering Principles I	3	3
22.113	Industrial Chemistry Processes	3½†	3½†
22.153	Material and Energy Balances	3	0
22.303	Polymer Science	2	4†
		11½	10½

† Laboratories operate for 4 hour periods in alternate weeks.

Stage 6			
2.003B	Organic Chemistry	6	0
22.123	Chemical Thermodynamics and Kinetics	3	3
22.133	Data Processing	3	4
22.163	Instrumentation and Process Control	0	3*
	General Studies Elective	1½	1½
		13½	11½

* Laboratories operate for 3 hour periods in alternate weeks.

302
Ceramic Engineering—Full-time Course

Bachelor of Science
BSc

Year 1		Hours per week S1	S2
1.001	Physics I	6	6
2.121	Chemistry IA *and*		
2.131	Chemistry IB	6	6
5.010	Engineering A*†	6	0
5.030	Engineering C*†	0	6
10.001	Mathematics I *or*		
10.011	Higher Mathematics I	6	6

* One session only.
† Ceramic Engineering students take 4.001 Introduction to Materials Science in 5.010 and 22.231 Introductory Ceramic Engineering in 5.030.

Year 2		Hpw S1	S2
1.922	Physics (Electronics)	3	0
1.932	Physics (Introduction to Solids)	0	3
2.002A	Physical Chemistry	6	0
2.042C	Inorganic Chemistry	0	6
2.002D	Analytical Chemistry	6	0
8.112	Materials and Structures	3	3
10.031	Mathematics	2	2
10.331	Statistics SS	2	2
22.232	Ceramic Engineering I	0	2
	General Studies Elective	1½	1½
		23½	19½

Year 3*			
3.111	Chemical Engineering Principles I	3	3
3.311	Fuel Engineering I	2	2
7.023	Mineral Process Engineering	2	0
22.123A	Chemical Thermodynamics	3	0
22.153	Material and Energy Balances	3	0
22.163	Instrumentation and Process Control I	0	3†
22.213	Chemical Ceramics	4	6
22.233	Ceramic Process Principles	3½	3½
25.201	Mineralogy	2	3
	General Studies Elective	1½	1½
		24	22

* Students who have completed a specified program at the University of Newcastle or at the University of Wollongong will be admitted with advanced standing to Year 3 at this University.
† Laboratories operate for 3 hour periods in alternate weeks.

Year 4			
18.131	Operations Research	2	0
22.164	Instrumentation and Process Control II	5	0
22.224	Physical Ceramics	6	6
22.234	Ceramic Engineering	4	4
22.294	Project	6	9
	Two General Studies Electives	3	3
		26	22

303
Ceramics — Part-time Course

Bachelor of Science (Technology)
BSc(Tech)

Stages 1 and 2*		Hours per week
1.001	Physics I	6
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6

* Two subjects are taken in the first year and the other two in the second year (as directed).

		Hpw
5.010	Engineering A**§	6
5.030	Engineering C**§	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I†	6

** One session only.
§ Ceramics students take 4.001 Introduction to Materials Science in 5.010 and 22.231 Introductory Ceramic Engineering in 5.030.
† There will be no evening lectures in this subject.

Stage 3

		S1	S2
1.922	Physics (Electronics)	3	0
1.932	Physics (Introduction to Solids)	0	3
2.002A	Physical Chemistry	0	6
10.031	Mathematics	2	2
10.331	Statistics SS	2	2
		7	13

Stage 4

2.042C	Inorganic Chemistry	0	6
2.002D	Analytical Chemistry	6	0
8.112	Materials and Structures	3	3
22.132	Ceramic Engineering I	0	2
	General Studies Elective	1½	1½
		10½	12½

Stage 5

3.111	Chemical Engineering Principles I	3	3
7.023	Mineral Process Engineering	2	0
22.153	Material and Energy Balances	3	0
22.163	Instrumentation and Process Control I	0	3†
22.233	Ceramic Process Principles	3½	3½
	General Studies Elective	1½	1½
		13	11

† Laboratories operate for 3 hour periods in alternate weeks.

Stage 6

3.311	Fuel Engineering I	2	2
22.123A	Chemical Thermodynamics	3	0
22.213	Chemical Ceramics	4	6
25.201	Mineralogy	2	2
	General Studies Elective	1½	1½
		12½	11½

School of Food Technology

Food Technology is the application of basic science to the management of foods from the time of production until their use by the consumer. It is concerned with optimum food quality and quantity, with nutritional status and safety, and with means of production, processing, preservation, distribution and utilization.

A study of food science and technology demands an interdisciplinary and integrated approach, one that brings many scientific disciplines into focus. Its basis is in areas of chemistry, biochemistry and microbiology, and its borders merge with those of agriculture, engineering, nutrition and commerce.

The food technologist acquires new knowledge by laboratory and process research, and applies it to the development of acceptable foods by optimum processes and equipment. Foods are studied in terms of their basic constituents and the changes they undergo when subjected to modern processing and distribution. The technologist is equally concerned with the development and selection of raw materials from agricultural, horticultural, animal and marine sources.

There is a demand, both national and international, for professionally trained people who are prepared to accept responsibility for the quality and safety of man's food supply, who can contribute to the solution of one of the greatest problems of our age, how to make food supplies grow faster than population.

The School of Food Technology offers a four-year, full-time course leading to the degree of Bachelor of Science and a six-year part-time course leading to the degree of Bachelor of Science (Technology). Graduates of both courses qualify for membership of the Royal Australian Chemical Institute, the Australian Institute of Food Science and Technology, and the US Institute of Food Technologists.

A Graduate Diploma course in Food Technology of one year full-time or two years' part-time is designed for graduates in science or agriculture wishing to familiarize themselves with the principles of food technology.

306
Food Technology—Full-time Course

Bachelor of Science
BSc

This course is designed to provide depth and breadth in the relevant physical and biological sciences on which food technology is based. Graduates are able to pursue more advanced studies in any of these sciences.

Year 1		Hours per week S1	S2
1.001	Physics I	6	6
2.121	Chemistry IA *and*		
2.131	Chemistry IB	6	6
10.001	Mathematics I *or*		
10.011	Higher Mathematics I	6	6
17.011	Biology of Mankind	6	0
17.021	Comparative Functional Biology	0	6
		24	24

Year 2			
2.002A	Physical Chemistry	3	3
2.002B	Organic Chemistry	0	6
2.002D	Analytical Chemistry	0	6
38.121	Food and Man	0	6
41.101	Introductory Biochemistry	12	0
44.143	Microbiology AS	10	0
	General Studies Elective	0	3
		25	24

Year 3			
2.043L	Chemistry and Enzymology of Foods	6	6
38.131	Food Technology II	6	3
38.132	Food Technology III	0	12
3.431	Food Engineering I	3	3
10.331	Statistics SS	2	2
44.142	Microbiology for Food Technologists	6	0
	General Studies Elective	1½	1½
		24½	27½

Year 4			
38.140	Food Technology Project	8	8
38.141	Food Technology IV	7	7
	General Studies Elective	1½	1½
	General Studies Advanced Elective	1½	1½

Plus *one or more* of the following electives to a total of not less than 6 hrs/week.

		Hpw S1	S2
2.003B	Organic Chemistry	6	6
3.441	Food Engineering II	3	3
18.121	Production Management	3	3
18.551	Operations Research	3	3
28.012	Marketing Models	3	0
28.022	Marketing Systems	0	4
38.142	Oenology	3	3
38.143	Cereal Technology	0	6
38.144	Treatment and Utilization of Food Processing Wastes	3	3
38.341	Public Health and Food Legislation	0	2
38.342	Laboratory Methods for Food Borne Pathogens	0	6
38.343	Brewing Science	4	0
38.541	Nutrition	3	0
42.102	Fermentation Technology	0	6

or such other electives, to a total of not less than 6 hrs/week, as approved by the Head of School.

During the second, third and fourth years of the course excursions are made to various food industries. Detailed reports of some of these visits are required.

A detailed report of the student's activities during his period in industry is required, and is taken into account in the classification for the honours list.

307
Food Technology—Part-time Course

Bachelor of Science (Technology) BSc(Tech)

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

The course covers the same subject matter as the first three years of the full-time course. For the first two years students follow a common course in which general biology is taken, and thereafter specialize in the biological sciences, which are fundamental to the study of food science and technology. The subjects of Stages 4, 5 and 6 may be available only in day-time classes, and substantial day-time release from industry may be required.

Students who have completed the requirements of this course and have qualified for the degree of Bachelor of Science (Technology) may proceed to the degree of Bachelor of Science by attending for one full-time year and completing the subjects listed in fourth year of the full-time course. Students desiring to proceed to a BSc degree must apply to the Head of the School not later than 31 December of the year in which the sixth stage is completed.

Stages 1 and 2*

		Hours per week S1	S2
1.001	Physics I	6	6
2.121	Chemistry IA *and*		
2.131	Chemistry IB	6	6
10.001	Mathematics I *or*	6	6
10.011	Higher Mathematics I†		
17.011	Biology of Mankind	6	0
17.021	Comparative Functional Biology	0	6
		24	24

* Two of the subjects listed will be taken in first year and the other two in second year (as directed).
† There will be no evening lectures in this subject.

Stage 3

2.002B	Organic Chemistry	0	6
2.002D	Analytical Chemistry	0	6
41.101	Introductory Biochemistry	12	0
	General Studies Elective	1½	1½
		13½	13½

Stage 4

2.002A	Physical Chemistry	0	6
38.121	Food and Man	0	6
44.143	Microbiology AS	10	0
	General Studies	1½	1½
		11½	13½

Stage 5

2.043L	Chemistry and Enzymology of Foods	6	6
38.131	Food Technology II	6	3
3.431	Food Engineering I	3	3
		15	12

Stage 6

3.212	Food Technology III	2	10
10.331	Statistics SS	2	2
44.142	Microbiology	6	0
	General Studies Elective	1½	1½
		11½	13½

School of Geography

Geographers study the spatial relationships of the phenomena which make up man's physical and social environment, and aim to establish principles which govern those relationships. The geographer may concentrate on selected variables, as in systematic geography, or may deal with variables operative in a specific area, as in regional geography.

The cultural significance of geography lies in its contribution to an understanding of the total environment, but the geographer's skills also find practical application in the conservation and planned development of resources. Increasing numbers of geographers are finding such professional employment. For instance, geomorphologists and biogeographers are undertaking resource-inventory surveys in northern Australia, and economic geographers are engaged as regional planners and market researchers.

Applied Geography—Full-time Courses Bachelor of Science

The School offers three four-year full-time courses leading to the degree of Bachelor of Science, which aim to train professional geographers for entry into applied fields. There are elective specializations in biogeography and bioclimatology, geomorphology and pedology, or economic geography (with emphasis on urban geography). First year courses involve systematic studies of the physical or economic bases of geography. There is progressive specialization in the following years, but all courses in physical geography have common training in fundamental observation and data handling. For the award of honours, students will be required to have distinguished themselves in formal work, in additional assignments as directed by the Head of the School, and in the final year project for which a thesis will be required.

It is recommended that all students spend a period of four to six weeks with organizations concerned with the investigation and planned use of resources *et cetera*.

Additional information on possible course combinations, subject content and evaluation, text and reference booklists, field work, and career opportunities is available from the School Information Centres at the following places and times:

Monday 3 January to Friday 21 January

Hut 7 (Ref D9)	10.00 am to 12 noon
Staff in attendance	2.00 pm to 4.00 pm
Mondays, Wednesdays	6.00 pm to 8.00 pm
and Fridays	(Wednesdays only)

Monday 7 February to Friday 25 February

Unisearch House	10.00 am to 12 noon
Anzac Parade	
Staff in attendance	
on Faculty enrolment	
days	

Monday 28 February to Friday 11 March

Hut 7 (Ref D9) 10.00 am to 12 noon
Staff in attendance 2.00 pm to 4.00 pm
Mondays, Wednesdays and Fridays.

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Applied Geography—Full-time Course

Bachelor of Science
BSc

Biogeography and Bioclimatology

For students enrolled for the first time prior to 1976.

		Hours per week	
Year 3		S1	S2
27.014	Advanced Methods in Physical Geography	2½	2½
27.103	Climatology	0	5½
27.203	Biogeography*	5½	0
27.333	Agricultural Geography* *or*	0	4½
27.413	Geomorphology*	4½	0
27.423	Pedology*	0	4½
43.111	Plant Evolution and Ecology	6	0
43.142	Environmental Botany	6	0
	Two General Studies Electives	3	3
		27½	20

* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Year 4			
27.104	Bioclimatology*	6	0
27.204	Advanced Biogeography*	9	0
27.504	Project (Biogeography and Bioclimatology)	2	16
	General Studies Advanced Elective	1½	1½
		18½	17½

* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Biogeography and Bioclimatology

For students enrolled for the first time in 1976 and thereafter.

		Hours per week	
Year 1		S1	S2
2.121 / 2.131	Chemistry IA *and* Chemistry IB	6	6
10.001 / 10.011 / 10.021	Mathematics I *or* Higher Mathematics I *or* Mathematics IT	6	6
17.011	Biology of Mankind	6	0
17.021	Comparative Functional Biology	0	6
27.001	Applied Physical Geography†	6	6
		24	24

† Up to 3 days' field work, equivalent to 24 tutorial hours, is an essential part of the subject.

Year 2			
1.001	Physics I	6	6
27.011	Applied Economic Geography I (Part 1)‡	6	0
27.862	Australian Environment and Land Resources*	0	5
43.101	Genetics *or*	0	6
43.121	Plant Physiology	0	6
43.111	Flowering Plants	6	0
	General Studies Elective	1½	1½
		19½	18½

‡ One day of field work, equivalent to 8 tutorial hours, is an essential part of the subject.
* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Year 3			
27.014	Advanced Methods in Physical Geography	2½	2½
27.103	Climatology	0	5½
27.203	Biogeography**	5½	0
27.333	Agricultural Geography** *or*	0	4½
27.413	Geomorphology**	4½	0
27.423	Pedology**	0	4½
43.142	Environmental Botany	6	0
43.112	Plant Taxonomy* *or*	0	6
43.162	The Plant Kingdom *or*	0	6
43.152	Palaeoecology	0	6
	Two General Studies Electives	3	3
		21½ *or* 17	26 *or* 21½

* Requires 43.101 Genetics as a prerequisite.
** Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the course.

Year 4		Hpw S1	S2
27.104	Bioclimatology*	6	0
27.204	Advanced Biogeography*	9	0
27.504	Project (Biogeography and Bioclimatology)	2	16
	General Studies Advanced Elective	1½	1½
		18½	17½

* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Geomorphology and Pedology

Year 1		Hours per week
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I *or*	6
10.021	Mathematics IT	
25.011	Geology I	6
27.001	Applied Physical Geography†	6
		24

† Up to 3 days' field work, equivalent to 24 tutorial hours, is an essential part of the subject.

Year 2		S1	S2
1.001	Physics I	6	6
25.012	Geology IIA	6	6
25.022	Geology IIB	3	3
27.011	Applied Economic Geography I (Part 1)‡	6	0
27.862	Australian Environment and Land Resources*	0	5
	General Studies Elective	1½	1½
		22½	21½

‡ 1 day of field work, equivalent to 8 tutorial hours, is an essential part of the subject.
* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Year 3			
25.0303	Geology for Geomorphologists and Pedologists	4	2
27.103	Climatology	0	4½
27.203	Biogeography*	5½	0
27.413	Geomorphology*	6	0
27.423	Pedology*	0	6
27.014	Advanced Methods in Physical Geography	2½	2½
	Two General Studies Electives	3	3
		21	18

* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the course.

Year 4		Hpw S1	S2
27.414	Advanced Geomorphology*	7	0
27.424	Advanced Pedology*	7	0
27.504	Project (Geomorphology and Pedology)	2	16
	General Studies Advanced Elective	1½	1½
		17½	17½

* Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Applied Economic Geography

Year 1		Hours per week
10.001	Mathematics I *or*	
10.011	Higher Mathematics I *or*	6
10.021	Mathematics IT	
15.001	Economics IA *and*	
15.011	Economics IB	3/4
53.101	Sociology IA *and*	
53.102	Sociology IB	3
27.011	Applied Economic Geography I (Part 1)†	6
		18/19

† Two days' field work, equivalent to 16 tutorial hours, is an essential part of the subject.

Year 2		S1	S2
15.002	Economics IIA *and*	4	0
15.022	Economics IIB *or*		
15.042	Economics IIC	0	4
27.801	Introduction to Physical Geography†	4½	0
27.002	Applied Economic Geography II‡	0	6

† Two days' field work, equivalent to 16 tutorial hours, is an essential part of the subject.
‡ Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Plus *two* of the following combinations. The choice of subjects is to be approved by the Head of School.

28.012	Marketing Systems *and*		
28.022	Marketing Models	4	4
30.032	Behavioural Science *and*		
28.042	Consumer Behaviour	4	4
15.601	Economic History IA *and*		
15.611	Economic History IB	3	3
53.203	Sociology IIA *and*		
53.204	Sociology IIB	4½	4½

		Hpw S1	S2
Year 3			
27.013	Advanced Methods in Economic Geography	2½	2½
27.003	Applied Economic Geography III	5/6	0

Plus *three* of the following as available. The choice is to be approved by the Head of School.

27.023	Population Geography*	5/6	0
27.113	Urban Geography*	5/6	0
27.303	Transportation Geography*	0	5/6
27.323	Marketing Geography*	0	5/6
27.333	Agricultural Geography*	0	5/6

Plus *two* of the following Economics options, *one* in each session:

15.053	Economic Development	3	0
15.003	Economics IIIA	3	0
15.023	Economics IIIB	0	4
15.073	Natural Resource Economics	0	3
15.082	Labour Economics	0	3
15.093	Public Sector Economics	0	3

* Students attend a weekly seminar at Honours level in two of these subjects. Up to 5 days' field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Year 4			
36.411	Town Planning	3	0
27.124	Geographic Thought and Perspectives	3	3
27.304	Advanced Economic Geography	6	0
27.504	Project (Economic Geography)	6	16
		18	19

Geography in Other Faculties

Courses in Geography are available on a full-time basis in the Faculties of Arts, Commerce and Science.

School of Metallurgy

The metallurgical profession is developing rapidly in importance in Australia, in keeping with the recent spectacular growth of our metal and mineral industry. In terms of value of production this industry has become recognized as one of Australia's most important, especially in terms of export earnings. Expansion of the industry has greatly enhanced the need for metallurgists.

Industrial development in metallurgy has been accompanied by, and is based on, the development of metallurgical research. This is being carried on in a number of laboratories run by industry, government, and the universities.

The graduate metallurgist has a wide choice of type of employment and location. He may work in production, technical control or development, either in the ore treatment or metal extraction plants in locations such as Newcastle, Port Kembla, Broken Hill, Mt. Isa, Mt. Morgan, Gladstone, Port Pirie, Whyalla, Kwinana, Kalgoorlie or Pilbara; or in the metal manufacturing plants, including the automobile, aircraft, ship-building and other industries, of the main centres and capital cities. In the metal industry in general the opportunities for a career in management are excellent, since it is a tradition in this industry that management should be in the hands of technical men. If the graduate is inclined towards research and development, he will find considerable scope in various government, University, and industrial research laboratories.

The undergraduate courses in metallurgy have been designed to prepare students for employment in metallurgical industries and research institutions, and involve a general training in basic sciences and engineering. These fundamental principles are then extended to cover studies of the extraction, refining, working, fabrication and use of metals. There are three undergraduate courses, two full-time in Metallurgy and in Metallurgical Process Engineering, leading to the award of the BSc and the BE degree respectively; and one part-time in Metallurgy, leading to the award of the BSc(Tech) degree. The aim of the BE course is to prepare graduates for employment in the mineral, metallurgical and manufacturing industries as metallurgical process engineers.

The first year of the full-time Bachelor of Science course consists of physics, chemistry, mathematics, and *either* engineering *or* geology. The structure of this Year 1 course is similar to that of many other science, applied science and engineering courses. Consequently, students may delay their final choice of a professional course until the end of Year 1.

These courses meet the formal educational requirements for admission to the professional metallurgical institutes, such as the Australasian Institute of Mining and Metallurgy and the Institution of Metallurgists (London). Further details about membership of these institutes, the Australian Institute of Metals and the undergraduate Metallurgical Society of the University, all of which students are encouraged to join, may be obtained from the Head of the School. It is expected that submissions to the Institution of Engineers for recognition of the Bachelor of Engineering course will meet with success.

Candidates for the honours degree are required to undertake special reading and other assignments as directed by the Head of the School. In considering the award of honours special attention is paid to the performance of a candidate in the final year research project for which a thesis describing a theoretical or experimental study is required.

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Metallurgy—Full-time Course

Bachelor of Science
BSc

Students in this course attend the University for twenty-eight weeks over two sessions from March to November (excluding examinations and recesses).

Students are required, before graduation, to have gained at least sixteen weeks of approved industrial experience, and to have submitted satisfactory reports on the work done to comply with this requirement. Industrial experience is normally obtained during the long vacations at the end of second and third years. During the second, third, and fourth years of the course, visits are made to various metallurgical works, and students are required to submit reports on some of these.

Year 1

		Hours per week
1.001	Physics I	6
2.121	Chemistry IA (Session 1) *and*	
2.131	Chemistry IB (Session 2)	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I	6
Plus one of:		
5.010	Engineering A *and*	
5.030	Engineering C *or*	6
25.011	Geology I	6
		24

Old Course

For students who completed Year 1 before the beginning of Session 1, 1975.

Year 4

4.013	Metallurgy III*	18
4.021	Metallurgy Project†	5
	General Studies Elective	1½
		24½

* Session 2 10
† From Week 12 in Session 1 10
Project includes three weeks' laboratory work during Midyear Recess.

Revised Course

For students who completed Year 1 in 1975 or later.

		Hours per week S1	S2
Year 2			
2.002A	Physical Chemistry	6	0
4.302	Chemical and Extraction Metallurgy I	5	2
4.402	Physical Metallurgy I	7	6½
4.602	Metallurgical Engineering I	2	6½
4.802	Metallurgical Physics	0	2
10.031	Mathematics II	2	2
25.201	Mineralogy	2	2
	General Studies Elective	1½	1½
		25½	22½

Year 3 (Operates from 1977)

4.303	Chemical and Extraction Metallurgy II	7	2
4.403	Physical Metallurgy II	10	5
4.613	Metallurgical Engineering IIA	1	3
4.703	Materials Science	0	6
4.813	Mathematical Methods *or*	3	3
6.851	Electrical Engineering	3	0
6.852	Electrical Engineering	0	3
7.023	Mineral Process Engineering	2	0
	Two General Studies Electives	3	3
		26	22

Year 4 (Operates from 1978)

4.024	Metallurgy Project*	6	3
4.054	Metallurgy Seminar	2	2
4.314	Chemical and Extraction Metallurgy IIIA	4½	0
4.324	Chemical and Extraction Metallurgy IIIB	0	4½
4.414	Physical Metallurgy IIIA	4½	0
4.424	Physical Metallurgy IIIB	3	4½
4.504	Mechanical and Industrial Metallurgy	3	9
	General Studies Elective	1½	1½
		24½	24½

* Project includes three weeks' laboratory work during Midyear Recess.

318
Metallurgical Process Engineering—Full-time Course

Bachelor of Engineering
BE

Attendance and Industrial Training requirements are as for those listed in the Bachelor of Science degree.

Year 1

		Hours per week S1	S2
1.001	Physics I	6	6
2.121	Chemistry IA *and*		
2.131	Chemistry IB	6	6
10.001	Mathematics I *or*		
10.011	Higher Mathematics I	6	6
5.010	Engineering A *and*	6	0
5.030	Engineering C	0	6
		24	24

Year 2

2.002A	Physical Chemistry	6	0
4.302	Chemical and Extraction Metallurgy I	5	2
4.402	Physical Metallurgy I	7	6½
4.602	Metallurgical Engineering I	2	6½
4.802	Metallurgical Physics	0	2
10.031	Mathematics II	2	2
25.201	Mineralogy	2	2
	General Studies Elective	1½	1½
		25½	22½

Year 3

4.303	Chemical and Extraction Metallurgy II	7	2
4.403	Physical Metallurgy II	10	5
4.613	Metallurgical Engineering IIA	1	3
4.623	Metallurgical Engineering IIB	0	6
4.813	Mathematical Methods *or*	3	3
6.851	Electrical Engineering	3	0
6.852	Electrical Engineering	0	3
7.023	Mineral Process Engineering	2	0
	Two General Studies Electives	3	3
		26	22

Year 4

		Hpw S1	S2
4.054	Metallurgy Seminar	2	2
4.314	Chemical and Extraction Metallurgy IIIA	4½	0
4.504	Mechanical and Industrial Metallurgy	3	9
4.604	Metallurgical Engineering III	6	9
4.624	Metallurgical Engineering Project*	3	3
	General Studies Advanced Elective	1½	1½
Plus *one* of the following electives:			
4.414	Physical Metallurgy IIIA	4½	0
7.314	Mineral Processing (Part only)	6	0
		24½/26	24½

* Project includes three weeks' laboratory work during Midyear Recess.

Modifications to the full-time BSc course in Metallurgy have necessitated consequential changes in the part-time courses available in the School. The course set out below is for operation in 1977 and subsequently.

Stages 1 and 2*

1.001	Physics I	6
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6
5.010	Engineering A *and* } *or*	
5.030	Engineering C }	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I†	6

* Two of the first four subjects listed are taken in first year and the other two in second year.
† There are no evening lectures in this subject.

Stage 3

		S1	S2
2.002A	Physical Chemistry	6	0
4.302	Chemical and Extraction Metallurgy I	1	5
4.802	Metallurgical Physics	0	2
10.031	Mathematics	2	2
	Two General Studies Electives	3	3
		12	12

Stage 4

4.402	Physical Metallurgy I	7	5
4.602	Metallurgical Engineering I	2	5
7.023	Mineral Process Engineering	2	0
25.201	Mineralogy	2	2
		13	12

		Hpw S1	S2
Stage 5			
4.000	Metallurgy Special Topics	1	1
4.403	Physical Metallurgy II	7	7
6.801	Electrical Engineering	3	3
	General Studies Elective	1½	1½
		12½	12½
Stage 6			
4.024	Metallurgy Project	6	3
4.054	Metallurgy Seminar	2	2
4.504	Mechanical and Industrial Metallurgy	3	6
4.613	Metallurgical Engineering IIA	1	3
		12	14

School of Mining Engineering

Australia is one of the world's largest producers of minerals and with vast reserves of metallic ores, coal and diverse other minerals, the mining industry of this country is assured of a long and prosperous future. Mining, whether underground, at the surface or on the ocean floor has become a technically advanced activity and education for mining engineers has progressed rapidly to cater for present day and future requirements of the industry. The mining engineer is now a front-line executive, planning, co-ordinating and controlling the many activities which comprise the operations of a mine. He is in control of all phases of the mining project from the initial planning and development to mineral extraction and processing and final restoration of the land.

To prepare the graduate for these tasks, the School of Mining Engineering provides an education in a wide range of engineering topics and associated scientific subjects, at the same time providing a comprehensive insight into the techniques and practices of modern mining, mineral processing and mine management.

The School offers a 4 year full-time course in Mining Engineering leading to the degree of Bachelor of Engineering (pass or honours) and a graduate course requiring one year of full-time or two years of part-time study leading to the Graduate Diploma (GradDip) in Mining and Minerals Engineering.

Part-time courses are conducted at the W. S. & L. B. Robinson University College, Broken Hill — in Mining Engineering leading to the BE and in Mineral Processing leading to the BSc(Tech)*. It is also possible to take the BE course at Broken Hill as a full-time student.

* This course is currently under revision for presentation as a BE course.

314
Mining Engineering — Full-time Course

Bachelor of Engineering
BE

The first year of the course is essentially the same as that for several other Engineering courses and second year includes those subjects of common relevance to the Engineering disciplines. The third year is largely devoted to basic mining subjects and the fourth year provides advanced instruction in subjects essential to all mining engineers. In addition, the fourth year offers a wide range of elective subjects, allowing the student, if he so wishes, to concentrate his studies on a particular sector of the industry, such as coal mining or metalliferous mining. An important fourth year requirement is for the student to undertake a personal research or study project in mining or minerals engineering and on which he is required to submit a thesis for examination.

For the award of Honours at the conclusion of the full-time course, students will need to have distinguished themselves in the formal work, in other assignments as directed by the Head of School and in the final year project.

In the undergraduate course it is compulsory for students to gain practical experience in the mining industry during successive long recesses. The minimum requirement is 100 days which must be completed before graduation. The School assists students in securing suitable vacation employment. Upon entering the final year, students are required to submit for assessment an industrial training report on the vacation and other relevant experience acquired at that stage.

After graduation, the mining engineer is equipped to enter any sector of the mining industry such as coal mining, metalliferous mining, petroleum production, sea-floor mining, quarrying or mineral processing. If he chooses to develop a career in production management, he will be required to gain further practical experience before obtaining his Mine Managers Certificate of Competency, in either Coal or Metalliferous Mining. These statutory certificates of competency, for which a mining degree is a prerequisite, are issued by the State Government Department of Mines, which in the case of New South Wales coal mining comes under the *Coal Mines Regulation Act No. 37, 1912*, and for metalliferous mining under the *Mines Inspection Act No. 75, 1901*.

The graduate mining engineer is not, however, restricted to primary production for employment. Many find posts in civil sub-surface construction; research and development; with consultants, governments or universities; or with his broad engineering training, in a wide range of manufacturing industries.

Arrangements have been made with the University of Newcastle and the University of Wollongong for students who have completed a specified program at these institutions to be admitted with advanced standing to Year 3 of the Mining Engineering course at the University of New South Wales.

Year 1		Hours per week S1	S2
1.001	Physics I	6	6
2.121	Chemistry IA	6	0
5.010	Engineering IA	6	0
5.020	Engineering IB	0	6
5.030	Engineering IC†	0	6
10.001	Mathematics *or*		
10.011	Higher Mathematics	6	6
		24	24

† Incorporates 7.111, Introduction to Mining Engineering. Visits to mines and related undertakings are a requirement of this subject.

Year 2			
4.972	Materials for Mining Engineers	1½	1½
5.611	Fluid Mechanics and Thermodynamics	4	4
6.801	Electrical Engineering	3	3
7.112	Mineral Resources	1	0
7.122	Mine Development†	0	1
8.172	Mechanics of Solids II	4	0
8.250	Properties of Materials	2	2
10.022	Engineering Mathematics II	4	4
25.101	Geology for Mining Engineers I‡	0	4
10.341	Statistics Su	1½	1½
29.441	Surveying for Engineers	3	3
	General Studies Elective	1½	1½
	Survey Camp	0	0
		25½	25½

† Visits to mines and related undertakings are a requirement of this subject.
‡ Includes two compulsory field tutorials.

Year 3			
7.113	Mining Methods†	2	2
7.123	Geomechanics	3	3
7.133	Mine Transport	0	2½
7.143	Mine Environment and Safety Engineering‡	2½	2½
7.153	Power Supply in Mines	0	2½
7.163	Excavation Engineering	2	2
7.173	Computer Applications in Mining	2	2
7.213	Mine Surveying	2	0
7.313	Minerals Engineering Processes	3	3
25.102	Geology for Mining Engineers II§	4	4
	General Studies Elective	1½	1½
		22	25

† Visits to mines and related undertakings are a requirement of this subject.
‡ Includes field training in mine-rescue and recovery.
§ A geology field excursion is held at the end of Session 1.

Year 4 (commences in 1978)		Hpw S1	S2
4.974	Mining Materials	1	0
7.114	Geotechnical Engineering	3	3
7.214	Mine Economics and Planning	4	4
7.224	Operational Management	2	2
7.414	Minerals Industry Project	4	4
7.424	Industrial and Research Seminars	1	1
	General Studies Elective	1½	1½

together with an approved grouping† of 3 subjects selected from the following

3.311M	Fuel Engineering IM	3	3
4.374	Metal Extraction Processes	3	3
7.124	Coal Face Mechanization*	3	3
7.134	Metalliferous Mining Systems*	3	3
7.314	Mineral Process Technology	3	3
7.144	Surface and Offshore Mining	3	3
7.154	Petroleum Engineering	3	3
7.164	Tunnel Engineering	3	3
		25½	24½

† Approval for a group of subjects must be obtained from the Head of School and must include *at least one* of the subjects marked.*

420
Mining Engineering—Part-time Course

Bachelor of Engineering
BE

(W. S. and L. B. Robinson University College, Broken Hill)

The School of Mining Engineering offers a part-time course in Mining Engineering at Broken Hill. Although the course is presented as a seven-year enrolment there is provision for acceleration by a combination of full and part-time study. Exceptional students may be given permission to increase their part-time enrolment to fifteen hours per week and may finish their course in six years.

A minimum of three years' concurrent industrial training in approved industries is required before graduation.

Stage 1		Hours per week S1	S2
2.021	Chemistry IE	6	0
5.030	Engineering IC	0	6
10.001	Mathematics I *or* Higher Mathematics	6	6
		12	12

Note: Not all options are offered in Engineering IA, IB and IC. Subject to enrolments in any one year it may be necessary to teach 2.121 Chemistry IA and 2.131 Chemistry IB and substitute 5.031R for 5.010 and 5.020 in Stage 2.

Stage 2

		Hpw S1	S2
1.001	Physics I	6	6
5.010	Engineering IA	6	0
5.020	Engineering IB	0	6
		12	12

Stage 3

6.801	Electrical Engineering	3	3
7.112R	Mineral Resources	1	0
7.122R	Mine Development	0	1
5.411	Mechanics of Solids	4	0
8.250	Properties of Materials	0	4
10.022	Engineering Maths II	4	4
	General Studies Elective	1½	1½
		13½	13½

Stage 4

4.972R	Materials for Mining Engineers	1½	1½
5.611	Fluid Mechanics/ Thermodynamics	4	4
10.351	Statistics	1½	1½
25.101	Geology for Mining Engineers I*	2	2
29.441	Surveying for Engineers	3	3
29.491	Survey Camp†	(40 class contact hours)	
		12	12

* Excursions will be necessary.
† Candidates with sufficient practical experience in a mine survey office may be excused from the camp.

Stage 5

7.123R	Geomechanics	3	3
7.113R	Mining Methods	3	3
7.163R	Excavation Engineering	1½	1½
7.213R	Mine Surveying	2	0
25.1021R	Geology for Mining Engineers II (Part 1)	2	2
	General Studies Elective	1½	1½
		13	11

Stage 6

		Hpw S1	S2
7.133R	Mine Transport	0	2½
7.143R	Mine Environment and Safety Engineering	2½	2½
7.153R	Power Supply in Mines	2½	0
7.313R	Mineral Processing	5	5
25.1022R	Geology for Mining Engineers II (Part 2)	2	2
	General Studies Elective	1½	1½
		13½	13½

Stage 7

7.114R	Geotechnical Engineering	2	2
7.214R	Mine Economics and Planning	3	3
7.224R	Operational Management	1½	1½
7.424R	Feasibility Studies and Seminars	2	2
7.414R	Minerals Industry Project	4	4
	General Studies Elective	1½	1½
		14	14

422
Mineral Processing—Part-time Course

Bachelor of Science (Technology)
BSc(Tech)

W. S. and L. B. Robinson University College, Broken Hill

This course is under revision and the changes have not yet been approved. Intending students should write to the Director of the W. S. and L. B. Robinson College for details of the proposed arrangements.

Students currently enrolled in the BSc(Tech) Mineral Processing course will be allowed to complete it. The following course outline is available only to those continuing students.

Stages 1 and 2

		Hours per week S1	S2
1.001	Physics I	6	6
2.001	Chemistry I	6	6
2.021	Chemistry IE	6	0
5.010	Engineering IA†	6	6
5.020	Engineering IB	0	6
5.030	Engineering IC†	5	5
10.001	Mathematics I *or*		
10.011	Higher Mathematics I	6	6

† One session only. Students take this subject in either Session 1 or 2.

Stage 3

		Hpw S1	S2
2.002A	Physical Chemistry I	6	0
4.941	Materials	2	0
8.250	Properties of Materials	0	4
10.022	Engineering Mathematics II	4	4
	General Studies Elective	1½	1½
		13½	9½

Stage 4

2.002D	Analytical Chemistry I	3
7.023R	Mining and Mineral Process Engineering—Parts 1 and 2*	2
10.331	Statistics SS	2
25.101	Geology for Engineers†	2
25.201	Mineralogy	2
		11

* Course consists of 44 lectures, and four visits, each of three hours, to mines or mineral processing plants.
† Two short Geology excursions are an essential part of the course.

Stage 5

6.801	Electrical Engineering	3
7.314R	Mineral Processing I—Parts 1 and 2	6
7.411	Fluid Mechanics	2
	General Studies Elective	1½
		12½

Stage 6

7.316R	Mineral Processing II	7
7.326R	Mineral Industry Processes — Parts 1 and 2	2
7.414R	Mineral Industry Elective Project†	2
	General Studies Elective	1½
		12½

† The Project for an award with merit is more advanced than that required for the award of the pass degree.

School of Textile Technology

The conversion of textile raw materials into their finished products is simply a succession of, and an interaction between, a number of chemical, physical and engineering processes. Graduates with a good background in physics, chemistry or engineering, and with a broad training in the range of textile sciences and technologies, as provided in the courses in Textile technology, will substantially meet the present and future technological requirements of the textile and allied industries. Since present day textile technology is based on engineering and the fundamental sciences, excellent opportunities also await university-trained scientists and technologists in research and development organizations. Such scientists and technologists will play a decisive part in bridging the gap which exists between fundamental research and its industrial application.

Students are given the opportunity of choosing from four courses, viz Textile Chemistry, Textile Physics, Textile Engineering and Textile Manufacture. The course in Textile Manufacture, which includes subjects in Commerce, is especially designed to meet the need for executives in industry who have been given a comprehensive technological training. Each course extends over four years. All students take a common first year, and they need not choose the option they desire to follow until the end of that year. The aim of all four courses is to produce graduates who have acquired a comprehensive knowledge of all the textile sciences and technologies, the courses themselves differing only in the subjects offered outside the School in the second and third years. Students are required to undertake a minimum of eight weeks' industrial training during the long recesses between Years 2 and 3, and 3 and 4.

317
Textile Technology—Full-time Course

Bachelor of Science
BSc

Year 1 (All courses)		**Hours per week**
1.001	Physics I *or*	
1.011	Higher Physics I	6
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6
5.010	Engineering A *and*	
5.030	Engineering C	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I	6
		24

Textile Chemistry

Year 2

		Hours per week
2.002A 2.002B 2.002D	Physical Chemistry Organic Chemistry Analytical Chemistry	9
10.031	Mathematics	2
10.331	Statistics SS	2
13.111	Textile Technology I	8
13.211	Textile Science I	3
	General Studies Elective	1½
		25½

Year 3

2.003B 2.003H	Organic Chemistry Molecular Spectroscopy and Structure	6
13.112	Textile Technology II	13
13.212	Textile Science II	2
13.311	Textile Engineering I	1
	Two General Studies Electives	3
		25

Textile Physics

Year 2

			Hours per week
1.112A 1.122A 1.112B 1.122B	Electromagnetism *or* Electromagnetism Modern Physics *or* Quantum Physics	*and*	6
1.112C 1.122C	Thermodynamics and Mechanics *or* Thermodynamics and Mechanics		2
10.111A 10.121A	Linear Algebra *or* Algebra		2
10.111B 10.121B	Analysis *or* Real and Complex Analysis		2
10.211A	Mathematical Methods *or*		
10.221A	Mathematical Methods		2½
10.331	Statistics SS		2
13.111	Textile Technology I		8
13.211	Textile Science I		3
	General Studies Elective		1½
			29

Year 3

			Hpw
1.113A 1.113B 1.113C 1.113D	Wave Mechanics and Spectroscopy Electromagnetic Fields and Physical Optics Statistical Mechanics and Solid State Astrophysics and Nuclear Physics	*or*	7
1.123A 1.123B 1.123C 1.123D	Quantum Mechanics Electromagnetic Theory and Statistical Methods Solid State and Nuclear Physics Atomic Physics and Spectroscopy		7
13.112	Textile Technology II		13
13.212	Textile Science I		2
13.311	Textile Engineering I		1
	Two General Studies Electives		3
			26

Textile Engineering

Year 2

		Hours per week S1	S2
5.020B	Engineering Mechanics II	4	0
5.311	Engineering Mechanics	0	2
5.611	Fluid Mechanics/ Thermodynamics	0	2
8.112	Materials and Structures	3	3
10.022	Engineering Mathematics	4	4
10.331	Statistics SS	2	2
13.111	Textile Technology I	8	8
13.211	Textile Science I	3	3
	General Studies Elective	1½	1½
		25½	25½

Year 3

5.111	Mechanical Engineering Design	4
5.331	Dynamics of Machines I	2
6.801	Electrical Engineering	3
13.112	Textile Technology II	13
13.212	Textile Science II	2
13.311	Textile Engineering I	1
	Two General Studies Electives	3
		28

Textile Manufacture

Year 2

		Hours per week S1	S2
10.331	Statistics SS	2	2
13.111	Textile Technology I	6	10
13.211	Textile Science I	3	3
14.501	Accounting and Financial Management IA	4	0
14.511	Accounting and Financial Management IB	0	4
15.001	Economics IA	4	0
15.011	Economics IB	0	4
15.501	Introduction to Industrial Relations	3	0
	General Studies Elective	1½	1½
		23½	24½

Year 3

		Hpw
13.112	Textile Technology II	13
13.212	Textile Science II	2
13.311	Textile Engineering I	1
14.081	Introduction to Financial Analysis	2
28.012	Marketing Systems	
28.022	Marketing Models	4
	Two General Studies Electives*	3
		25

* Not to include Economics.

Year 4 (All courses)

13.113	Textile Technology III	6½
13.213	Textile Science III	5
13.312	Textile Engineering II	1½
13.411	Project	7
	Optional*	2
	General Studies Advanced Elective	1½
		23½

* Optional Subjects

13.223	Advanced Textile Chemistry
13.233	Advanced Textile Physics
13.313	Advanced Textile Engineering
14.602	Information Systems

School of Wool and Pastoral Sciences

Motivated by strong competition from cheaply-produced man-made fibres, wool producers, by the implementation of the Wool Use Promotion Act of 1945 and subsequent legislation, have undertaken a program to improve efficiency through research, increased extension services, and adequate publicity for wool. The full development of this program requires specialist personnel trained to give service to the pastoral industry.

To meet this need the School of Wool and Pastoral Sciences offers a full-time course in Wool and Pastoral Sciences, leading to the degree of Bachelor of Science (pass or honours).

From 1972 the School has provided a course in Wool and Pastoral Sciences (Education Option), to provide training at the tertiary level for teachers of sheep husbandry and wool science in the Department of Technical Education and in the Agricultural High Schools and Colleges. Students who complete the course successfully will be eligible to become certificated teachers. Graduates could proceed to higher degrees in the field of Rural Extension or of certain scientific aspects of the pastoral industry.

At the graduate level the School offers a course requiring one year of full-time or two years of part-time study leading to the Graduate Diploma in Wool and Pastoral Sciences. Research may also be undertaken for the degrees of Master of Science and Doctor of Philosophy.

The Wool and Pastoral Sciences courses aim to provide a pool of graduates with a liberal scientific outlook, and the habit of exact and logical thought. These graduates will be familiar with the latest developments in the various fields relating to Wool and Pastoral Sciences and the utilization of the products stemming from the industry. Graduates of the School are keenly sought after for positions as research workers, teachers, extension workers, agricultural journalists, valuers, and managers of estates, and for other professional occupations in the pastoral industry.

The first year of the BSc course consists of a basic training in general science; vocational subjects essential to all branches of the wool industry are given in the second, third and fourth years. The fourth year work includes a project which will give each student an opportunity to express initiative and originality. By association with lecturers, and teachers who are all engaged in research, we aim to provoke both curiosity and interest in students who will themselves endeavour to contribute to the advance of efficiency.

In Years 3 and 4 provision is made for students who wish to specialize in Plant Sciences, Animal Production, Wool Technology, Farm Management and Economics or in the appropriate scientific areas of Genetics and Biostatistics, Physiology, Nutrition and Biochemistry, Rural Extension, Agricultural Chemistry or Parasitology.

From time to time compulsory field excursions, farm tours and consolidated courses on University field stations are arranged for students.

Industrial Training Requirements

1. Students are required to obtain twenty-four weeks' practical experience on commercial properties. At least twenty weeks of experience must be obtained concurrently with the course, while up to four weeks may be allowed for practical experience obtained immediately prior to the commencement of the course.

2. Students are encouraged to obtain experience in a diversity of pastoral enterprises, ie cattle, sheep and cropping, in different climatic zones.

3. A maximum of eight weeks shall be allowed for practical experience on any one property, including home properties. Up to eight weeks employment at research or teaching institutions is allowed towards the industrial training requirement.

4. In order to obtain recognition for practical work carried out, students shall, within six weeks of the commencement of the Session immediately following the period of employment:

A Submit written evidence from the owner/manager of the property or the director of the institution as to the length of employment.

B Submit a written report along the guidelines which are available from the School.

Year 2

		Hpw
9.121	Livestock Production I	3
9.221	Agronomy	4
9.411	Agricultural Chemistry I	4
9.531	Wool Technology I	7
9.601	Animal Physiology I	5
10.331	Statistics SS	2
	General Studies Elective	1½
		26½

Year 3

		S1	S2
9.131	Animal Health and Preventive Medicine I	0	3
9.231	Pastoral Agronomy	2	4
9.311	Agricultural Economics I	2	0
9.801	Genetics I	2	3
41.101A	Chemistry of Biologically Important Molecules	6	0
41.101B	Metabolism	6	0
41.101C	Control Mechanisms	0	6
	Two General Studies Electives	3	3
		21	19

322
Wool and Pastoral Sciences—Full-time Course

Bachelor of Science
BSc

Year 1

		Hours per week
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I *or*	6
10.021	Mathematics IT	
9.001	Biology of Grazing Sheep and Cattle†	6
17.021	Comparative Functional Biology†	6
27.001	Geography*	6

† One session only.
* Students wishing to specialize in Wool Science or Wool Technology may substitute 1.011 Higher Physics I or 1.001 Physics I for 27.001 Geography I.

Plus at least *two* of the following subjects in each session as approved by the Head of the School (maximum 26 hours):

9.122	Livestock Production II	2	0
9.123	Livestock Production III	0	2
9.232	Crop Agronomy	0	2
9.312	Agricultural Economics II	0	2
9.313	Farm Management I	2	0
9.314	Farm Management II	0	2
9.316	Analysis of Rural Development Projects	0	2
9.532	Wool Technology II (Wool Study)	2	2
9.533	Wool Technology III (Wool Metrology)	3	3
9.534	Wool Technology IV (Raw Materials)	0	2
9.602	Animal Physiology II	2	2

Year 4

		Hpw	
9.001	Project	6	6
9.811	Biostatistics	4	4
	General Studies Elective	1½	1½

Plus subjects providing at least 12 hours per week of lecture, tutorials and laboratory work in each session, selected from the following. The choice of subjects is to be approved by the Head of the School.

9.124	Livestock Production IV	2	2
9.132	Animal Health and Preventive Medicine II	3	0
9.232	Crop Agronomy	0	2
9.412	Agricultural Chemistry II	6	6
9.421	Animal Nutrition	3	0
9.535	Wool Technology V	2	2
9.536	Wool Technology VI	4	4
9.603	Animal Physiology III	4	4
9.802	Genetics II	4	4
9.901	Rural Extension	4	4
9.312	Agricultural Economics II	0	2
9.313	Farm Management I	2	0
9.314	Farm Management II	0	2
9.315	Farm Management III	2	0
9.316	Analysis of Rural Development Projects	0	2
43.121	Plant Physiology	0	6
43.142	Environmental Botany	6	0

Table of Progression in Subjects

Year 1		Year 2		Year 3		Year 4	
27.001	Geography I	9.221	*Agronomy*	9.231	*Pastoral Agronomy*	9.232 43.121 43.142	Crop Agronomy Plant Physiology Environmental Botany
9.001	*Biology of Grazing Sheep and Cattle*	9.061	*Animal Physiology I*	9.602	Anim. Physiol. II	9.603	Anim. Physiol. III
17.021	*Comparative Functional Biology*	9.121	*Livestock Production I*	9.122 9.123 9.131	L'stock Prodn. II L'stock Prodn. III *Animal Health and Prev. Medicine I*	9.421 9.123 9.132	Anim. Nutrition L'stock Prodn. III Anim. Health and Prev. Medicine II
2.121 2.131	*Chemistry IA* *Chemistry IB*	9.411	*Agricultural Chemistry I*	41.101	*Biochemistry I*	9.412	Agric. Chemistry II
10.001 10.011 10.021	*Mathematics I*	10.331	*Statistics SS*	9.801	*Genetics I*	9.811 9.802	*Biostatistics* Genetics II
				9.311 9.312 9.313 9.314 9.316	*Agricultural Economics I* Agricultural Economics II Farm Management I Farm Management II Analysis of Rural Development Projects	9.312 9.313 9.314 9.315 9.316 9.901	Agric. Economics II Farm Management I Farm Management II Farm Management III Analysis of Rural Development Projects Rural Extension
1.001 1.011	Physics I	9.531	*Wool Technology I*	9.532 9.533 9.534	Wool Technology II Wool Technology III Wool Technology IV	9.535 9.536	Wool Technology V Wool Technology VI

NOTE
1. Students may take either Geography I or Physics I.
2. Subjects in italics are compulsory.
3. Course requires yearly progression and apart from compulsory subjects, there are no co- or prerequisites.

321
Wool and Pastoral Sciences (Education Option)—Full-time Course

Bachelor of Science
BSc

Year 1

		Hours per week
1.001	Physics I *or*	
1.011	Higher Physics I	6
2.121	Chemistry IA *and*	
2.131	Chemistry IB	6
10.001	Mathematics I *or*	
10.011	Higher Mathematics I *or*	
10.021	Mathematics IT	6
9.001	Biology of Grazing Sheep and Cattle†	6
17.021	Comparative Functional Biology†	6

† One session only.

Year 2

9.121	Livestock Production I	3
9.221	Agronomy	4
9.411	Agricultural Chemistry I	4
9.531	Wool Technology I	7
9.601	Animal Physiology I	5
58.512	Introduction to Education	3
	General Studies Elective	1½
		27½

Year 3

		S1	S2
9.122	Livestock Production II	2	0
9.123	Livestock Production III	0	2
9.131	Animal Health and Preventive Medicine I	0	3
9.231	Pastoral Agronomy	2	4
9.311	Agricultural Economics I	2	0
9.533	Wool Technology III	3	3
9.801	Genetics I	2	3
58.513	Education IA	5	4
58.061	Methods of Teaching*	3	3
	Two General Studies Electives	3	3
		22	25

* Teaching Practice is arranged by the School of Wool and Pastoral Sciences over 3 hours each week which will be additional to the hours shown. Part of this requirement may be met outside University sessions.

Year 4

		Hpw	
9.124	Livestock Production IV	2	2
9.232	Crop Agronomy	0	2
9.312	Agricultural Economics II	0	2
9.313	Farm Management I	2	0
9.421	Animal Nutrition	3	0
43.101C	Plant Physiology	0	6
44.111	Microbiology	3	3
58.062	Methods of Teaching*	3	3
58.514	Education IIA	4	4
58.063	Seminar and Thesis on Educational Issues	2	2
	General Studies Elective	1½	1½
		20½	25½

* Teaching Practice is arranged by the School of Wool and Pastoral Sciences over 3 hours each week which will be additional to the hours shown. Part of this requirement may be met outside University sessions.

Graduate Study

Graduate Enrolment Procedures

Qualifying Programs (for admission to Higher Degree Candidature)

Students may enrol in such programs after approval has been obtained from the relevant Higher Degree Committee.

Unless advised to the contrary, successful applicants are required to attend for enrolment at the appropriate time and place as listed below. The letter offering a place must be taken to the enrolment centre.

Candidates who are continuing a qualifying program are required to attend for re-enrolment at the appropriate time and place as listed below.

Note: All qualifying students must lodge an authorized enrolment form with the Cashier on the day the enrolling officer signs the form. (See Enrolment Procedures earlier in this handbook.)

Friday 4 March
2.00 pm to 5.00 pm
6.00 pm to 8.00 pm
Office of the appropriate School

Higher Degree Research Programs

New Students

Students seeking admission to Higher Degree (Research) must make application on the appropriate form which should be submitted to the Registrar. *Successful applicants will be advised by letter concerning the method of enrolment.*

Re-enrolling Students

Candidates registered for Higher Degrees (Research) are required to re-enrol at the commencement of each academic year. **Unless advised to the contrary candidates should obtain re-enrolment forms and advice on procedure and fees from the office of the appropriate School** after 1 January 1977. Each candidate must complete a re-enrolment form and submit it to the Cashier. (See Enrolment Procedures earlier in this handbook.)

A candidate who has completed all the work for a graduate degree except for the submission of a thesis is required to re-enrol as above *unless* the thesis is submitted by 18 March 1977, in which case the candidate is not required to re-enrol.

Masters Degree and Graduate Diploma Courses

Note: All formal masters degree and graduate diploma students must lodge an authorized enrolment form with the Cashier on the day the enrolling officer signs the form. (See Enrolment Procedures earlier in this handbook.)

New Students
Students seeking admission to formal masters degree courses and graduate diploma courses are required to apply on the appropriate form and by the closing date specified for the particular course. Unless advised to the contrary successful applicants are required to attend for enrolment at the appropriate time and place as shown under **Qualifying Programs.** The letter offering a place must be taken to the enrolment centre.

Re-enrolling Students
Candidates continuing formal graduate courses, including those who have completed their formal examination but have not submitted their project report, are required to attend for re-enrolment at the appropriate time and place as listed under **Qualifying Programs.**

Graduate Study

The Faculty provides facilities for students to proceed to the higher degrees of Doctor of Philosophy, Master of Engineering, Master of Science and Master of Applied Science. Courses leading to the award of a Graduate Diploma are also offered. The degree of Doctor of Science is awarded for a contribution of distinguished merit in the fields of science, engineering or applied science.

The degrees of Doctor of Philosophy, Master of Engineering and Master of Science are all awarded for research and require the preparation and submission of a thesis embodying the results of an original investigation or design. Candidates for the Doctorate of Philosophy may read for the degree in this Faculty and are normally involved in three years' work. The work for the Master's degree may be completed in a minimum of one year, but normally requires two years of study.

The Faculty offers courses leading to the award of the degree of Master of Applied Science. The institution of this degree springs from the recognition of the considerable advance of knowledge in the fields of applied science and engineering which has marked recent years and the consequent increased scope for advanced formal instruction in these fields. Students are usually in attendance at the University for one year on a full-time basis, or for two years part-time.

Numbers of courses are also offered at the graduate level leading to the award of a Graduate Diploma. Students are required to attend courses of study for one year full-time or two years part-time. The courses available for the Graduate Diploma are Corrosion Technology, Food Technology, Fuel Technology, Polymer Technology, Mining and Mineral Engineering and Wool Technology.

Courses leading to the degree of Master of Applied Science and Graduate Diplomas are available at Kensington only. Candidates may register for all the research degrees at Kensington and for the degrees of Master of Science and Master of Engineering at the W. S. and L. B. Robinson University College, Broken Hill, subject to adequate research facilities and satisfactory supervision being available in the candidate's particular field of study. Where these special conditions can be met the Professorial Board may grant permission to a candidate to register for the degree of Doctor of Philosophy in these centres.

The conditions governing the award of the various higher degrees and graduate diplomas are set out later in this handbook in **Conditions for the Award of Higher Degrees.**

Short, intensive graduate and special courses are provided throughout each year designed to keep practising scientists and technologists in touch with the latest developments in their various fields.

School of Applied Geology

802
Hydrogeology-Engineering Geology Graduate Course

Master of Applied Science
MAppSc

The purpose of this course, which leads to the Master of Applied Science, is to train graduates who have a suitable background as specialist Hydrogeologists and Engineering Geologists. It is designed to provide a bridge between Civil Engineering and Geology for graduates who wish to study and work in the field of water resources or civil engineering geology.

The normal requirement for admission is completion of a four year degree course in Geology. Other graduates with suitable academic and professional attainments may be permitted to register.

The program may be completed in either one year on a full-time or two years on a part-time basis. The course consists of both subjects of Group A, *one* subject from Group B and *two* subjects from Group C.

Group A	
25.034	Engineering Geology (Geomechanics)
25.403G	Project
Group B	
25.121G	Engineering Geology
25.402G	Hydrogeology
25.404G	Environmental Geology
Group C	
25.421G	Foundation Geology
25.701G	Subsurface Geology and Pollution Control
and *either*	
27.901G	Geomorphology for hydrologists
or	
27.904G	Geomorphology for engineering geologists
8.753G	Soil Mechanics I
8.708G	Finite Element Methods in Civil Engineering I

807
Applied Geophysics Graduate Course*

Master of Applied Science
MAppSc

The Master of Applied Science course in Applied Geophysics is designed to meet the principal needs and the changing demands of the exploration industry, and the continuing rapid development in the scope, sophistication, application and geological interpretation of geophysical methods.

A student may be admitted to the MAppSc degree course in Applied Geophysics provided that he is a four-year graduate in Science, Applied Science or Engineering, or has an equivalent qualification, and provided further that he has reached a second year level in Physics and Mathematics and a first year level in Geology.

The duration of the proposed course is one academic year of full-time study, and consists of:

25.331G	Applied Geophysics I
25.333G	Applied Geophysics IIA
25.335G	Applied Geophysics Project

Fifteen days' field tutorials and seminars are an integral part of the course.

* Not available in 1977.

809
Mineral Exploration Graduate Course

Master of Applied Science
MAppSc

The course in mineral exploration has been designed to give specialized training to geologists, geophysicists, geochemists and mining engineers in modern methods of exploration for metallic mineral deposits. The course consists of eight subjects and a project. A wide choice of subjects is available to suit the interests and background of the student. The subjects are:

7.013	Principles of Mining
7.023	Mineral Process Engineering
25.014	Exploration Geophysics and Mathematical Geology
25.337G	Geophysical Procedures
25.338G	Computer Applications in Exploration Geology
25.339G	Geology in Exploration
25.340G	Geochemical Prospecting
25.341G	Remote Sensing
7.001G	Exploratory Drilling
25.343G	Mineral Economics, Leasing Law and Management
25.141	Advanced Engineering Geology *or*
4.121	Principles of Metal Extraction
25.000G	Special Laboratory Project
25.344G	Field and Laboratory Methods in Exploration
25.345G	Project

School of Chemical Engineering

Formal courses in the School of Chemical Engineering lead to the Master of Applied Science or to the Graduate Diploma.

Master of Applied Science Degree Courses

The MAppSc courses involve a project, 3.900G, which must integrate and apply the principles treated in the course. It may take the form of a design feasibility study or an experimental investigation. Evidence of initiative and of a high level of ability and understanding is required in the student's approach, and the results must be embodied in a report and submitted in accordance with the University's requirements.

Graduate Courses Specializing in:

800
Bioprocess Engineering*

801
Chemical Engineering

804
Environmental Pollution Control*

806
Fuel Technology

808
Industrial Pollution Control

Master of Applied Science
MAppSc

The MAppSc courses provide for a comprehensive study of theoretical and practical aspects of many advanced topics. The courses are formal and elective in nature and provide an opportunity for graduates to apply their basic skills in fields in which the School has developed special expertise, namely: Chemical Engineering, Environmental and Industrial Pollution Control, Fuel Technology; and Bioprocess Engineering.

* For additional information see below.

The courses specializing in Chemical Engineering, Industrial Pollution Control and Fuel Technology are primarily intended for graduates in Applied Science, Engineering, or Science with principal interests in Chemistry, Mathematics and/or Physics. The course specializing in Bioprocess Engineering is primarily intended for graduates in Agriculture, Applied Science, and Science with principal interests in Biochemistry, Chemistry and/or Microbiology. They are designed to allow the maximum flexibility consistent with the standing of the award. Intending candidates are invited to submit proposed study programs to the Head of the School for advice and recommendation.

An acceptable course is a program of formal study aggregating approximately twenty hours weekly for two sessions full-time or ten hours weekly for four sessions part-time, comprising:

1. a major strand of course material making up 75% of the total program. This includes a project constituting not less than 15% and not more than 30% of the program;

2. a minor strand of broader-based supporting material making up to 25% of the total program; and

3. undergraduate material (generally designated as subjects without a suffixed G number), which may be included in one or both strands but may not exceed 25% of the total program.

Approximately 60% of the program (including the project) must be undertaken in the School of Chemical Engineering. The remainder, subject to approval and availability, may be undertaken in other Schools within the University. Full details of all subjects are listed under **Disciplines of the University** in the Calendar.

Bioprocess Engineering Graduate Courses

The graduate subjects offered have been unitized to provide maximum flexibility. Any combination of units may be selected, subject to a minimum of prerequisite or co-requisite requirements as specified. Further, some of these units are designed as bridging material and would not be offered to graduates with previous qualifications in these particular areas.

The units offered are summarized below.

		Hours per week S1	S2
3.281G	**Design of Microbial Reactors**		
	Unit 1 Rate Processes *Not available to graduates with previous experience in advanced rate processes*	1	0
	Unit 2 Fundamentals of Microbial Stoichiometry *Not available to graduates with a principal interest in the life sciences prerequisite or co-requisite 44.111 or equivalent*	1	0
	Unit 3 Design of Microbial Reactors *Prerequisite 3.281G Unit 1 or equivalent and 3.281G Unit 2 or equivalent*	0	2
3.282G	**Microbial Kinetics and Energetics**		
	Unit 1 Microbial Kinetics *Prerequisite or co-requisite 3.281G Unit 2 or equivalent*	1	1
	Unit 2 Microbial Energetics *Prerequisite or co-requisite 3.281G Unit 2 or equivalent*	2	2
3.283G	**Bioprocess Unit Operations and Equipment Design** *Prerequisite or co-requisite 3.284G or equivalent*	3	2
3.284G	**Heat, Mass and Momentum Transport** *Not available to graduates with previous experience in Chemical Engineering Principles*	1	1
3.285G	**Bioprocess Laboratory**	3 *or*	3

800

Master of Applied Science* MAppSc

This course is designed to provide professional training in the application of chemical engineering principles in the bioprocess industries. The course extends over one full-time year or two part-time years and leads to the degree of Master of Applied Science as outlined above.

As the material in this course will be of interest to graduates from a wide range of disciplines, the suggested course outlines consist of a central core selected from the subjects above and a range of background material. This background material can be designed to suit graduates from either of the two groups consisting of firstly Applied Science, Engineering or Science with principal interests in Chemistry, Mathematics, or Physics, or, secondly, Agriculture or Science graduates with principal interests in Biochemistry, Chemistry and/or Microbiology. Graduates with an inadequate background in Mathematics and/or rate processes will be required to do a bridging course consisting of a specified reading list with associated assignments up to a maximum of 1 hour per week.

* For additional information on the MAppSc degree course see above.

Suggested course outlines for graduates from the two primary areas are given below, however these outlines may be modified to suit individual interests within the general requirements for the MAppSc degree course described above.

Applied Science Graduate or equivalent
Core Material

		Hours per week
3.281G	Unit 3 Design of Microbial Reactors	1
3.282G	Microbial Kinetics and Energetics	3
3.283G	Bioprocess Unit Operations and Equipment Design	2½
3.285G	Bioprocess Laboratory	1½
3.900G	Project	6

Plus 6 hours of other material, for example:

1. Students wishing a more complete coverage of the live sciences may select

42.211G	Principles of Biology	1½
42.212G	Principles of Biochemistry	1½
44.111	Microbiology	3

2. Students wishing to reinforce other areas in chemical engineering may select

44.111	Microbiology	3
3.281G	Unit 2—Fundamentals of Microbial Stoichiometry	½
	plus other elective material	3

Science Graduate with a principal interest in the Life Sciences or equivalent
Core Material

3.281G	Unit 1 Rate Processes	½
	Unit 3 Design of Microbial Reactors	1
3.282G	Microbial Kinetics and Energetics	3
3.283G	Bioprocess Unit Operations and Equipment Design	2½
3.284G	Heat, Mass and Momentum Transport	1
3.900G	Project	6

Plus 6 hours of other material, for example:

3.163G	Industrial Use and Re-use of Water	1½
38.159G	Treatment and Utilization of Biological Effluents	2
3.396G	Unit Operations in Waste Management	1½
	Reading List (Mathematics)	1

804
Environmental Pollution Control Graduate Course*

Master of Applied Science
MAppSc

The graduate course in Environmental Pollution Control leads to the degree of Master of Applied Science. It extends over one full-time year or two part-time years. The course is primarily intended for candidates in Chemical Engineering and Industrial Chemistry who have completed a four year degree program, but candidates from other disciplines may be admitted.

The advent of new laws governing the disposal of effluents into the environment will make the problems of industry more acute as industrial processes are developed and expanded. This course is intended to cover the problems in environmental engineering which may be encountered in industrial plants.

		Hours per week
1.		
3.170G	Process Principles or Graduate Elective	2
2.		
3.162G	Urban Planning	½
3.164G	Medical Aspects	1
3.166G	Legislative Aspects	1
27.902G	Meteorological and Hydrological Principles	1
44.111	Microbiology	3
3.		
3.163G	Industrial Use and Re-use of Water	1½
38.159G	Treatment and Utilization of Biological Effluents	2
3.391G	Atmospheric Pollution and Control	2
3.396G	Unit Operations in Waste Management	1½
	Optional Elective(s) *and*	3
3.901G	Pollution Elective *or*	3
3.900G	Project	

3.170G Process Principles is a bridging course for all candidates other than Chemical Engineering and Industrial Chemistry graduates. Candidates who have passed the equivalent of first year Chemistry take 3.170G Process Principles, and those who have passed the equivalent of second year Chemistry may take specified parts of 3.170G Process Principles and an approved graduate elective each for one hour per week. Graduates in Chemical Engineering or Industrial Chemistry take an approved elective.

All electives must be approved by the Head of the School but applications will be considered regarding any subject available in the University which has a relevance to Pollution Control.

* For additional information on the MAppSc degree course see above.

Students intending to undertake the course over two part-time years may do so by attending on one afternoon and two evenings per week. Every effort should be made to include in the first part-time year the subjects listed in **1.** and **2.** above.

The work involved in 3.901G Pollution Elective must be embodied in a report and submitted in accordance with the requirements of the School.

806
Fuel Technology Graduate Course

501
Corrosion Technology Graduate Diploma Course

Graduate Diploma
GradDip

The Graduate Diploma course in Corrosion Technology is open to graduates in Engineering, Applied Science or Science who wish to undertake formal studies to promote their careers in industry. At present it may only be taken as a two year part-time course.

The course is designed for those professionals in industry who are faced with the problem of combating corrosion. Its aim is to develop an appreciation of the fundamentals, principles of corrosion and of the available methods of overcoming it.

For graduates from Engineering (non-chemical) or Science (in a particular major) a bridging course is a necessary introduction to the graduate level of certain subjects. For this purpose the subject, 3.170G Process Principles, is specified.

The first year of the course introduces elementary aspects of corrosion technology and suitably orientates students depending on their initial qualifications. The second year of the course contains more detailed instruction at a graduate level in Corrosion Theory and Prevention, together with suitable laboratory assignments.

Year 1		**Hours per week**
3.170G	Process Principles *or*	2
3.172G	Corrosion Laboratory	2
3.171G	Corrosion Technology I	3
		5

Chemical Engineering graduates will undertake:
3.172G Corrosion Laboratory

Science graduates who have passed the equivalent of second year Chemistry will undertake parts of:

3.170G Process Principles (1 hr/wk)
3.172G Corrosion Laboratory (1 hr/wk)

Graduates who have passed only the equivalent of first year Chemistry will undertake 3.170G Process Principles.

Year 2		**Hpw**
3.173G	Corrosion Materials	2
3.174G	Corrosion Technology II	3
3.175G	Seminar	1
3.176G	Corrosion Literature Review	2†
3.177G	Testing Laboratory (by roster)	2†
		10

† This is the weekly equivalent of total hours for the subject. These hours may, however, be concentrated in one period.

503
Fuel Technology Graduate Diploma Course*

Graduate Diploma
GradDip

The Graduate Diploma Course in Fuel Technology has been designed to provide professional training and specialization in fuel science and engineering for graduates in science, applied science or engineering who have not had previous training in this field.

Holders of the Graduate Diploma in Fuel Technology are exempted from the examination required for admission to corporate membership of the Institute of Fuel. Applicants holding an appropriate degree or equivalent qualification in science, applied science or engineering are eligible for admission to the course. They may also be required to undertake assignments or successfully complete examinations as directed by the Head of the School.

The Graduate Diploma in Fuel Technology (GradDip) is awarded on the successful completion of one year of full-time study (18 hours per week) or two years of part-time study (9 hours per week). The course is a blend of formal lectures and laboratory work at undergraduate and post-graduate levels.

		Hours per week
1. *Introductory Stage (up to 9 hours per week)*		
3.381	Principles of Fuel Technology	3
3.382	Combustion Engineering	3
3.383	Fuel Plant Evaluation and Assignments	3
		9

Full-time Course

2. *Advanced Stage (up to 9 hours per week)*		
3.390G	Graduate Seminar	1
	Advanced Electives*	8
		9

* This course not available in 1977.

* Subjects to be selected from the following according to availability and specialization required:

3.391G	Atmospheric Pollution and Control	2
3.392G	Fuel Science	3
3.393G	Fuel Engineering Plant Design	3
3.394G	Thermal Engineering and Fuel Processing	3
3.395G	Research Techniques and Extension Methods	2
3.396G	Unit Operations in Waste Management	1½

When appropriate, up to three hours per week may be selected from approved courses offered by other Schools within the University, eg Coal Preparation, Instrumentation and Automatic Control, Ceramics, Nuclear Engineering, etc.

School of Chemical Technology

880
Chemical Technology Graduate Course

Master of Applied Science
MAppSc

The aim of this course is not to produce narrow specialists but to train graduates to identify and solve a wide range of problems in those areas of the chemical industry concerned with the production and development of inorganic chemicals, organic chemicals, surface coatings, plastics, elastomers, or ceramic materials. The method is student participation in formal courses and projects of a collaborative kind.

Intending candidates are invited to submit proposed study programs to the Head of the School for advice and recommendation. Each individual course must be approved by the Higher Degree Committee of the Faculty of Applied Science. An acceptable course would be a program of formal study aggregating approximately 20 hours weekly for two sessions full-time or ten hours weekly for four sessions part-time, and which could comprise:

1. A major strand of course material making up 75 percent of the total program. This would include a project constituting not less than 15 percent and not more than 30 percent of the program.

2. A minor strand of broader-based supporting material making up to 25 percent of the total program.

Undergraduate material may be included in one or both strands but may not exceed 25 percent of the total program. Approximately 60 percent of the program (including the project) must be taken in the School of Chemical Technology. The remainder, subject to approval and availability, may be undertaken in other schools within the university.

Graduate subjects in Chemical Technology may be selected from:

		Hours per week
22.110G	Process Evaluation	3*
22.120G	Machine Computation in Chemical Technology	6
22.130G	Chemical Reactor Analysis and Control	6
22.131G	Catalysis and Applied Reaction Kinetics	6
22.140G	Chemical Process Simulation	6
22.141G	Modelling in Chemical Technology	6
22.142G	Chemical Process Control	6
22.150G	Instrumental Analysis for Industry	3*
22.160G	Industrial Electrochemistry	6
22.161G	Electrochemical Techniques for Control and Analysis	6
22.210G	Solid State and Mineral Chemistry	2*
22.220G	Refractory Technology I	6
22.221G	Refractory Technology II	6
22.230G	Chemistry of Glass Melting	6
22.300G	Polymer Science	10
22.310G	Analytical Characterization of Polymers	8
22.330G	Polymer Engineering	6
22.340G	Polymer Physics	6
22.900G	Major Project	6*
22.901G	Minor Project	3*

The work involved in the project must be embodied in a report and submitted in accordance with the requirements of Faculty.

Depending on the candidate's background, enrolment in some of the above subjects may be accompanied by enrolment in related undergraduate subjects as prerequisites or corequisites. A given subject may not necessarily be conducted in any one year.

* These subjects operate for *two* sessions at the stated hours per week.

School of Food Technology

The School of Food Technology conducts formal courses leading to the award of the Master of Applied Science degree and of the Graduate Diploma in Food Technology.

In addition, the School welcomes enquiries from graduates in Chemistry, Biochemistry, Microbiology, Applied Science and Agriculture who are interested in pursuing research in food science and technology for the degrees of Master of Science and Doctor of Philosophy.

The Head of School provides information on research scholarships, fellowships, grants-in-aid and School research activities. Graduates are advised to consult the Head of School before making a formal application for registration.

803
Food Technology Graduate Courses

Master of Applied Science
MAppSc

This course provides for a comprehensive study of theoretical and applied aspects of the science and technology of foods. The course is formal and elective in nature, providing an opportunity for graduates to apply their basic skills in areas relevant to this field of applied science. It is a course particularly relevant to graduates in Agriculture, Applied Science and Science with principal interests in Chemistry, Biochemistry and/or Microbiology.

Intending candidates are invited to submit proposed study programs to the Head of the School for advice and recommendation. Each individual course must be approved by the Higher Degree Committee of the Faculty of Applied Science. An acceptable course would be a program of formal study aggregating approximately 20 hours weekly for two sessions full-time or ten hours weekly for four sessions part-time, and which could comprise:

1. A major strand of course material making up 75 percent of the total program. This would include a project constituting not less than 15 percent and not more than 30 percent of the program.

2. A minor strand of broader-based supporting material making up to 25 percent of the total program.

Undergraduate material may be included in one or both strands but may not exceed 25 percent of the total program. Approximately 60 percent of the program (including the project) must be taken in the School of Food Technology. The remainder, subject to approval and availability, may be undertaken in other schools within the university.

Graduate subjects in Food Technology may be selected from:

		Hours per week*
38.151G	Introductory Food Science	1
38.152G	Food Process Laboratory	3
38.153G	Food Technology Seminar	2
38.154G	Food Technology	4
38.155G	Dairy Technology	2
38.156G	Oenology	1
38.157G	Technology of Cereal Products	1
38.158G	Marine Products	1
38.159G	Treatment and Utilisation of Biological Effluents	2
38.160G	Food Quality Assessment	1
38.161G	Food Additives and Toxicology	1
38.351G	Public Health and Legislative Aspects of Foods	3
38.551G	Nutrition	1½
38.900G	Major Project	6
38.901G	Minor Project	3

The work involved in the project must be embodied in a report and submitted in accordance with the requirements of the Faculty.

Depending on the candidate's background, enrolment in some of the above subjects may be accompanied by enrolment in related under-graduate subjects as prerequisite or co-requisites. A particular subject may not necessarily be conducted in any one year.

* Weekly equivalent of total hours for subject. These hours may be concentrated in one session.

502
Food Technology Graduate Diploma Course

Graduate Diploma
GradDip

The graduate diploma course is designed to provide professional training at an advanced level for graduates in science, applied science or engineering who have not had previous training in Food Technology.

Requirements are a first degree and, in some cases, the successful completion of assignments or examinations, as directed by the Head of the School.

The course is a blend of formal lectures and laboratory work at the undergraduate and graduate levels. The Graduate Diploma in Applied Science in Food Technology (GradDip) is awarded on the successful completion of one year of full-time study (18 hours/week), or two years of part-time study (9 hours/week). It involves the following program:

		Hours per week
38.131	Food Technology II	2
38.132	Food Technology III	2
38.151G	Introductory Food Science	1
38.152G	Food Process Laboratory	3
38.153G	Food Technology Seminar	2
	Electives*	8

* Electives are to be selected from the following list of subjects according to availability and with the approval of the Head of School. The hours of these electives must include at least three devoted to graduate subjects.

		Hours per week
2.271G	Chemistry and Analysis of Foods	3
3.431	Food Engineering I	3
3.441	Food Engineering II	3
42.211G	Principles of Biology	1½
42.212G	Principles of Biochemistry	1½
42.213G	Biochemical Methods	1½
42.214G	Biotechnology	1½
44.111	Microbiology	3

or

such other electives approved by the Head of School. In all cases, the hours devoted to graduate subjects will constitute at least 50 percent of the total course hours.

School of Metallurgy

The School of Metallurgy conducts courses which may lead to the award of Master of Applied Science.

In addition, the School welcomes enquiries from graduates in Science, Engineering and Metallurgy who are interested in doing research in metallurgy for the degrees of Master of Science, Master of Engineering and Doctor of Philosophy.

The Head of the School will be pleased to give information about research scholarships, fellowships and grants-in-aid. Graduates are advised to consult him before making a formal application for registration.

805
Metallurgy Graduate Course

Master of Applied Science
MAppSc

This course provides for a comprehensive study of theoretical and practical topics at an advanced level. It is designed to allow the maximum flexibility in choice of topics consistent with the standing of the award.

Intending candidates are invited to discuss proposed study programs with the Head of the School for advice and recommendation.

An acceptable program would be:

1. A program of formal study (including a project) totalling approximately twenty hours per week for two sessions full-time.

2. A project comprising about twenty per cent of the program.

At least eighty per cent of the total program must be composed of units selected from those available as part of the graduate subjects listed below, except that not more than eight hours per week for two sessions may be devoted to each of 4.211G Metallurgical Practice and 4.231G Advanced Theoretical Metallurgy and not more than six hours per week for two sessions may be devoted to 4.221G Advanced Metallurgical Techniques.

Graduate Subjects

		Hours per week*
4.241G	Graduate Metallurgy Project	Not less than 4
4.211G	Metallurgical Practice Detailed studies relating to one or more of the following: **1.** Extractive Metallurgy **2.** Metal working and forming **3.** Foundry practice **4.** Welding and metal fabrication **5.** Metal finishing and corrosion protection	4 to 8
4.221G	Advanced Metallurgical Techniques	1 to 2
4.231G	Specialist lectures in Advanced Theoretical Metallurgy	Offered in units of 7 hours (ie 1 hour/ week for 7 weeks)
4.251G	Advanced Materials Technology	3

* These courses may be presented at twice the weekly rate over one session.

Undergraduate Subjects

These subjects are intended for inclusion in qualifying courses and to satisfy prerequisite and co-requisite requirements for students whose first degree is in a field other than metallurgy.

		Hours per week
4.121	Principles of Metal Exraction	3
4.131	Principles of Physical and Mechanical Metallurgy	3
4.141	Experimental Techniques in Physical Metallurgy	2

The above undergraduate subjects offered by the School of Metallurgy and undergraduate and graduate subjects offered by other Schools of the University may be included, but may not exceed 20 per cent of the total program.

School of Mining Engineering

The School offers a graduate course leading to the award of a Graduate Diploma (GradDip).

504
Mining and Mineral Engineering Graduate Diploma Course

GradDip

The Graduate Diploma Course in Mining and Mineral Engineering is designed to provide professional training for graduates in science, applied science or engineering who wish to specialize in the fields of mining and mineral beneficiation. The course is concerned primarily with instruction in the scientific and engineering principles associated with the mining and beneficiation of minerals and coal.

The Graduate Diploma in Mining and Mineral Engineering (GradDip) will be awarded on the successful completion of one year full-time or two years part-time study. The course is a blend of lecture and laboratory work and allows the choice of elective specialization in either the beneficiation of minerals or the preparation of coal.

When appropriate, certain sections of the course may be offered as a unit over a short period of time to permit mineral industry personnel to attend the advanced course in a particular area of that discipline. Normally, the program will be arranged so that it may be completed in one year full-time or two years part-time. It should be noted that some degree of specialization will be possible in the laboratory investigations.

		Hours per week S1	S2
Year 1—Part-time			
7.023	Mining and Mineral Process Engineering, Parts 1 and 2	4	0
7.033	Mineralogical Assessment	1	0
7.234	Mineral Economics	0	2
7.311G	Mineral Beneficiation	0	3
7.111G	Mining Engineering	0	3
		5	8
Year 2—Part-time			
7.122G	Mining Engineering Technology *or*	6	0
7.322G	Mineral Beneficiation Technology	6	0
7.132G	Mining Engineering Laboratory and Project *or*	0	6
7.332G	Mineral Engineering Laboratory	0	6
		6	6

When appropriate, up to 3 hours per week may be selected from approved courses available within this School or offered by other Schools within the University.

School of Wool and Pastoral Sciences

508
Wool Technology Graduate Diploma Course

Graduate Diploma
GradDip

The course leading to the award of the Graduate Diploma in Wool Technology is specially designed for graduate students preparing themselves for careers in the pastoral industry. One of the principal functions of the course is to provide a bridge from other disciplines such as Agriculture, Veterinary Science and Pure Science for graduates who wish to study and work in the field of Wool and Pastoral Sciences, which is of such overall importance to Australia.

Recently the course was made more flexible to permit prospective students to specialize in particular graduate aspects of Wool and Pastoral Sciences, and at the same time, to do supporting work in related undergraduate fields which they may not have covered in their undergraduate training, or which they may have covered and wish to revise.

The normal requirement for admission to the course is a degree in Agriculture, Veterinary Science or Science in an appropriate field. In addition, students may be required to take a qualifying examination in the basic disciplines of the undergraduate BSc degree course, viz. General and Human Biology, Agronomy and/or Livestock Production. Such qualifying examination will be of a standard which will ensure that the student has sufficient knowledge of the subject and the principles involved to profit by the course.

The following program may be completed either in one year on a full-time basis or over two years on a part-time basis. Students are required to carry out full-time study or its equivalent of two optional graduate level subjects to the extent of ten hours lecture and laboratory work per week for two sessions plus approved undergraduate subjects to the extent of eight hours per week for two sessions. Both graduate subjects and undergraduate subjects may be chosen to suit the requirements of the student subject to their availability and the approval of the Head of the School.

Full-time Course

		Hours per week
9.105G	Advanced Livestock Production	4
9.503G	Wool Study	6
9.711G	Advanced Wool Technology	4
9.902G	Techniques of Laboratory and Field Investigation	4
	Approved undergraduate subjects	8

Graduate Diploma students are expected to work at the level of honours students in the undergraduate courses and to carry out prescribed study of current research material in the appropriate field.

545
Industrial Engineering Graduate Diploma Course

Graduate Diploma
GradDip

Students who have graduated from schools of the Faculty of Applied Science and who wish to continue their studies in the field of scientific management, may enrol in the Graduate Diploma in Industrial Engineering offered by the School of Mechanical and Industrial Engineering.

This course provides instruction in accountancy, economics, industrial law, economic analysis, the use of human and physical resources, organization and administration, operations research and production control. Students take part in a case-study program and staff from the Schools of the Faculty of Applied Science participate so that effective application of the principles of the course can be made to a student's own special industry.

Conditions for the Award of Higher Degrees

First Degrees

Rules, regulations and conditions for the award of first degrees are set out in the appropriate Faculty Handbooks.

For the list of undergraduate courses and degrees offered see **Disciplines of the University: Faculty Table (Undergraduate Study)** in the Calendar.

Higher Degrees

The following is the list of higher degrees and graduate diplomas of the University, together with the publication* in which the conditions for the award appear.

For the list of graduate degrees by research and course work, arranged in faculty order, see **Disciplines of the University: Faculty Table (Graduate Study)** in the Calendar.

For the statements **Preparation and Submission of Project Reports and Theses for Higher Degrees** *and* **Policy with respect to the use of Higher Degree Theses** see the Calendar.

Title	Abbreviation	Calendar/Handbook
Doctor of Science	DSc	Calendar
Doctor of Letters	DLitt	Calendar
Doctor of Laws	LLD	Calendar
Doctor of Medicine in the Faculty of Medicine	MD	Calendar Medicine
Doctor of Philosophy	PhD	Calendar and all faculties
Master of Applied Science	**MAppSc**	**Applied Science**
Master of Architecture	MArch	Architecture
Master of Arts	MA(Hons)	Arts Military Studies
	MA	Arts Military Studies

Title	Abbreviation	Calendar/Handbook
Master of Building	MBuild	Architecture
Master of Business Administration	MBA	Commerce **
Master of Business Administration	MBA	AGSM
Master of Chemistry by Formal Course Work	MChem	Sciences *
Master of Commerce (Honours)	MCom(Hons)	Commerce
Master of Commerce by Formal Course Work	MCom	Commerce
Master of Counselling (Education)	MCouns(Ed)	Professional Studies
Master of Education	MEd	Professional Studies
Master of Engineering	**ME**	**Applied Science**
Master of Engineering without Supervision		Engineering
		Military Studies
		Sciences *
Master of Engineering Science	MEngSc	Engineering
Master of General Studies	MGenStud	General Studies
Master of Health Administration	MHA	Professional Studies
Master of Health Personnel Education	MHPEd	Calendar †
Master of Health Planning	MHP	Professional Studies
Master of Landscape Architecture	MLArch	Architecture
Master of Laws by Research	LLM	Law
Master of Librarianship by Formal Course Work	MLib	Professional Studies
Master of Librarianship by Research		
Master of Mathematics	MMath	Sciences *
Master of Optometry	MOptom	Sciences *
Master of Psychology	MPsychol	Sciences ‡
Master of Public Administration	MPA	AGSM
Master of Science	**MSc**	**Applied Science**
Master of Science without Supervision		Engineering
		Medicine
		Military Studies
		Professional Studies
		Sciences *‡
Master of Science (Acoustics)	MSc(Acoustics)	Architecture
Master of Science by Formal Course Work	MScSoc	Sciences *
Master of Science (Biotechnology)	MSc(Biotech)	Sciences ‡
Master of Science (Building)	MSc(Building)	Architecture
Master of Science (Building Services)	MSc(Building Services)	Architecture
Master of Social Work by Research	MSW	Professional Studies
Master of Social Work by Formal Course Work		
Master of Statistics	MStats	Sciences *
Master of Surgery	MS	Medicine
Master of Surveying	MSurv	Engineering
Master of Surveying without Supervision		
Master of Town Planning	MTP	Architecture

** Course withdrawn at end of 1977.
* Faculty of Science.
† Professorial Board.
‡ Faculty of Biological Sciences.

Title	Abbreviation	Calendar/Handbook
Graduate Diploma	GradDip	Applied Science Architecture Engineering Sciences *‡
Graduate Diploma in the Faculty of Professional Studies	DipArchivAdmin DipEd DipLib GradDip	Professional Studies

* Faculty of Science.
‡ Faculty of Biological Sciences.

Graduate Diplomas

Doctor of Philosophy (PhD)

1. The degree of Doctor of Philosophy may be granted by the Council on the recommendation of the Professorial Board to a candidate who has made an original and significant contribution to knowledge and who has satisfied the following requirements:

Qualifications

2. A candidate for registration for the degree of Doctor of Philosophy shall:

A hold an honours degree from the University of New South Wales; or

B hold an honours degree of equivalent standing from another approved university; or

C if he holds a degree without honours from the University of New South Wales or other approved university, have achieved by subsequent work and study a standard recognised by the appropriate Faculty or Board of Studies as equivalent to honours; or

D in exceptional cases, submit such other evidence of general and professional qualifications as may be approved by the Professorial Board on the recommendation of the Faculty or Board of Studies.

3. When the Faculty or Board of Studies is not satisfied with the qualifications submitted by a candidate, the Faculty or Board of Studies may require him, before he is permitted to register, to undergo such examination or carry out such work as the Faculty or Board of Studies may prescribe.

Registration

4. A candidate for registration for a course of study leading to the degree of Doctor of Philosophy shall:

A apply to the Registrar on the prescribed form at least one calendar month before the commencement of the session in which he desires to register; and

B submit with his application a certificate from the head of the University school in which he proposes to study stating that the candidate is a fit person to undertake a course of study and research leading to the degree of Doctor of Philosophy and that the school is willing to undertake the responsibility of supervising the work of the candidate and of reporting to the Faculty or Board of Studies at the end of the course on the merits of the candidate's performance in the prescribed course.

5. Subsequent to registration the candidate shall pursue a program of advanced study and research for at least six academic sessions, save that:

A a candidate fully engaged in advanced study and research for his degree, who before registration was engaged upon research to the satisfaction of the Faculty or Board of Studies, may be exempted from not more than two academic sessions;

B in special circumstances the Faculty or Board of Studies may grant permission for the candidate to spend not more than one calendar year of his program in advanced study and research at another institution provided that his work can be supervised in a manner satisfactory to the Faculty or Board of Studies;

C in exceptional cases, the Professorial Board on the recommendation of the Faculty or Board of Studies may grant permission for a candidate to be exempted from not more than two academic sessions.

6. A candidate who is fully engaged in research for the degree shall present himself for examination not later than ten academic sessions from the date of his registration. A candidate not fully engaged in research shall present himself for examination not later than twelve academic sessions from the date of his registration. In special cases an extension of these times may be granted by the Faculty or Board of Studies.

7. The candidate shall be required to devote his whole time to advanced study and research, save that:

A the Faculty or Board of Studies may permit a candidate on application to undertake a limited amount of University teaching or outside work which in its judgment will not interfere with the continuous pursuit of the proposed course of advanced study and research;

B a member of the full-time staff of the University may be accepted as a part-time candidate for the degree, in which case the Faculty or Board of Studies shall prescribe a minimum period for the duration of the program;

C in special circumstances, the Faculty or Board of Studies may, with the concurrence of the Professorial Board, accept as a part-time candidate for the degree a person who is not a member of the full-time staff of the University and is engaged in an occupation which, in its opinion, leaves the candidate substantially free to pursue his program in a school of the University. In such a case the Faculty or Board of Studies shall prescribe for the duration of his program a minimum period which, in its opinion, having regard to the proportion of his time which he is able to devote to the program in the appropriate University school is equivalent to the six sessions ordinarily required.

8. Every candidate shall pursue his program under the direction of a supervisor appointed by the Faculty or Board of Studies from the full-time members of the University staff. The work, other than field work, shall be carried out in a School of the University save that in special cases the Faculty or Board of Studies may permit candidates to conduct their work at other places where special facilities not possessed by the University may be available. Such permission will be granted only if the direction of the work remains wholly under the control of the supervisor.

9. Not later than two academic sessions after registration the candidate shall submit the topic of his research for approval by the Faculty or Board of Studies. After the topic has been approved it may not be changed except with the permission of the Faculty or Board of Studies.

10. A candidate may be required by the Faculty or Board of Studies to attend a formal course of study appropriate to his work.

Thesis

11. On completing his course of study every candidate must submit a thesis which complies with the following requirements:

A the greater proportion of the work described must have been completed subsequent to registration for the PhD degree;

B it must be an original and significant contribution to the knowledge of the subject;

C it must be written in English except that a candidate in the Faculty of Arts may be required by the Faculty on the recommendation of the supervisor to write the thesis in an appropriate foreign language;

D it must reach a satisfactory standard of expression and presentation.

12. The thesis must present the candidate's own account of his research. In special cases work done conjointly with other persons may be accepted, provided the Faculty or Board of Studies is satisfied on the candidate's part in the joint research.

13. Every candidate shall be required to submit with his thesis a short abstract of the thesis comprising not more than 600 words.

The abstract shall indicate:

A *the problem investigated;*

B *the procedures followed;*

C *the general results obtained;*

D *the major conclusions reached;*

but shall not contain any illustrative matter, such as tables, graphs or charts.

14. A candidate may not submit as the main content of his thesis any work or material which he has previously submitted for a university degree or other similar award.

Entry for Examination

15. The candidate shall give in writing two months' notice of his intention to submit his thesis and such notice shall be accompanied by the appropriate fee.

16. Four copies of the thesis shall be submitted together with a certificate from the supervisor that the candidate has completed the course of study prescribed in his case. The four copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.† The candidate may also submit any work he has published whether or not such work is related to the thesis.

17. It shall be understood that the University retains the four copies of the thesis submitted for examination, and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968 the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

18. There shall normally be three examiners of the thesis, appointed by the Professorial Board on the recommendation of the Faculty or Board of Studies, at least one of whom shall be an external examiner.

19. After examining the thesis the examiners may:

A decide that the thesis reaches a satisfactory standard; or

B recommend that the candidate be required to re-submit his thesis in revised form after a further period of study and/or research; or

C recommend without further test that the candidate be not awarded the degree of Doctor of Philosophy.

20. If the thesis reaches the required standard, the examiners shall arrange for the candidate to be examined orally, and, at their discretion, by written papers and/or practical examinations on the subject of the thesis and/or subjects relevant thereto, save that on the recommendation of the examiners the Faculty or Board of Studies may dispense with the oral examination.

21. If the thesis is of satisfactory standard but the candidate fails to satisfy the examiners at the

† See later.

oral or other examinations, the examiners may recommend the University to permit the candidate to represent the same thesis and submit to a further oral, practical or written examination within a period specified by them but not exceeding eighteen months.

22. At the conclusion of the examination, the examiners will submit to the Faculty or Board of Studies a concise report on the merits of the thesis and on the examination results, and the Faculty or Board of Studies shall recommend whether or not the candidate may be admitted to the degree.

23. A candidate shall be required to pay such fees as may be determined from time to time by the Council.

Master of Applied Science (MAppSc)

1. The degree of Master of Applied Science may be awarded by the Council on the recommendation of the Professorial Board to a candidate who has satisfactorily completed a program of advanced study comprising formal course work and including, where set down in course programs, the submission of a report on a project approved by the Higher Degree Committee of the Faculty or Board of Studies.

Qualification for Registration as a Candidate for the Degree

2. A An applicant for registration for the degree shall normally be a graduate from an appropriate four-year, full-time undergraduate course in the University or other approved university or tertiary institute.

B The Higher Degree Committee of the Faculty (hereinafter referred to as the Committee) may consider applications from graduates of three-year, full-time courses in the University or other approved university or tertiary institute who have satisfactorily completed an approved qualifying program of not less than one year full-time or its equivalent or have submitted evidence of attainment in appropriate graduate studies extending over a period of not less than one full-time year or its equivalent.

C The Committee may also consider applications from graduates of the Bachelor of Science (Technology) and Bachelor of Science (Engineering) courses of the University who have satisfactorily completed an approved qualifying program of not less than one year part-time or who can submit evidence of academic attainment in appropriate graduate studies extending over the same period or its equivalent.

D Notwithstanding any other provisions of these conditions the Committee may require an applicant to demonstrate fitness for registration by carrying out such work and taking such examinations as the Committee may determine.

3. A An application to register as a candidate for the degree of Master shall be made on the prescribed form which shall be lodged with the Registrar at least six (6) weeks before the commencement of the course.

B A candidate for the degree shall be required to undertake such course of formal study, pass such examinations and, where specified, submit a report on a project, as prescribed by the Committee.

C No candidate shall be considered for the award of the degree until the lapse of two sessions in the case of a full-time candidate or four sessions in the case of a part-time candidate from the date from which registration becomes effective. The Committee may approve remission of up to two sessions for a part-time candidate.

D The progress of a candidate shall be reviewed annually by the Committee on the recommendation of the Head of School or Department in which the candidate is registered and as a result of such review the Committee may terminate the candidature.

Project

4. A Where specified, a report on a project approved by the Committee may be submitted at the completion of the formal section of the course, but in any case shall be submitted not later than one year after the completion of such course.

B The format of the report shall accord with the instructions of the Head of School and shall comply with the requirements of the Committee for the submission of project reports.

C 1. The report shall be examined by two examiners appointed by the Committee.

2. A candidate may be required to attend for an oral or written examination.

5. Consequent upon consideration of the examiners' reports, where appropriate, and the candidate's other results in the prescribed course of study, the Committee shall recommend to the Professorial Board whether the candidate may be admitted to the degree. **Recommendation for Admission to Degree**

6. An approved candidate shall pay such fees as may be determined from time to time by the Council. **Fees**

1. The degree of Master of Engineering may be granted by the Council on the recommendation of the Professorial Board to a candidate who has demonstrated ability to carry out research by the submission of a thesis embodying the results of an original investigation. **Master of Engineering (ME)**

2. An application to register as a candidate for the degree of Master of Engineering shall be made on the prescribed form which shall be lodged with the Registrar at least one full calendar month before the commencement of the session in which the candidate desires to register.

3. A An applicant for registration for the degree shall have been admitted to the degree of Bachelor in the University of New South Wales, or other approved University, in an appropriate school.

B In exceptional cases a person may be permitted to register as a candidate for the degree if he submits evidence of such academic and professional attainment as may be approved by the Professorial Board on the recommendation of the appropriate Faculty (hereinafter referred to as 'the Faculty').

4. Notwithstanding any other provisions of these conditions, the Faculty may require an applicant to demonstrate fitness for registration by carrying out such work and sitting for such examinations as the Faculty may determine.

5. In every case, before permitting an applicant to register as a candidate, the Faculty shall be satisfied that adequate supervision and facilities are available.

6. An approved applicant shall register in one of the following categories:

A student in full-time attendance at the University;

B student in part-time attendance at the University;

C student working externally to the University;

and shall pay such fees as may be determined from time to time by the Council.

7. Every candidate for the degree shall be required to carry out a program of advanced study, to take such examinations and perform such other work as may be prescribed by the Faculty. The program shall include the preparation and submission of a thesis embodying the results of an original investigation, three copies of which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.† The candidate may submit any work he has published whether or not such work is related to the thesis.

8. It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968 the University may issue the thesis in whole or part, in photostat or microfilm or other copying medium.

9. The investigation and other work as provided in paragraph **7.** shall be carried out under the direction of a supervisor appointed by the Faculty or under such conditions as the Faculty may determine.

10. No candidate shall be considered for the award of the degree until the lapse of four complete sessions from the date from which registration becomes effective save that, in the case of a candidate who obtained the degree of Bachelor with Honours or who has had previous research experience, this period may, with the approval of Faculty, be reduced by up to two sessions.

11. For each candidate there shall be at least two examiners appointed by the Professorial Board, on the recommendation of the Faculty, one of whom shall, if possible, be an external examiner.

Master of Science (MSc)

1. The degree of Master of Science may be granted by the Council on the recommendation of the Professorial Board to a candidate who has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.

2. An application to register as a candidate for the degree of Master of Science shall be made on the prescribed form which shall be lodged with the Registrar at least one full calendar month before the commencement of the session in which the candidate desires to register.

3. A An applicant for registration for the degree shall have been admitted to the degree of Bachelor of Science in the University of New South Wales, or other approved University, in an appropriate School or Department.

B In exceptional cases a person may be permitted to register as a candidate for the degree if he submits evidence of such academic and professional attainments as may be approved by the Professorial Board on the recommendation of the appropriate Faculty or Board of Studies.

4. Notwithstanding any other provisions of these conditions the Faculty or Board of Studies may require an applicant to demonstrate fitness for registration by carrying out such work and sitting for such examinations as the Faculty or Board of Studies may determine.

5. In every case before permitting an applicant to register as a candidate the Faculty or Board of Studies shall be satisfied that adequate supervision and facilities are available.

6. An approved applicant shall register in one of the following categories:

A student in full-time attendance at the University;

B student in part-time attendance at the University;

C student working externally to the University;

and shall pay such fees as may be determined from time to time by the Council.

7. Every candidate for the degree shall be required to submit three copies of a thesis embodying the results of an original investigation or design, to take such examinations and to perform such other work as may be prescribed by the Faculty or Board of Studies. The thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.* The candidate may submit also for examination any work he has published whether or not such work is related to the thesis.

8. It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968 the University may issue the thesis in whole or in part in photostat or microfilm or other copying medium.

9. The investigation, design and other work as provided in paragraph **7.** shall be carried out under the direction of a supervisor appointed by the Faculty or Board of Studies or under such conditions as the Faculty or Board of Studies may determine.

* See **Conditions for the Award of Degrees** in the Calendar.

At least once a year and at any other time that the Higher Degree Committee sees fit, the candidate's supervisor shall present to the Head of School in which the candidate is registered a report on the progress of the candidate. The Committee shall review the report and as a result of its review may cancel registration or take such other action as it considers appropriate.

10. Unless otherwise recommended by the Committee, no candidate shall be awarded the degree until the lapse of four complete sessions from the date of registration, save that in the case of a candidate who obtained the degree of Bachelor with Honours or who has had previous research experience, this period may be reduced by up to two sessions with the approval of the Committee. A candidate who is fully engaged in research for the degree shall present himself for examination not later than six academic sessions from the date of registration. A candidate not fully engaged in research shall present himself for examination not later than twelve academic sessions from the date of his registration. In special cases an extension of these times may be granted by the Committee.

11. A A candidate shall give in writing to the Registrar two months' notice of his intention to submit his thesis.

B For each candidate there shall be at least two examiners, appointed by the Professorial Board on the recommendation of the Committee, one of whom, if possible, shall be external to the University.

C After examining the thesis an examiner may:

1. recommend that the candidate be awarded the degree without further examination
or
2. recommend that the candidate be awarded the degree subject to minor corrections as listed being made to the satisfaction of the Head of School
or
3. recommend that the candidate be not awarded the degree but be permitted to resubmit his thesis in a revised form after a further period of study and/or research
or
4. recommend that the candidate be not awarded the degree and be not permitted to resubmit his thesis.

D In considering a recommendation made in terms of clause 3. of sub-condition C of this condition the Committee may specify the period within which the thesis is to be resubmitted.

E Having considered the examiners' reports the Committee shall recommend to the Professorial Board whether or not the candidate should be admitted to the degree.

Graduate Diplomas

Graduate Diploma (GradDip)

1. An application for admission to a graduate diploma course shall be made on the prescribed form which should be lodged with the Registrar at least two full calendar months before the commencement of the course.

2. An applicant for admission to a graduate diploma course shall be:

A a graduate of the University of New South Wales or other approved university,

B a person with other qualifications as may be approved by Faculty.

3. Notwithstanding clause **2.** above, Faculty may require an applicant to take such other prerequisite or concurrent studies and/or examinations as it may prescribe.

4. Every candidate for a graduate diploma shall be required to undertake the appropriate course of study, to pass any prescribed examinations, and if so laid down in the course, to complete a project or assignment specified by the Head of the School. The format of the report on such project or assignment shall accord with the instructions laid down by the Head of the School.

5. An approved applicant shall be required to pay the fee for the course in which he desires to register. Fees shall be paid in advance.

Subject Descriptions and Textbooks

Identification of Subjects by Numbers

Each of the subjects taught in the University is identifiable both by number and by name. This is a fail-safe measure at the points of enrolment and examination against a student nominating a subject other than the one intended. Subject numbers are allocated by the Assistant Registrar, Examinations and Student Records, and the system of allocation is:

1. The School offering a subject is indicated by the number before the decimal point;

2. If a subject is offered by a Department within a School, the first number after the decimal point identifies that Department;

3. The position of a subject in a sequence is indicated by the third number after the decimal point. For example, 2 would indicate that the subject is the second in a sequence of subjects;

4. Graduate subjects are indicated by the suffix G.

As indicated above, a subject number is required to identify each subject in which a student is to be enrolled and for which a result is to be returned. Where students may take electives within a subject, they should desirably be enrolled initially in the particular elective, and the subject numbers allotted should clearly indicate the elective. Where it is not possible for a student to decide on an elective when enrolling or re-enrolling, and separate examinations are to be held in the electives, Schools should provide to the Examinations and Student Record Section in April (Session 1) and August (Session 2) the names of students taking each elective. Details of the actual dates in April and August are set out in the Calendar of Dates earlier in this volume.

Those subjects taught in each Faculty are listed in full in the handbook of that Faculty, together with the subject description and the required textbook list, in the section entitled Subject Descriptions and Textbooks.

The **identifying numbers** for each School are set out below.

Details of subjects available in Faculty of Applied Science courses but not included in this list may be obtained from the School responsible for the subject. Details of subjects in the Faculty of Arts which may be taken as humanities subjects may be found in the current Arts Faculty Handbook.

Students are required to have their own copy of the prescribed Textbooks. Lists of Reference Books for additional reading, and of Textbooks, where not given here, are issued by the Schools. For General Studies subjects see the General Studies Handbook, which is available free of charge.

Information Key

The following is the key to the information supplied about each subject listed below:
S1 (Session 1); S2 (Session 2); F (Session 1 *plus* Session 2, ie full year); S1 or S2 (Session 1 *or* Session 2, ie choice of either session); SS (single session, ie which session taught is not known at time of publication); L (Lecture, followed by hours per week); T (Laboratory/Tutorial, followed by hours per week).

	School, Department etc * Subjects also offered for courses in this handbook	Faculty	Page
1	**School of Physics***	Science	90
2	School of Chemistry*	Science	93
3	**School of Chemical Engineering**	Applied Science	95
4	**School of Metallurgy**	Applied Science	108
5	School of Mechanical and Industrial Engineering *	Engineering	112
6	School of Electrical Engineering	Engineering	114
7	**School of Mining Engineering**	Applied Science	114
8	School of Civil Engineering*	Engineering	118
9	**School of Wool and Pastoral Sciences**	Applied Science	119
10	School of Mathematics*	Science	123
11	School of Architecture	Architecture	
12	School of Psychology*	Biological Sciences	125
13	**School of Textile Technology**	Applied Science	125
14	School of Accountancy*	Commerce	127
15	School of Economics*	Commerce	127
16	School of Health Administration	Professional Studies	
17	Biological Sciences*	Biological Sciences	129
18	Department of Industrial Engineering*	Engineering	130
19	School of Transportation and Traffic	Engineering	
20	School of Highway Engineering	Engineering	
21	Department of Industrial Arts	Professional Studies	
22	**School of Chemical Technology**	Applied Science	130
23	School of Nuclear Engineering*	Engineering	136
25	**School of Applied Geology**	Applied Science	136
26	Department of General Studies*	Board of Studies in General Education	
27	**School of Geography**	Applied Science	143
28	School of Marketing*	Commerce	147
29	School of Surveying*	Engineering	148
30	Department of Behavioural Science	Commerce	148
31	School of Optometry	Science	
33	Graduate School of Business	Commerce	
35	School of Building	Architecture	
36	School of Town Planning*	Architecture	148

	School, Department etc * Subjects also offered for courses in this handbook	Faculty	Page
38	**School of Food Technology**	Applied Science	148
40	Professorial Board		
41	School of Biochemistry*	Biological Sciences	151
42	School of Biological Technology*	Biological Sciences	152
43	School of Botany*	Biological Sciences	153
44	School of Microbiology*	Biological Sciences	154
45	School of Zoology	Biological Sciences	
50	School of English	Arts	
51	School of History	Arts	
52	School of Philosophy	Arts	
53	School of Sociology*	Arts	155
54	School of Political Science	Arts	
55	School of Librarianship	Professional Studies	
56	School of French	Arts	
57	School of Drama	Arts	
58	School of Education*	Professional Studies	155
59	School of Russian	Arts	
62	School of History and Philosophy of Science	Arts	
63	School of Social Work	Professional Studies	
64	School of German	Arts	
65	School of Spanish and Latin American Studies	Arts	
66	Subjects Available from Other Universities		
68	Board of Studies in Science and Mathematics	Board of Studies in Science and Mathematics	
70	School of Anatomy	Medicine	
71	School of Medicine	Medicine	
72	School of Pathology	Medicine	
73	School of Physiology and Pharmacology	Medicine	
74	School of Surgery	Medicine	
75	School of Obstetrics and Gynaecology	Medicine	
76	School of Paediatrics	Medicine	
77	School of Psychiatry	Medicine	
79	School of Community Medicine	Medicine	
80	Faculty of Medicine		
85	Australian Graduate School of Management	AGSM	
90	Faculty of Law	Law	
97	Division of Postgraduate Extension Studies		

School of Physics

The School of Physics has introduced new and revised Level II and Level III units. The School realises that some students presently enrolled will not have completed either all of the old Level II units, or all of the old Level III units. Some of the new units are sufficiently compatible, to permit substitution of a new unit in a program requiring an old unit. Where this is not possible the old unit will be provided for those students wishing to complete a set of Level II or Level III units.

Undergraduate Study

Physics Level I units

1.001
Physics I* F L3T3

Aims and nature of physics and the study of motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Concepts of force, inertial mass, energy, momentum, charge, potential, fields. Application of the conservation principles to solution of problems involving charge, energy and momentum. Electrical circuit theory, application of Kirchoff's Laws to AC and DC circuits. Uniform circular motion, Kepler's Laws and rotational mechanics.

A molecular approach to energy transfer, kinetic theory, gas laws and calorimetry. The wave theories of physics, transfer of energy by waves, properties of waves. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarization. Interaction of radiation with matter, photoelectric effect, Compton effect, spectroscopy. Resolution of the wave, particle paradox by means of wave mechanics and the uncertainty principle.

Textbook

Weidner R. T. & Sells R. L. *Elementary Physics, Classical and Modern* Ally & Bacon

1.011
Higher Physics I F L3T3

For students of all Faculties except Medicine and Architecture who have a good secondary school record and who wish to do a more challenging course.

As for 1.001 with additional topics: space physics, mechanical properties of real materials, rotational dynamics, physics of biological systems, AC and charged particle dynamics, physics of energy resources and conversion.

Textbooks

Russell G. J. & Mann K. *Alternating Current Circuit Theory* NSWUP
Weidner R. T. & Sells R. L. *Elementary Physics, Classical and Modern* Allyn & Bacon

* Students in the Faculty of Applied Science who have not reached a sufficient standard for further study in Physics but whose performance is otherwise satisfactory may be granted a pass in 1.071 Physics IT.

1.071
Physics IT

See footnote to 1.001 Physics I.

Physics Level II units

1.012 S1 L3T2
Mechanics and Thermal Physics

Prerequisites: 1.001, 10.001. Co-requisite: 10.211A.

Properties of solids and liquids, elasticity, hydrostatics, hydrodynamics, damped and forced vibrations, resonance, coupled systems, normal modes, Fourier analysis, waves, group velocity, reflection and transmission at a boundary.

Kinetic theory, Maxwell velocity distribution, transport coefficients, first and second laws of thermodynamics, thermodynamic functions, simple applications, microscopic approach to thermodynamics, Boltzmann probability.

Additional material is studied for the award of Distinction/High Distinction.

Textbooks

French A. P. *Vibrations and Waves* Nelson
Mandl F. *Statistical Physics* Wiley

1.022 S2 L3T2
Electromagnetism and Modern Physics

Prerequisites: 1.001, 10.001. Co-requisite: 10.211A.

Electrostatics in vacuum and in dielectrics, Gauss' law, current density, magnetostatics in vacuum and in magnetic materials, electromagnetic induction, displacement current, Maxwell's equations, simple solutions, applications.

Special theory of relativity, Lorentz transformation, simultaneity relativistic mass, momentum and energy, formalism of wave mechanic Schrödinger's equation, simple solutions, hydrogen atom, spectra, electron spin, selection rules, exclusion principle, Zeeman effect molecules.

Additional material is studied for the award of Distinction/High Distinction.

Textbooks

Parton J. E. & Owen S. J. T. *Applied Electromagnetics* Mac Press

For students intending to proceed to Level III Physics:

Arya A. P. *Elementary Modern Physics* Addison-Wesley

or

Arya A. P. *Fundamentals of Atomic Physics* Allyn & Bacon

1.032 Laboratory — F T3

Prerequisites: 1.001, 10.001.

Alternating current circuits, complex impedance, resonance, mutual inductance, introductory electronics, diode characteristics and circuits, power supplies, transistor characteristics, single stage and coupled amplifiers, experiments using A.C. circuits. Experimental investigations in a choice of areas including radioactivity, spectroscopy, properties of materials, Hall effect, nuclear magnetic resonance, photography, vacuum systems.

Textbooks

No set texts.

1.112A Electromagnetism — S2 L2½T3½

Not available to students unless completing a set of Physics Level II units.

Electrostatics and magnetostatics in vacuum and in dielectrics. Magnetic materials. Maxwell's equations and simple applications.

Textbook

Parton J. E. & Owen S. J. T. *Applied Electromagnetics* Mac Press

1.112B Modern Physics — S1 L2½T3½

Not available to students unless completing a set of Physics Level II units.

Special theory of relativity, Lorentz transformation, relativistic mass momentum and energy: Schrödinger wave equation expectation values, operators, eigenfunctions, eigenvalues, free-particle, bound-particle and applications to physical systems, spectra, electron spin, spin-orbit coupling, exclusion principle, origins and spectra of X-rays, electron energy levels in solids.

Textbook

Arya A. P. *Elementary Modern Physics* Addison-Wesley

Terminating Physics Level II units

1.922 Electronics — S1 L1T2

Prerequisites: 1.001 or 1.011, 10.001 or 10.011 or 10.021.

The application of electronics to other disciplines. Principles of circuit theory and analogue computing; amplifiers, their specification and application; transducers; electronic instrumentation; industrial data acquisition.

Textbooks

Smith R. J. *Circuits, Devices and Systems Theory* 2nd ed Wiley

1.932 Introduction to Physics of Solids — S2 L2T1

Prerequisites: 1.001 or 1.011, 10.001 or 10.011 or 10.021. Excluded: 1.022.

Introductory quantum mechanics and atomic physics; crystal structure; point and line defects; introductory band theory; conductors, semiconductor and insulators; energy level diagrams.

Textbooks

Rudden M. N. & Wilson J. A. *Simplified Approach to Solid State Physics* Butterworths

Higher Physics Level III units

1.123A Quantum Mechanics — S1 L2½T3½

Not available to students unless completing a set of Physics Level III units. For details of arrangements consult the School of Physics.

Concepts, measurements, expectation values, wave mechanics, matrix mechanics, free particle and barrier problems, hydrogen atom spin, exclusion principle, stationary and time dependent perturbation methods, scattering. Born approximation and partial waves.

Textbook

Gasiorowicz S. *Quantum Physics* Wiley

1.123B Electromagnetic Theory and Statistical Mechanics — S1 L2½T3½

Not available to students unless completing a set of Physics Level III units. For details of arrangements consult the School of Physics.

Metallic boundary conditions, eigenfunctions and eigenvalues, cavities, wave guides, scattering by a conductor wave equation for potentials, radiation fields, Hertz potential, dipole and multipole radiation, radiated energy and angular momentum.

Statistical mechanics: Kinetic theory, the Boltzmann equation, Maxwell-Boltzmann distribution, Boltzmann's H-theorem, classical statistical mechanics: postulates, equipartition, ensembles, difficulties; quantum statistical mechanics; postulates, ensembles, Fermi and Bose statistics.

Textbooks

Lorrain P. & Corson D. *Electromagnetic Fields and Waves* 2nd ed Freeman

Reif F. *Fundamentals of Statistical and Thermal Physics* McGraw-Hill.

1.123C
Solid State and Nuclear Physics — S2 L2½T3½

Not available to students unless completing a set of Physics Level III units. For details of arrangements consult the School of Physics.

Crystallography, binding energy, phonons, lattice conduction, free electron gas, band theory.

Nuclear models, binding energy, nuclear forces, elementary particles, nuclear reactions, radioactive decay.

Textbooks

Burcham W. E. *Nuclear Physics and Introduction* Longman

Kittel C. *Introduction to Solid State Physics* 4th ed Wiley

Physics Level III units

1.013
Quantum Mechanics and Nuclear Physics — F L1½T½

Prerequisites: 1.012, 1.022, 10.211A.

Concepts and formulation, expectation values and measurement, steps, wells, and barriers, tunnelling, harmonic oscillator, perturbation theory, hydrogen atom, angular momentum operators, spin and spin orbit coupling, vector model, fine structure, identical particles, helium atom, spectroscopy, electron states in molecules and solids.

Detecting instruments for nuclear particles, counting statistics, Rutherford scattering, radioactivity, radiative processes, reactions, optical model, parity, introduction to particle physics, mesons, baryons, quarks.

Additional material is studied for the award of Distinction/High Distinction.

Textbooks

White R. P. *Basic Quantum Mechanics* McGraw-Hill

1.023
Statistical Mechanics and Solid State Physics — S1 L3T1

Prerequisites: 1.012, 1.022, 10.211A. Co-requisite: 1.013.

Canonical distribution, paramagnetism, Einstein solid, ideal gas, equipartition, grand canonical ensemble, chemical potential, phase equilibria, Fermi and Bose statistics, blackbody radiation. Crystal structure, bonding, diffraction, lattice vibrations, phonons, free-electron model of metals, band theory, point defects, dislocations.

Additional material is studied for the award of Distinction/High Distinction.

Textbooks

Mandl F. *Statistical Physics* Wiley

Blakemore J. S. *Solid State Physics* Saunders

1.033
Electromagnetism and Optical Physics — S2 L3T1

Prerequisites: 1.012, 1.022, 10.211A.

Wave equation, reflection and transmission at dielectric, metallic and plasma interfaces, Fresnel equations, skin depth, waveguides and cavities, radiation fields, dipole and long antenna.

Fourier theory, diffraction from rectangular and circular apertures, interference and interferometry, coherence, image formation, resolution, holography, Fourier transform spectroscopy.

Additional material is studied for the award of Distinction/High Distinction.

Textbooks

Hecht E. & Zajac A. *Optics* Addison-Wesley

1.043
Experimental Physics — F T6

Prerequisites: 1.012, 1.022, 1.032.

A course of instruction in modern experimental techniques, methods of experimental design and analysis of results. Experiments which will in the main consist of small open-ended projects, will be available in many areas of physics including electromagnetic waves, solid state physics, nuclear physics, atomic physics and spectroscopy, optical and laser physics, vacuum systems.

Textbooks

No set texts.

1.113A
Wave Mechanics — S1 L2½T3½

Not available to students unless completing a set of Physics Level III units. For details of arrangements consult the School of Physics.

Concepts and formulation, finite wells and barriers, tunnelling, harmonic oscillator and applications, hydrogen atom, perturbations, systems of identical particles, electron states in complex systems, bonding, molecules, periodic solids.

Textbooks

No set texts.

School of Chemistry

Undergraduate Study

2.002A
Physical Chemistry — S1 or S2 L3T3

Prerequisites: 2.121 and 10.011 or 10.001 or 10.021.

Thermodynamics: First, second and third laws of thermodynamics; statistical mechanical treatment of thermodynamic properties; applications of thermodynamics: chemical equilibria, phase equilibria, solutions of non-electrolytes and electrolytes, electrochemical cells.

Kinetics: Order and molecularity; effect of temperature on reaction rates; elementary reaction rate theory.

Surface Chemistry and Colloids: Adsorption, properties of dispersions; macromolecules and association colloids.

Textbooks

Barrow G. M. *Physical Chemistry* 3rd ed McGraw-Hill

Shaw D. J. *Introduction to Colloid and Surface Chemistry* 2nd ed Butterworths

2.002B
Organic Chemistry — S1 or S2 L3T3

Prerequisite: 2.131.

Chemistry of the more important functional groups: aliphatic hydrocarbons, monocyclic aromatic hydrocarbons, halides, alcohols, phenols, aldehydes, ketones, ethers, carboxylic acids and their derivatives, nitro compounds, amines, and sulphonic acids.

Textbooks

Morrison R. T. & Boyd R. N. *Organic Chemistry* 3rd ed Allyn & Bacon

or

Solomons T. W. G. *Organic Chemistry* Wiley

Vogel A. I. *Elementary Practical Organic Chemistry Pt. II Qualitative Organic Analysis* Longman (only if proceeding to further study of Organic Chemistry).

2.002C
Chemistry II (Inorganic/Analytical Chemistry) — S1 or S2 L2T4

Prerequisites: 2.121 and 2.131.

Chemistry of typical metals; transition metals; introduction to nuclear chemistry. Quantitative inorganic analysis.

Textbooks

Bard A. J. *Chemical Equilibrium* Harper Int

Quagliano J. V. & Vallarino L. M. *Coordination Chemistry* Heath

2.002D
Analytical Chemistry — S1 or S2 L2T4

Prerequisites: 2.121 and 2.131 and 10.011 or 10.001 or 10.021.

Chemical equilibria in analytical chemistry. Acid-base, complex formation, redox systems, solid/solution, and liquid/liquid equilibria with applications to volumetric, gravimetric and complexometric analysis, and to liquid/liquid extractions.

Spectrophotometry, basic principles. Chromophores. Fundamentals of precision. Electrochemistry, theory and applications to electrodeposition and potentiometry; ion selective electrodes. Radioactive tracer techniques. Data evaluation in analytical chemistry. Qualitative analysis.

Textbooks

Ewing G. W. *Instrumental Methods of Chemical Analysis* 4th ed McGraw-Hill

Peters D. G. Hayes J. M. & Hieftje G. M. *Chemical Separations and Measurements* Saunders

2.003B
Organic Chemistry — S1 or S2 L2T4

Prerequisite: 2.002B.

Alicyclic Chemistry: Stereochemistry of acyclic systems; classical and non-classical strain in cyclic systems; stereochemistry and conformation of monocyclic and polycyclic compounds; synthesis, reactions and rearrangement of monocyclic compounds, including stereochemical selectivity; transannular reactions in medium rings. Synthesis and reactions of fused and bridged polycyclic systems.

Heterocyclic Chemistry: Synthesis and reactions of the following hetero-aromatic systems: pyridine, quinoline, isoquinoline. Flavones and isoflavones; pyrimidine; pyrrole, furan, thiophen. Indole, imidazole.

Textbooks

Morrison R. T. & Boyd R. N. *Organic Chemistry* 3rd ed Allyn & Bacon

or

Roberts J. D. & Caserio M. C. *Basic Principles of Organic Chemistry* Benjamin

Joule J. A. & Smith G. F. *Heterocyclic Chemistry* Van Nostrand Reinhold

McQuillin F. J. *Alicyclic Chemistry* CUP

Vogel A. I. *Elementary Practical Organic Chemistry Pt II Qualitative Organic Analysis* Longman

Whittaker D. *Stereochemistry and Mechanism* Clarendon

2.003H
Molecular Spectroscopy and Structure — S2 L3T3

Prerequisites: 2.121 and 2.131.

Absorption and emission of radiation. Atomic spectra. Molecular spectroscopy: vibrational, including infrared and Raman; UV-visible; instrumentation and sample handling. Magnetic resonance. Mass spectrometry with particular reference to structure determination. Laboratory and tutorial work to illustrate the above, including inspection of major instruments.

Textbook

Silverstein R. M. Bassler C. G. & Morrill T. C. *Spectrometric Identification of Organic Compounds* 3rd ed Wiley

2.013L
Chemistry and Enzymology of Foods — F L1T2

Prerequisite: 2.002B. Excluded: 2.023L, 2.043L, 2.053L.

The chemistry of food constituents at an advanced level and the relationship between the chemistry and enzymology associated with the origin and handling of foodstuffs. Treatment of the stability of constituents, changes in colour and texture occurring during processing and storage. Methods of assessment, chemical and physical.

General classification of constituents, role of free and combined water. Fixed oils and fats, rancidity of enzymic and autoxidative origin, antioxidants — natural and synthetic — theories on mechanisms of action, carbohydrates reactivity, role in brewing processes, carbohydrate polymers, starch structure, enzymic susceptibility and mode of action, estimations, enzymic degradation and enzymic browning, reactions and stability of natural pigments, vitamins, preservatives.

Textbooks

No set texts. A list of reference books is provided.

2.021
Chemistry IE — S1 or S2 L3T3

A terminating subject for students in the Aeronautical, Civil, Electrical, Industrial, Mechanical and Mining Engineering, and Naval Architecture courses.

Classification of matter and theories of the structure of matter. Atomic and molecular structure, the periodic table and chemical behaviour.

Chemical bonding and the nature and properties of chemical systems. Equilibrium and energy changes in chemical systems. Introduction to colloidal systems.

Textbooks

Aylward G. H. & Findlay T. J. V. eds *SI Chemical Data* Wiley

Barrow G. M. Kenney M. E. Lassila J. D. Litle R. L. & Thompson W. E. *Understanding Chemistry* Benjamin

Brescia F. Arents J. Meislich H. & Turk A. *Fundamentals of Chemistry* 3rd ed Academic

Chemistry IE Laboratory Manual University of NSW

2.042C
Inorganic Chemistry — S1 or S2 L2T4

Prerequisites: 2.121 and 2.131.

Chemistry of the non-metals, including B,C,Si,N,P,S,Se,Te, halogens, and noble gases. Chemistry of the metals of groups IA, IIA, and Al. Typical ionic, giant-molecule and close packed structures. Transition metal chemistry, including variable oxidation states, paramagnetism, Werner's theory, isomerism of six- and four-coordinate complexes, chelation, stabilization of valency states. Physical methods of molecular structure determination. Chemistry of Fe,Co,Ni,Cu,Ag,Au.

Textbooks

Cotton F. A. & Wilkinson G. *Basic Inorganic Chemistry* Wiley

2.043L
Chemistry and Enzymology of Foods

Prerequisite: 2.002B. Excluded: 2.013L, 2.023L, 2.053L.

Syllabus as for 2.013L but in greater detail and depth.

Textbooks

No set text. A list of reference books is provided.

2.111
Introductory Chemistry — S1 L2T4

Classification of matter and the language of chemistry. The gas laws and the Ideal Gas Equation, gas mixtures and partial pressure. The structure of atoms, cations and anions, chemical bonding, properties of ionic and covalent compounds. The Periodic classification of elements, oxides, hydrides, halides of selected elements. Acids, bases, salts, neutralisation. Stoichiometry, the mole concept. Electron transfer reactions. Qualitative treatment of reversibility and chemical equilibrium, the pH scale. Introduction to the diversity of carbon compounds.

Textbooks

Aylward G. A. & Findlay T. J. V. *S.I. Chemical Data* Wiley

Laboratory Manual, Chemistry 2.111, 2.121 and 2.131 UNSW

Mahan B. H. *University Chemistry* 3rd ed Addison-Wesley

2.121
Chemistry IA — S1 or S2 L2T4

Prerequisite: 2.111. Students who have passed 2.121 may not enrol in 2.111.

Stoichiometry and solution stoichiometry. The Ideal Gas Model and the kinetic theory, real gases and the van der Waals Equation. Liquids and liquid-vapour equilibrium. Solids, packing of spheres, solid-liquid-vapour equilibria. Thermochemistry, internal energy and enthalpy changes.

Homogeneous and heterogeneous equilibria, equilibrium constants, probability and change, entropy changes, free energy changes, the relationship between equilibrium and standard free energy changes. Ideal solutions, colligative properties. Equilibrium in electrolyte solutions, strengths of acids and bases, acid-base equilibria, buffers, solubility equilibria. Redox equilibria and electrochemical cells, standard electrode potentials.

Textbooks

Aylward G. A. & Findlay T. J. V. *S.I. Chemical Data* Wiley

Laboratory Manual, Chemistry 2.111, 2.121 and 2.131 UNSW

Mahan B. H. *University Chemistry* 3rd ed Addison-Wesley

2.131
Chemistry IB — S1 or S2 L2T4

Prerequisite: 2.111 or 2.121

The rate of a chemical change and chemical kinetics, catalysis, order and molecularity, activation energy, the Arrhenius Equation, reaction mechanism. Electronic structure of atoms in terms of the quantum mechanical model. Structure of the Periodic Table and its relationship to electronic configuration. Chemical bonding, hybridization, molecular shape, multiple bonding, bond polarity, intermolecular forces. Properties of compounds of selected elements, acid-base character of oxides and hydroxy compounds, relative stability of oxidation states. Chemistry of carbon compounds, stereoisomerism reactions of aliphatic and aromatic hydrocarbons, alcohols, phenols, ethers, alkyl halides, aldehydes, ketones, carboxylic acids and their derivatives, ester, acyl halides, anhydrides, amides, amines.

Textbooks

Aylward G. A. & Findlay T. J. V. *S.I. Chemical Data* Wiley

Laboratory Manual, Chemistry 2.111, 2.121 and 2.131 UNSW

Mahan B. H. *University Chemistry* 3rd ed Addison-Wesley

De Puy C. H. & Rinehart K. L. *Introduction to Organic Chemistry* 2nd ed Wiley

Graduate Study

2.271G
Chemistry and Analysis of Foods

Illustrates the bases and application of analytical techniques as applied to foods. Emphasis is placed on the design of methods, on the preparation of material for instrumental analysis and on the interpretation of data.

Subject matter includes: proteins and flesh foods, carbohydrates and saccharine foods, fats and oils, dairy and fermentation products, vitamins, food additives — preservatives and colouring matters, pesticide residues, metal contaminants — food microscopy.

School of Chemical Engineering

Undergraduate Study

General

Students are expected to possess a slide rule having exponential (log-log) scales, or a calculator of equivalent capabilities (ln x and exp x or "x to the y"), and these will normally be allowed to be used in examinations. However, it should be noted that calculators with very much greater capabilities than the above might not be allowed in examinations, because they could give the user an unfair advantage over other candidates. Further information may be obtained from the Head of the School.

Students are earnestly advised to purchase a copy of Perry J. H. ed. *Chemical Engineers' Handbook* 5th ed, McGraw-Hill, as early as they can in the course. This book is used extensively for most subjects and units.

Certain subjects and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

3.001
Introduction to Chemical Engineering — S2 L½T1½

Application of material and simple energy balances in chemical process operations. Primary reference to the oil, heavy chemical and related process industries with additional examples of the application of chemical engineering technology to identifying and solving problems in areas such as environmental pollution, food technology and medicine.

3.101
Computation and Modelling in Applied Chemistry

Simple computer models for ecological systems, based on chemical data and physico-chemical properties. A familiarity with elementary computer programming and differential equations is presupposed.

Textbook

Dickson T. R. *The Computer and Chemistry* Freeman

3.111 ✓
Chemical Engineering IA

Unit 1
Flow of fluids — S1 L1T1

Prerequisite: 10.001 Mathematics I

Introduction and units. Definitions and properties. Statics pressure distribution and measurements. Dynamics. Euler and Bernouilli equations. Momentum equations. Laminar and turbulent flow. Steady flow in pipes and equipment. Pressure losses. Flow metering. Elementary boundary layer theory. Boundary layers in pipes and on flat plates.

Unit 2
Dimensions and Dimensional Analysis — S1 L½T½

Prerequisites: 1.001 Physics I and 10.001 Mathematics I

Units and measures. Conversions of units and equations. Dimensions and Dimensional Analysis. Basic principles of modelling.

Unit 3
Heat Transfer I — S2 L1T1

Prerequisite: 3.111 Chemical Engineering IA, Unit 1

Introduction to steady state heat transfer including conduction, convection, radiation, boiling and condensation with an emphasis on problem solving. Resistance concept in heat transfer with series and parallel combinations.

Unit 4
Pumps and Pumping — S2 L½T½

Prerequisite: 3.111 Chemical Engineering IA, Unit 1

Types of piping and fittings. Blow cases. Air lift pumps. Reciprocating pumps, centrifugal pumps and gear pumps. Blowers and compressors.

Textbooks

All Units

Faust A. S. Wenzel L. A. Clump C. W. Maus L. & Andersen L. B. *Principles of Unit Operations* Wiley

Unit 1

Massey B. S. *Mechanics of Fluids* 2nd ed Van Nostrand-Reinhold

Unit 3

Holman J. P. *Heat Transfer* 4th ed McGraw-Hill

3.112 ✓
Chemical Engineering IB

Unit 1
Material Balances — S1 L1T1

A revision and extension of material balance calculations with more complex examples, including those arising from stagewise operation of extraction equipment. Graphical solution of multi-stage calculations.

Unit 2
Thermodynamics I — S2 L1T1

Co-requisite: 2.002A Physical Chemistry

Basic thermodynamic principles leading to Phase Rule, P-V-T relationships. Energy balances. 2nd Law of Thermodynamics. Entropy.

Unit 3
Computations I — S2 T1

Prerequisite: 10.001 Mathematics I
Co-requisite: 3.111 Chemical Engineering IA

A review of the fundamentals of FORTRAN, with extension to formatting, dimensioned variables and sub-routines. Application to the solution of selected problems involving heat and mass balances, fluid flow and pumping. This course is intended to be complementary to other material in 3.111 and 3.112.

Textbooks

Unit 2

Smith J. M. & Van Ness H. C. *Introduction to Chemical Engineering Thermodynamics* 3rd ed McGraw-Hill

Unit 3

Blatt J. M. *Introduction to Fortran IV Programming* Prentice-Hall

3.121
Chemical Engineering IIA

Unit 1
Mass Transfer I — S1 L1T1

Prerequisites: 2.002A Physical Chemistry, 3.111 Chemical Engineering IA

Molecular diffusion in gases, liquids and solids and the measurement and calculation of diffusion coefficients. Diffusion at an interface — one component unidirectional diffusion and equimole counterdiffusion under steady state conditions. Mass transfer coefficients. Estimation and application of chemical and phase equilibria. Stage calculations applied to liquid/liquid, vapour/liquid and other mass transfer operations. The two film theory and the transfer unit concept in gas/liquid, vapour/ liquid, and other operations.

Unit 2
Heat Transfer II (Theory) — S1 L1

Prerequisite: 3.111 Chemical Engineering IA, Units 1 & 2

An extension of the work covered in 3.111, Unit 3, with an emphasis on the fundamentals of convection and condensation; unsteady state conduction; introduction to heat exchanger design.

Unit 3
Solids Handling — S1 L1

Prerequisite: 3.111 Chemical Engineering IA, Unit 1

Classification of granular solids and powders according to properties which affect their storage and movement. Storage in and retrieval from stacked piles, silos and hoppers; rules for their design. Feeders and their suitability to various kinds of granular solids. Mechanical conveyors and elevators; distance limitations; hoist height limitations. Rules for design of mechanical conveyors and elevators. Fluid-particle conveyors. Introduction to hydraulic and pneumatic conveyors, feeders and fluid-particle separation systems. Rules for design of simple slurry transportation and dilute phase pneumatic transportation systems. Practical and economic considerations determining choice of system.

Unit 4
Multicomponent Systems — S2 L1

Prerequisites: 3.121 Chemical Engineering IIA
3.122 Unit 1 Thermodynamics

The separation of multicomponent systems by stagewise operations. Brief review of conventional graphical calculation methods leading to a graphical treatment of ternary distillation. Multicomponent separations using modern computer techniques. Phase equilibrium relationships for liquid-vapour and liquid-liquid systems. Azeotropes and azeotropic distillation.

Unit 5
Mass Transfer I (Design) — S2 L½T1

Prerequisite: 3.121 Chemical Engineering IIA, Unit 3

The design of equipment for absorption, distillation and liquid-liquid extraction. Selection of column type. Design of sieve and other types of plate for plate columns. Design of packed columns. Performance characteristics of plate and packed columns. Selection of equipment for liquid-liquid extraction. Design of mixer settlers and column-type extractors. Factors affecting the performance of liquid-liquid extraction equipment. Other mass transfer equipment.

Unit 6
Heat Transfer II (Design) S2 T1

Prerequisite: 3.121, Chemical Engineering IIA, Unit 3

Thermal design procedures for shell and tube heat exchangers and fin-fan coolers. Service fluids for heating and cooling duties.

Unit 7
Fluid-particle Systems S2 L1T1

Prerequisite: 3.111 Chemical Engineering IA, Unit 1

Interaction between particles and fluids: drag, terminal velocity, sedimentation. Flow through porous media; pressure gradient, filtration, fluidization, dispersion; multiphase flow, irrigated packed columns.

Textbooks

All Units

Faust A. S. Wenzel L. A. Clump C. W. Maus L. & Andersen L. B. *Principles of Unit Operations* Wiley

Unit 1

Skelland A. H. P. *Diffusional Mass Transfer* Wiley

Unit 2

Holman J. B. *Heat Transfer* 4th ed McGraw-Hill

Unit 6

Kern D. Q. *Process Heat Transfer* McGraw-Hill

Units 1 & 4

Sherwood T. K. Pigford R. L. & Wilke C. R. *Mass Transfer* McGraw-Hill

3.122
Chemical Engineering IIB

Unit 1
Thermodynamics II S1 L1T1

Prerequisite: 3.112 Chemical Engineering IB, Unit 2

The thermodynamic properties of pure fluids and homogeneous mixtures; an introduction to phase equilibrium; chemical reaction equilibrium.

Unit 2
Reaction Engineering I S1 T2

Prerequisites: 2.002A Physical Chemistry, 10.031 Mathematics

A course comprising 28 hours of lectures together with weekly assignments covering the design and analysis of ideal reactor systems, involving single and multiple reactor types, in which simple or complex, single or multiple reactions are effected.

Unit 3
Thermodynamics III S2 L1

Prerequisites: 3.112 Thermodynamics I and 3.122 Thermodynamics II

Applications of thermodynamics, including power cycles, refrigeration and liquefaction. Thermodynamic analysis of processes.

Unit 4
Reaction Engineering II S2 L1

Prerequisite: Thermodynamics III

A course of lectures comprising 14 hours together with assignments covering the concept of process rate and rate of change of process variables. Differential balances and examples in mass and heat transfer, and reactive systems.

Unit 5
Computations II S2 T1

Prerequisites: 3.112 Chemical Engineering IB, Unit 3.
10.031 Mathematics

Digital Computation: Introduction to Cyber control language, use of files, efficient FORTRAN programming methods. Numerical methods for solving algebraic equations, and other computer techniques. Application to the analysis and solution of selected chemical engineering problems.

Analogue computation: An introduction to the theory and programming of analogue computers, with application to the solution of differential equations and the simulation of dynamic systems.

Unit 6
Process Dynamics I S2 L1

Prerequisites: 3.112 Unit 2, Material Balances; 10.031 Mathematics

Classification of system variables. Formulation of mathematical description of simple dynamic systems. Use of Laplace transforms and block diagrams in manipulating linear dynamic equations. Time response of linear systems.

Textbooks

Units 1 and 3

Smith J. M. & Van Ness H. C. *Introduction to Chemical Engineering Thermodynamics* 3rd ed McGraw-Hill

Units 2 and 4

Levenspiel O. *Chemical Reaction Engineering* 2nd ed Wiley

Unit 4

Churchill S. W. *The Interpretation and use of Rate Data* McGraw-Hill

Unit 6

Coughanowr D. R. & Koppell L. B. *Process Systems Analysis and Control* McGraw-Hill

3.123
Chemical Engineering IIC

Unit 1
Process Engineering S1 L1

The role of the Process Engineer. Process development, and the creation and screening of alternatives. Block diagrams and process flowsheets, presentation of material properties, mass and energy flows at various points. Preparation and critical examination of Engineering Flowsheets. Preparation of operating instructions. Process engineering (or performance) specifications for equipment items. Practice in preparation of engineering designs and drawings.

Unit 2
Process Report — S1 T1

The process report is a compilation of recent information on a process for the production of a specific chemical or a group of chemicals. The report will cover such aspects as: historical account of the process with process details; Australia's imports and exports of the particular chemical, local production, company ownership and overseas connections; the present state of the process and its future in Australia with particular respect to scale, raw materials and alternative and competing end products and processes.

Unit 3
Process Vessels — S2 L½T1

Prerequisite: 8.112 Structures

Mechanical design and fabrication of pressure vessels. Code and legal requirements. Design of supports for vertical and horizontal cylindrical vessels. Visualisation, freehand sketching and presentation of formal drawings and specifications for pressure vessels and equipment components. Relief valves, bursting discs, venting and draining systems.

Unit 4
Plant Layout I — S2 T1

Prerequisites: 3.111 Chemical Engineering IA,
3.123 Chemical Engineering IIC, Unit 2

Factory Layout: Factors governing location of processing plant. Typical dispositions of process batteries, central utilities, laboratories, workshops, amenities, storage areas, effluent treatments. Distribution of electricity, steam, process and reticulated cooling water. Boiler plants and cooling towers, steam turbine versus electric motors, local versus central location of particular utilities. Provision for expansion.

Piping & Fittings: fabrication, standards, most used sizes and types. Welded, screwed and bolted connections. Common valve types; their flow and serviceability characteristics, relative costs and integrity; blinds and blanking valves. Practical assessment of pressure loss and line sizing in straight runs and simple networks involving pumps, or blowers, valves and bends.

Process Battery: Considerations of accessibility for maintenance, operator convenience and safety. Distribution of utility fluids. Methods of erecting major process units.

Unit 5
Economics I — S2 L1

Estimation of capital and operating costs. Components of fixed and variable costs. Break-even charts. Methods of comparing alternatives: rate of return, minimum payback time, incremental return rate, optimisation. Depreciation and taxation and their effect on economic analyses. Economic design.

Unit 6
Design Report — S2 T1

The basis of this subject is a design report to test knowledge of principles and design as applied to a possible industrial situation. The report should take the form of a set of iterative calculations and specifications for the components of a simple processing battery and is usually limited in size to a battery consisting of two principal unit operations in series (e.g. extractor and fractionator, reactor and separator, etc.). Particular attention is paid to operating instructions, hazards and safety, economic evaluation, use of standards and general presentation.

Unit 7
Instrumentation — S2 L1

Prerequisites: 3.112 Chemical Engineering IB, Unit 1, Material Balances; 10 031 Mathematics
Co-requisites: 3.122 Chemical Engineering IIB, Unit 6, Process Dynamics I

The principles of operation and use of the basic industrial measuring instruments. The fundamentals of feedback control, leading to the analysis of single-loop control systems.

Textbooks

Units 1 and 4

Bockhurst J. R. & Harker J. H. *Process Plant Design* Heineman

Unit 4

Rase H. F. *Piping Design for Process Plants* Wiley

Units 4 and 5

Peters M. S. & Timmerhaus K. D. *Plant Design and Economics for Chemical Engineers* 2nd ed McGraw-Hill

Unit 3

AS 1210-1972 *Unfired Pressure Vessels* Standards Association of Australia & Doc. 1300 *Australian requirements for boilers, pressure vessels and gas cylinders* Standards Association of Australia

3.124
Chemical Engineering Laboratory

Units 1 and 2 — F T2T3

Prerequisites: 3.111 Chemical Engineering IA, 3.112 Chemical Engineering 1B, 2.002A Physical Chemistry

An integrated chemical engineering laboratory incorporating experiments in fluid flow, heat transfer, mass transfer, thermodynamics and kinetics, instrumentation, process dynamics and control. The objectives of this laboratory are: to demonstrate, reinforce and extend the principles of chemical engineering which are covered in Chemical Engineering IA & B and II A, B & C, to introduce various laboratory techniques which are used in the experimental investigation of chemical engineering problems; to develop an interest in experimentation, and to develop a proficiency in technical report writing.

Textbook:

Holman J. P. *Experimental Methods for Engineers* McGraw-Hill

3.131
Chemical Engineering IIIA

Unit 1
Convective Mass Transfer — S1 L1

Prerequisite: 3.121 Chemical Engineering IIA

Models for convective mass transfer at fixed and free interfaces. Calculation of mass transfer rates at surfaces with simple geometry. Mass transfer in dispersions and in systems involving chemical reaction.

Unit 2
Simultaneous Heat & Mass Transfer — S1 L1

Psychometry, principles of design calculations for cooling towers and for humidification-dehumidification operations. Topics selected from: drying of solids, crystallization, sublimation, molecular distillation, gaseous and thermal diffusion will be discussed.

Unit 3
Surface Separation Processes — S1 L1

Principles of membrane processes, reverse osmosis, ultrafiltration, dialysis and electrodialysis. Design calculations for batch and continuous operation of reverse osmosis and ultrafiltration equipment. Principles of sorption processes, such as adsorption ion exchange and molecular sieves. Design of fixed-bed sorption equipment. Principles and design of other surface separation processes such as foam and bubble fractionation.

Unit 4
Transport Phenomena — S1 L1

A generalised treatment of the continuum approach to momentum, energy and mass transport. Application of the conservation equations to chemical engineering problems. Discussion of the advantages and limitations of the transport approach.

Textbooks

Units 1 and 2

Skelland A. H. P. *Diffusional Mass Transfer* Wiley

Units 1 and 2

Sherwood T. K. Pigford R. L. & Wilke C. R. *Mass Transfer* McGraw-Hill

Units 2 and 4

Bird R. B. Stewart W. E. & Lightfoot E. N. Transport Phenomena Wiley

3.132
Chemical Engineering IIIB

Unit 1
Process Dynamics II — S1 L1

Prerequisites: 3.122 Unit 6 Process Dynamics 1, 10.032 Mathematics

Extension of material on linear systems to distributed-parameter cases. Linear frequency response. Experimental characterization of linear systems. The analysis of non-linear systems by linearization and numerical methods. The application of these techniques to particular processes and instruments will be stressed.

Unit 2
Control I — S1 L1T1

Prerequisites: 3.122 Unit 6 Process Dynamics I, 3.123 Unit 7 Instrumentation, 10.032 Mathematics

Co-requisite: 3.132 Unit 1 Process Dynamics II

Basic concepts in control, and in the behaviour of feedback systems. Stability in linear systems. Analysis and synthesis of linear systems using root-locus and frequency response techniques. Criteria for satisfactory control. Use of computer techniques in control system analysis and synthesis.

Unit 3
Optimization — S1 L1

Prerequisite: 10.031 Mathematics

An introduction to some of the techniques of optimization and their application to problems from the process industries. The methods covered will include single and multiple dimensional search, linear programming and dynamic programming.

Textbooks

Units 1 and 2

Coughanowr D. R. & Koppell C. B. *Process Systems Analysis and Control* McGraw-Hill

Unit 3

Rudd F. & Watson C. C. *Strategy of Process Engineering* Wiley

3.133
Chemical Engineering IIIC

Unit 1
Safety and Failure Tolerance — S1 L1

Prerequisite: 3.123 Chemical Engineering IIC

Safe practices. Safety equipment. Handling and storage of hazardous materials. Disaster propagation, implications for plant and storage layout. Failure modes, the 'bath-tub' curve. Reliability theory, replacement and standby equipment. Criteria for reliability. Fault tree analysis. Accident analysis. Case histories. Factory visit.

Unit 2
Economics II — S1 L2

Prerequisite: 3.123 Unit 5, Economics I

Cash flow from trade and investment. Investment, decision criteria. Cost of capital, debt and equity capital, interest rates and opportunity cost. Depreciation, investment allowances and taxation, working capital, liquidity. Discounted cash flow methods of evaluating and comparing alternatives. Comparison of these methods, replacement studies, market forecasts, total demand, leasing versus investment studies, market growth, competition and market share. Plant size and utilization, sizing for future development, simulation studies. Venture analysis, treatment of technological and commercial uncertainties, sensitivity analysis, quantifying risk and combining probabilities. Treatment of risk and ranking of ventures. Case studies.

Unit 3
Atmospheric Pollution Control — S1 L1

Prerequisite: 3.311 Fuel Engineering I

Introduction, dispersion of pollutants, source and ambient measurement and monitoring, industrial pollution control.

Unit 4
Water Pollution Control — S1 L1

Prerequisite: 3.123 Chemical Engineering IIC

Water usage in the chemical industry. Pollutants and their effects. Water quality standards. Industrial options, source reduction, water re-use, effluent disposal. Performance and selection of treatment methods. Reliability of treatment methods. Economic aspects. Legislative aspects. Factory visit.

Textbooks

Units 1 and 2

Rudd F. & Watson C. C. *Strategy of Process Engineering* Wiley

Unit 4

Tebbutt T. H. Y. *Principles of Water Quality Control* Pergamon

Unit 3

Perkins H. C. *Air Pollution* McGraw-Hill, 1974

3.134
Chemical Engineering Laboratory — S1 T3

Prerequisite: 3.124 Chemical Engineering Laboratory

An integrated chemical engineering laboratory at a more advanced level than the 3.124 laboratory and with an emphasis on open-ended experiments.

3.135
Advanced Chemical Engineering Electives

Unit 1
Principles — S1 or S2 L1T2

Prerequisites: 3.131 Chemical Engineering IIIA

An advanced treatment of selected aspects of heat transfer, mass transfer, and fluid dynamics with an emphasis on recently published research.

Unit 2
Process Dynamics II — S1 or S2 L1T2

Prerequisites: 3.132, Unit 1, Process Dynamics II

In this course, the material covered in Process Dynamics I will be applied during tutorials to selected case studies, and will be illustrated by laboratory work, and by analogue and digital computation. Lecture material will complement the laboratory work, and will introduce selected topics such as state-space analysis, variable co-efficient systems and approximation techniques for linear systems.

Unit 3
Plant Layout II — S1 or S2 L1T2

Prerequisite: 3.123, Unit 4, Plant Layout I

Piping: Underground, trenched and above-ground piping. Piping decks. Arrangements of process plant, process and service piping in process area. Pressure, weight and expansion stresses. Simple flexural analysis to estimate terminal reactions and stresses in pipes, valves and equipment. Providing for expansion, supporting and anchoring. Expansion take-up devices and their integrity. Economic determinants. Flexural design using computer software. Grouping of components. Pressure and flow distribution in piping-pump-equipment networks. Practical guidelines to good layout. Preparation of specifications and drawings. Codes, mandates and rules of regulatory bodies. Design of vent and drainage systems; examples of poor design.

Plant layout: Site and battery plant layout to suit process, piping and operational requirements. Making the best use of topography. Preparation of plot and site plans and specifications. Logic operations and critical path planning. Project engineering.

Storage: Tank form arrangement, layout and associated pumps and piping.

Miscellaneous: Pneumatic and slurry transfer systems. Steam reticulation, trapping and condensate handling. Detailed consideration of layout and piping around particular equipment items, and preparation of associated drawings.

Unit 4
Control II — S1 or S2 L1T2

Prerequisites: 3.132, Unit 2, Control I

In this course, the material covered in Control I will be applied during tutorials to selected case studies, and will be illustrated by laboratory work, and by analogue and digital computation. Lecture material will complement the laboratory work, and will introduce selected topics such as multi-loop system control, system identification and estimation, and sequencing control.

Unit 5
Reactor Engineering — S1 or S2 L1T2

Differential balances with reaction, non-ideal homogenous reactors, reaction in mixing streams, rate equations for heterogenous reactions, non-catalytic fluid-solid, and fluid-fluid reactors, solid catalysed fluid reactors, examples of complex reactors.

Unit 6
Solids Processing — S1 or S2 L1T2

Prerequisites: 3.121 Chemical Engineering IIA, Units 5 and 6

Basic Theory: Brief review of fluid mechanics of pipe flow and motion of particles in fluids. Moving, Fluidised and Spouted Beds.

Regimes of fluidisation, gas and solids motion and distribution with increasing gas rate. Modelling of bed behaviour. Design of grid and bed. Design of feeder and offtake systems. Cascade and circulatory systems. Introduction of heat transfer surfaces into the bed.

Design of rotary kiln and moving bed systems. Behaviour and design of spouted and ducted bed systems. Pneumatic and hydraulic conveying — modes of particle suspension and transport. Transport of non-

Newtonian slurries in overland lines. Problems in feeding of heterogenously sized granules. Dense-phase pneumatic transportation systems and their design. Distance limitations. Co-current processing. Comminution and Mixing — breakage of solids and power requirements for grinding: characterisation of size distribution of products. Principles of solid/solid and solid/liquid mixing. Power requirements and selection of equipment. Separation — Particle separation according to size, shape, density, specific properties. Particle/fluid separation by gravity, impaction, centrifuging filtration and electro-static charge. Studies of selected separation equipment.

Unit 7
Advanced Chemical and Phase Equilibria — S1 or S2 L1T2

Prerequisites: 3.112 Chemical Engineering IB, Units 1 and 2

Sources of thermodynamic data. Methods of estimating and presenting thermodynamic data. Advanced chemical and phase equilibria of application in chemical and process engineering.

Unit 8
Process Engineering II

Prerequisites: 3.121 Chemical Engineering IIA, 3.122 Chemical Engineering IIC, 3.123 Chemical Engineering IIC, 3.133 Chemical Engineering IIIC

Process Design: Use of CAD software in the creation and screening of alternatives in process design. Writing of sufficiently appropriate steady-state simulations for particular parts of a process as adjuncts to a flowsheet executive. Problems involving changes to output quantity and quality, feedstock, changes and changes to utilities and effluents.

Fault Detection and Correction: Detection, location and identification of malfunctions in a simulated chemical plant. Selection of most appropriate remedies. Studies of repair and maintenance practices; on-stream corrections versus those requiring process shut-down. Temporary and permanent corrections. Exercises in fault analysis and correction using cases from practice.

Feasibility Studies: Studies involving the economic and/or strategic evaluation of the potential of a selected raw material or routes to a selected product. Consideration of technological development needs revealed by these studies.

Equipment: Detailed chemical engineering design of selected equipment items.

Textbooks

Unit 1
Bird R. B. Stewart W. E. & Lightfoot E. N. *Transport Phenomena* Wiley

Unit 3
Mecklenburg J. C. *Plant Layout* Intertext

Units 2 and 4
Coughanowr D. R. & Koppell L. B. *Process Systems Analysis and Control* McGraw-Hill

Unit 5
Levenspiel O. *Chemical Reaction Engineering* 2nd ed Wiley

3.136
Oil and Gas Engineering — F L1T2

Prerequisite: 3.311 Fuel Engineering I

Importance of crude oil, natural gas as energy sources, occurrence of petroleum and natural gas. Introduction to reservoir engineering. Flow through porous media. Sources of data on hydrocarbon properties. Phase behaviour of hydrocarbons, retrograde condensation. Processing of oil and gas at the field. Estimation of reserves. The petroleum refinery. Applications of chemical engineering principles to refinery processes. Products blending. Optimisation of refinery operations. Transportation of oil, gas and products. Design and operation of refinery equipment.

3.211
Biological Process Engineering — F L1T2

Prerequisites: 44.111 Microbiology

Structure of Metabolism: Growth of an undifferentiated organism as a physico-chemical process leading to quantification of growth processes. Structure and function of a single cell. The structure of metabolic processes. Energy metabolism balances. Small metabolite production. Macro-molecule production. Co-ordination and control of cellular processes.

Industrial Bio-processes: A review of Bio-process industries. The selection, screening and maintenance of commercial cultures. The optimisation of bio-processes. Batch and continuous fermentations. Enzyme engineering, single cell protein. Biodeterioration and microbiological stability. Sanitation. Fermentation practise.

Microbial Dynamics and Energetics: Principles used in the quantification of complex systems. Quantification of biomass and the growth process. Balanced growth. The Monod model and further extensions of the model. Uncoupling of growth processes. Quantification of product formation. Distributed, segregated, unstructured and structured models. Stochastic models. Overall energetics of growth processes. Entropy and free energy relationships in complex reaction sequences. Principles and requirements of driven reactions. The energetics of cell processes and the prediction of yields and metabolic heat evolution.

3.431
Food Engineering I — L2T1

An introduction to fluid mechanics, heat transfer, mass transfer with applications relevant to the food industry.

Textbooks

Earle R. L. *Unit Operations in Food Processing* Pergamon

Kay J. M. *An Introduction to Fluid Mechanics and Heat Transfer* 2nd ed CUP

3.441
Food Engineering II — L3T0

Fundamental and applied aspects of engineering in selected food processing operations. Food plant and machinery. Process control of food plant. Introduction to engineering economics. Plant experimentation. Design aspects of equipment for effluent treatment.

Department of Biological Process Engineering

3.211
Biological Process Engineering F L1T2

Prerequisite: 44.111 Microbiology

Structure of Metabolism: Growth of an undifferentiated organism as a physico-chemical process leading to quantification of growth processes. Structure and function of a single cell. The structure of metabolic processes. Energy metabolism balances. Small metabolite production. Macro-molecule production. Co-ordination and control of cellular processes.

Industrial Bio-processes: A review of Bio-process industries. The selection, screening and maintenance of commercial cultures. The optimisation of bio-processes. Batch and continuous fermentations. Enzyme engineering, single cell protein. Biodeterioration and microbiological stability. Sanitation. Fermentation practice.

Microbial Dynamics and Energetics: Principles used in the quantification of complex systems. Quantification of biomass and the growth process. Balanced growth. The Monod model and further extensions of the model. Uncoupling of growth processes. Quantification of product formation. Distributed, segregated, unstructured and structured models. Stochastic models. Overall energetics of growth processes. Entropy and free energy relationships in complex reaction sequences. Principles and requirements of driven reactions. The energetics of cell processes and the prediction of yields and metabolic heat evolution.

3.240
Biological Process Engineering Project

Project in Biological Process Engineering for students in Chemical Engineering.

Department of Fuel Technology

3.311
Fuel Engineering I

Fuels and Energy, Sources and Properties: Fossil fuels: coal, oil, gas; origin, occurrence in Australia; storage, sampling and analysis; properties and their significance; classification. Other energy sources: nuclear, solar, wind, water, etc. *Energy Conversion:* Principles of combustion of solid, liquid and gaseous fuels. Limits of inflammability, burning velocity, ignition temperature. Design principles of burners, combustion efficiency, excess air, air supply. *Fuel Processing:* Crude oil, refinery flow patterns. General methods of gas making. Carbonization and the production of metallurgical coke. *Fuel Plant Technology:* Design principles of boilers. Boiler water conditioning. Introduction to furnaces, ovens, kilns, etc.

Textbook

Macrae J. C. *An Introduction to the Study of Fuel* Elsevier

3.311M
Fuel Engineering I

An elective introductory course in fuels and energy for Mining Engineering students based on the subject 3.311 Fuel Engineering I, supplemented by appropriate laboratory experiments (consisting of 28 lectures and 14 hours of lab. classes per session, taught over two sessions).

Textbook

Macrae J. C. *An Introduction to the Study of Fuel* Elsevier

3.321
Fuel Engineering II

Combustion, Fundamentals and Science: Reaction mechanisms of various oxidation reactions. Combustion in the Internal Combustion Engine. Types of flames: laminar, turbulent, diffusion, aerated. Formation of carbon and NO_2 in flames. *Principles of Gasification:* Thermodynamics of basic reactions and calculation of equilibrium compositions. The production of fuel and synthesis gases, controlled furnace atmospheres; gas purification. *Radiation Heat Transfer and Engineering Applications:* Numerical and analogue methods of problem solution in radiative heat transfer. Gas and flame radiation in combustion systems, (non-luminous and luminous). *Measurements in Flames and Furnaces:* Gas flow, gas analysis, solids. Measurement of temperature of flames and surfaces. Temperature calculation, theoretical, graphical H-t charts and their application. *Laboratory:* Analyses and characterization of solid, liquid and gaseous fuels.

Textbooks

Technical Data on Fuel World Energy Conference, London

Gray W. A. & Muller R. *Engineering Calculations in Radiative Heat Transfer* Pergamon

Bradley J. N. *Flame and Combustion Phenomena* Methuen

Holman J. P. *Heat Transfer* McGraw-Hill

3.331
Fuel Engineering III

1977 only. To be replaced in 1978.

Fuel Plant Design: Furnace design for continuous and intermittent operations. Recuperator, regenerator and waste heat boiler design. Process heat transfer. Steam: condensers, evaporators. *Thermal Engineering:* Advanced heat transfer engineering, including numerical and analogue methods of problem solution with applications directed towards the design and performance of combustion appliances and furnaces. Gas and flame behaviour in combustion systems; the use of similarity criteria and models as computation aids.

Textbooks

Holman J. P. *Heat Transfer* 3rd ed McGraw-Hill

Kern D. Q. *Process Heat Transfer* McGraw-Hill

McAdams W. H. *Heat Transmission* McGraw-Hill

Trinks W. *Industrial Furnaces* Vols 1 and 2 Wiley

3.332
Fuel Engineering IV

1977 only To be replaced in 1978.

Flames: Carbon formation, radiation, temperature calculation and measurement; characteristics of industrial flames. *Secondary Fuels and Refractories. Carbonization:* Evaluation of coals, blending, additives; liquid fuels; evaluation, physical properties, specifications; refractories; raw materials, types, thermal, mechanical and chemical properties. *Atmospheric Pollution:* Nature of pollutants, sources, sampling, measurement, physiological effects; plume dispersal; effect of meteorological conditions; industrial gas cleaning, air quality standards and Clean Air Legislation.

Fundamental Constitution of Fuels: Constitution and classification of mineral oils; coal petrology; techniques and application; physical and chemical fine structure of coal.

Textbooks

Gaydon A. & Wolfhard H. *Flames* Chapman & Hall

Krevelen D. W. van. *Coal, Typology, Chemistry, Physics and Constitution* Elsevier

3.340
Fuel Engineering Project

Projects selected involving the design of fuel plant or experimental aspects of fuel science and/or fuel processing and utilization.

No books are recommended. Students are supplied with reading lists appropriate to individual requirements.

Graduate Study

Department of Chemical Engineering

3.162G
Urban Planning

Priorities in urban planning: topography, community services, industry; selective zoning and decentralization; relationships to regional planning. Cost of pollution and control measures: legal aspects; planned development; architectural aspects; density distribution. Case histories.

3.163G
Industrial Use and Re-Use of Water

Water sources, surface waters, ground waters — water quality, removal of gaseous, solid, solute and odorous contaminants. Physical and chemical treatments, softening plant, demineralization, plant design. Water collection and distribution, corrosion and its prevention, industrial contaminants and their removal, water-re-use in plant. Clean up before release, legal requirements. Costs and economics of supply and disposal.

3.164G
Medical Aspects

Aspects of medicine bearing upon physiological consequences of pollutants. Synergism and antagonism; photosynthesis and phytotoxicity, metabolic mechanisms; morbidity and mortality surveys; exposure indices. Particular pollutants: aldehydes, nitro-olefins, carbon monoxide, sulphur dioxide, oxides of nitrogen, hydrocarbons, ozone and oxidants, particulates, carcinogens.

3.166G
Legislative Aspects

Resources in law for the preservation of satisfactory environments. Local government, town planning, environmental, common law. History of Australian legislation — consequences in border regions. Types of legislation and machinery measures and actions thereunder. Problems of administration of available law. American experience. Economic and sociological factors.

3.170G
Process Principles

Material and energy balances and their application in chemical/combustion processes. Introduction to rate process theory. Applications of equilibria. Principles of analysis.

3.171G
Corrosion Technology I

Theory of Corrosion — Principles: Thermodynamics, electrode kinetics. Applications: Predicting corrosion behaviour, corrosion prevention, corrosion rate measurements. *Industrial Corrosion:* Definitions — What it is. Terms used, units of measurement, corrosion research, corrosion technology, importance of corrosion (loss of product, downtime, safety, etc.) Extent — where it occurs. Cost. Economics. How it is prevented — materials selection, coatings, design, cathodic prevention, inhibitors.

Types of Corrosion: Direct chemical, galvanic, crevice, pitting, intergranular, phase attack, erosion — cavitation, stress, fatigue, hydrogen, fretting, atmospheric oxidation, high temperature oxidation. *Materials — non-metallic:* Plastics: thermoplastic — cellulose, acrylics, nylons, polyethylenes, vinyls, polypropylene, polystyrenes, fluorocarbons, chlorinated polyether. Thermosetting — phenolics, epoxies, polyesters, silicones, ureas, laminates. Laminates: reinforced plastics — fibreglass. Foamed Plastics. Rubbers: natural, synthetic — butyl, buna-S, neoprene, nitrile, ABS, silicone. Glasses: bulk — borosilicate, fused silica, glass linings. *Ceramics:* acid resisting bricks, stoneware, porcelain, concrete. *Carbon and graphite. Woods.*

Principles of Design for Corrosion Prevention. Environmental Factors: Galvanic effects — potential differences, concentration cells, anode/cathode/areas operating anodic and cathodic reactions polarization, passivity ionic conducting electrolyte. Oxygen, velocity, temperature, atmospheric contaminants, partial immersion, geometry of design, fabrication and erection. *Intrinsic Factors:* Material structure, heat treatment, surface finish. *Corrosion Testing:* Aims, specimens, surface preparation, measurements, exposure techniques, duration, aeration, temperature, expression of results — units, interpretation of results, standard tests.

3.172G
Corrosion Laboratory

A number of laboratory assignments to illustrate and measure the mechanism of corrosion. Electroplating/anodising experiments.

3.173G
Corrosion Materials

Metallic — types available, properties and applications for each of the following: cast irons, alloy cast irons, carbon steels, low alloy steels, stainless steel, special alloys. The following metals and their alloys: aluminium, copper, nickel, titanium, lead, zinc, magnesium, tin, cadmium, chromium, cobalt. Refractory metals — molybdenum, tantalum, tungsten, zirconium. Noble metals — gold, platinum, silver.

3.174G
Corrosion Technology II

Corrosion in: *Special equipment and structures,* piping, tanks, heat exchangers. *Special Environments* — corrosion by sea water, soils, fresh water, steam, atmosphere, lubricants and packings, mineral acids, organic acids, alkalis, petroleum industry, biological means, liquid metals. *Surface Preparation and Coatings.* General Theory — surface preparation — acid cleaners, alkali cleaners, solvent cleaners, mechanical cleaning, equipment. Coatings — types, properties and applications, pre-treatments, primers based on acrylics, alkyd, bitumen, epoxy, chlorinated rubber, metals, phenolic polyurethane, vinyls. Temporary corrosion — preventive. Heat resistant, electroplated metal sprayed. Wrappings.

3.175G
Corrosion Seminar

Joint University/Industry colloquia on theory and practice of corrosion technology.

Students will present material arising from literature and/or laboratory assignments and industrialists will be invited to contribute papers and/or participate in the colloquia.

3.176G
Corrosion Literature Review

Students will be expected to consult and read the wide literature on corrosion and to produce a comprehensive and detailed report on a selected topic, eg, aspects of corrosion in the acid industry; marine corrosion; corrosion problems in the food industry; underground corrosion of pipelines.

3.177G
Testing Laboratory

Candidates will undertake a project involving the design/evaluation of corrosion testing equipment/techniques. A comprehensive report will be submitted.

3.181G
Advanced Process Dynamics

Distributed-Parameter Linear Systems: Selected distributed-parameter and mathematically similar systems. Methods of analysis and features of their response. Feedback systems containing deadtime. Heat exchangers. Distillation columns. *Nonlinear Systems:* Selected non-linear systems, eg, chemical reactors, flow systems, radiant heat transfer. Numerical solutions. Phase plane analysis. Limit cycles.

3.182G
Process Optimization

Multivariable analytical and numerical optimization in free and constrained parameter space. Optimization of functions of a continuous variable. Dynamic programming. Applications of these techniques to specific chemical engineering problems.

3.183G
Equilibrium Concepts in Water Systems

The application and limitations of chemical thermodynamics in water systems. Particular attention is given to aqueous inorganic process systems including water treatment and minerals processing and with consideration of the effects and control of pollution.

Thermodynamic diagrams such as lnE/pH, potential/pH, temperature/pH and concentration/pH will be developed as an aid to assessing system energetics.

Sources and estimation of thermodynamic data. Kinetics and mechanism in relation to aqueous system energetics. Analysis of kinetic data.

3.184G
System Simulation and Control

This is a participatory course in which case studies, discussion of recent papers, development of digital simulation programs and analog computer laboratory work play an important part.

Topics are selected from the following areas:

Unit 1 System Simulation

Numerical methods for digital simulation; programming languages and packages for system modelling; modelling of distributed parameter systems; use of analog computers in system simulation.
Application of these techniques to the study of process plant and equipment, environmental systems, and similar areas.

Unit 2 Advanced Process Control

System identification and parameter estimation; control of multi-loop systems; non-linear systems; digital control and data-logging, sequencing control.

3.185G
Interphase Mass Transfer

Advanced theories of mass transfer. The effect of interfacial instability and methods for predicting its presence. Theoretical prediction of mass transfer in dispersed systems. Multicomponent mass transfer.

3.186G
Fluid Particle Interactions

Fundamentals. Particle drag in an infinite laminar fluid, effect of turbulence and acceleration. Drag and rotation in shear flow. Multiparticulate systems with homo- and heterogeneously sized particles. Co-current systems. Limiting particle transport velocity, instabilities, various criteria. Transport line feed systems, transport line driers and reactor. Design of co-current fluid-particle systems. Gas-fluidized beds. Gross behaviour, bubblephase theories, instability theories, grid-bed geometry and resistance relationships, elutriation, residence-time and size-distribution studies. Heat and mass transfer: design of catalytic and non-catalytic fluidized reactors.

3.187G
Design of Process Envelopes

Theoretical treatments concerning stress analyses with time and temperature as variables, stresses at discontinuities and transitions in vessel geometry. Theories and modes of material behaviour, gas solubility effect, design of insulation, reinforcement, etc. Analyses of stresses and reactions in piping subject to large temperature changes. Code requirements. Practical aspects will include a treatment of high pressure components, eg, valves, fittings, pumps, safety devices. Economic aspects.

3.188G
Advanced Process Engineering Economics

Cost Evaluation: Capital and operating cost estimation, venture profitability, feasibility studies, and the effect of gearing, size and capacity factor on the DCF return. *Project Optimization:* Minimizing costs in the conception, design, tendering, construction, start-up and operational stages with emphasis on methods engineering, critical-path scheduling and good practice in business organization and management. *Australian Process Industry Economics:* The tariff, gross national product, balance of payments, productivity, population and industrial growth plus detailed economic analysis of Australia's chemical and metallurgical industries.

3.189G
Graduate Colloquia

Colloquia on research developments in Chemical Engineering. Students are required to participate actively in the colloquia and give at least one dissertation based on their own investigations.

3.190G
Specialist Lectures

3.191G
Advanced Thermodynamics

Equilibrium: liquid-liquid, liquid-solid and liquid-vapour phase equilibria for 1. high pressure; 2. multicomponent systems. Chemical reaction equilibrium for complex systems.

Molecular theory and statistical thermodynamics: partition functions, monatomic and diatomic gases; Chapman-Enskog theory, evaluation of 1. thermodynamic potentials; 2. virial coefficients.

Compressible flow: flow of compressible fluids in ducts including 1. supersonic flow; 2. shock waves; 3. stagnation properties.

3.192G
Computer-aided Design

A workshop type of course with considerable time devoted to discussion, seminars, writing and running of programs.

Programming. Methods, conventions, and standards. Program design, flow-charting, co-ordination and documentation.

Design. Individual plant units and components, flowsheets, optimization and economic analysis. Physical property estimation.

Simulation. Continuous change and discrete change systems.

3.193G
Chemical Engineering in Medicine

Application of chemical engineering principles to medicine. Introductory general physiology with particular emphasis on the kidneys, lungs and liver. Design and operation of hemodialyzers, membrane oxygenators and hemoperfusion devices. Considerations of criteria for optimal short- and long-term replacement of natural organs. Modelling of patient-artificial organ interactions. Associated laboratory work where appropriate.

Department of Biological Process Engineering

General

Units are offered separately subject to specified prerequisites as well as the restrictions on those units designed as bridging material.

3.281G
Design of Microbial Reactors

Unit 1
Rate Processes

This unit is a bridging course designed to provide the background in rate processes in heterogenous systems required for Unit 3. This unit could not be offered to a graduate with background in advanced rate processes, the equivalent of 3.135 Unit 6 Reactor Engineering.

Covers process rates and rates of change; generalized definition of a process rate. Material balances with reaction — integral balances and balances differential with respect to time, space, and both time and space.

Measurement, interpretation and correlation of process rates. Heterogenous systems, the influence of diffusional processes, linear and non-linear systems, lumped and distributed systems.

Unit 2
Fundamentals of Microbial Stoichiometry

This is a bridging unit offered to students with little or no background in the life sciences. A prerequisite or co-requisite would be 44.111 Microbiology or its equivalent. The unit is designed to provide an understanding of the structure of metabolism to allow the student to carry out the overall metabolic balances necessary for quantification of living systems.

Covers growth of an undifferentiated organism as a physico-chemical process leading to quantification of the growth processes. Overall structure of metabolic processes. Material, energy and redox balances under anaerobic and aerobic conditions. Specific metabolic rates and their quantification.

Unit 3
Design of Microbial Reactors

This unit would normally follow rate processes or fundamentals of microbial stoichiometry and is divided into two strands.

Reactor Design Fundamentals: Ideal and non-ideal reactors, residence time distribution and non-ideal reactor models. The significance of mixing and diffusion in microbial reactors for freely suspended microorganisms. The concept of a microfluid and a macrofluid and its application to the description of two-phase reacting systems — gas-liquid, oil-aqueous and solid-fluid systems will be examined with examples relevant to the biological process industries.

Microbial Reactor Calculations: The collection, quantification and interpretation of rate data, and the design of reactors for freely suspended microorganisms; batch, semi-batch and continuous reactors; gas exchange balances. Rate processes in microbial flocs and microbial films. Design for microbial floc and film reactors.

Textbook

Atkinson B. *Biochemical Reactors* Pion

3.282G
Microbial Kinetics and Energetics

Unit 1
Microbial Kinetics

Principles used in the quantification of complex systems. The quantification of biomass and the growth processes. A mechanistic approach to the quantification of microbial processes. The Monod model. Extension of the Monod model. Metabolic uncoupling. Inhibition kinetics and reactor stability. Factors affecting the substrate unlimited growth rate. The integration of metabolic control into an overall response.

Unit 2
Microbial Energetics

Significance of entropy and free energy changes in microbial growth. Driven reactions, group transfer potentials, driven reaction sequences and the significance of actual and standard free energy changes in open systems. Application to metabolism, energy requiring pathways, energy producing pathways. Thermodynamic efficiency of growth. Mass, heat and entropy balances in growing cultures, prediction of yield.

3.283G
Bioprocess Unit Operations and Equipment Design

Engineering design and operating characteristics of plant and processes normally used eg sterilization and air purification, dehydration drying at reduced pressure, reduced temperature preservation, radiation, product isolation, sedimentation, filtration, centrifugation, extraction, absorption, chromatography and ion exchange, absorption with reaction, electrophoresis and dialysis, aseptic design, materials of construction, effluent disposal.

3.284G
Heat, Mass and Momentum Transport

A bridging course designed to provide an introductory understanding of the mechanisms of transport processes. This unit could not be offered to a graduate with a background in chemical engineering principles.

Mechanisms of molecular and turbulent transport. Heat, mass and momentum transport as rate processes. Boundary layer theory. Lift and drag coefficients. Introduction to non-Newtonian flow.

3.285G
Bioprocess Laboratory

Practical experience in the industrial processing of biological and microbial systems. The essential nature of this work is small projects in areas of interest to the student.

3.900G
Master of Applied Science Project

3.901G
Pollution Elective

Department of Fuel Technology

Undergraduate Study

3.381
Principles of Fuel Engineering

An expanded version of the course 3.311 Fuel Engineering I, including appropriate laboratory work.

Textbooks are as for 3.311 Fuel Engineering I.

3.382
Combustion Engineering

Similar to 3.321 Fuel Engineering II. Offered in the graduate diploma.

Textbooks as for 3.321 Fuel Engineering II.

3.383
Fuel Plant: Evaluation and Assignments

Designed to meet the needs of individual students in the graduate diploma course, with an emphasis on the practical aspects of combustion engineering and the efficiency of operation of fuel plant. Also included are bridge courses of lectures in heat transfer, fluid mechanics, and chemical and engineering thermodynamics, which are designed to bring students from the varied backgrounds of their first degrees to a common level to facilitate further study of these subjects in the graduate diploma course.

Students are supplied with reading lists appropriate to individual requirements.

Graduate Study

Note: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks.

3.380G
Fuel Seminar

1 (SU) to be given in Second Session, compulsory. Content bias to choice of G subjects.

3.381G
Fuel Technology Practice

4 (SU) compulsory. Content bias towards choice of G subjects. Laboratory.

3.382G
Fuel Constitution

Unit 1 (1 SU) Coal-petrology and physical constitution
Unit 2 (1 SU) Coal-chemical constitution
Unit 3 (1 SU) Coal classification and statistical analysis
Unit 4 (1 SU) Constitution and classification of oils.

3.383G
Fuel Processing

Unit 1 (2 SU) Coal Pyrolysis
Unit 2 (1 SU) Principles of Gasification
Unit 3 (1 SU) Gasification Processes and gas purification
Unit 4 (1 SU) Synthetic Liquid Fuels (Hydrogenation and Synthesis)
Unit 5 (1 SU) Extraction Processes (Liquid and Gas extraction)
Unit 6 (1 SU) Processing of Liquid Feedstocks (from coal conversion, shale, oil etc)
Unit 7 (1 SU) Chemicals from coal
Unit 8 (1 SU) Condensate recovery and processing

3.384G
Fuel Plant Engineering

Unit 1 (2 SU) Furnace Design and Heat Recovery
Unit 2 (2 SU) Process Heat Transfer and Efficient Use of Steam
Unit 3 (1 SU) Fuel Plant Measurement and Instrumentation
Unit 4 (2 SU) Furnaces, boilers — control systems
Unit 5 (1 SU) Furnace heat transfer
Unit 6 (1 SU) Combustion Chamber and Furnace Aerodynamics
Unit 7 (1 SU) Natural Gas Engineering Applications
Unit 8 (1 SU) Burner and Appliance Design

3.385G
Combustion Science and Engineering

Unit 1 (1 SU) Flames and Combustion Mechanisms
Unit 2 (2 SU) Combustion Technology

3.386G
Energy Systems

Unit 1 (2 SU) Power cycles
Unit 2 (1 SU) Combined cycles and integrated energy systems
Unit 3 (1 SU) Efficiency in energy utilization (incl. T.)
Unit 4 (1 SU) Energy resources and economics
Unit 5 (1 SU) Alternate energy sources
Unit 6 (1 SU) Energy Storage Systems

3.387G
Fuel and the Environment

Unit 1 (2 SU) Atmospheric Pollution — Causes, Properties and Dispersion
Unit 2 (2 SU) Atmospheric Pollution — Monitoring, Control and Legislation
Unit 3 (2 SU) Advanced Atmospheric Pollution — Physical
Unit 4 (2 SU) Advanced Atmospheric Pollution — Chemical

N.B. Unit 1 — a prerequisite for Units 2, 3 and 4.
Unit 2 — a prerequisite for Units 3 and 4.

Unit 5 (3 SU) Waste Management and Control
Unit 6 (1 SU) Environmental Impact of Fuels

3.390G
Postgraduate Fuel Seminar

This is intended to assist students in assessing technical problems, in the collection of information and presentation of data, including technical report writing and critical evaluation of available information.

3.391G
Atmospheric Pollution and Control

Causes, measurement and control of atmospheric pollutants with special reference to fuel-using plant. Clean air legislation.

Textbooks

Stern A. C. Wohlers H. C. Boubel R. W. & Lowry W. P. *Fundamentals of Air Pollution* A.P.

Perkins H. C. *Air Pollution* McGraw-Hill

3.392G
Fuel Science

The nature of solid and liquid fuels, their physical and chemical properties and fundamental structure. The constitution of the coal matrix and coal petrography. The influence of the physical and chemical constitution of fuels and petrographic composition of coal on technological utilization.

Textbook

Krevelen D. W. van *Coal Typology, Chemistry, Physics and Constitution* Elsevier

3.393G
Fuel Engineering Plant Design

Extends the design subject-matter of 3.331.

Textbooks

As for 3.331

3.394G
Thermal Engineering and Fuel Processing

Extends the subject-matter of 3.331 and 3.332

Textbooks

Inst. of Petroleum *Modern Petroleum Technology*

Holman J. P. *Heat Transfer* 3rd ed McGraw-Hill

McAdams W. *Heat Transmission* McGraw-Hill

3.395G
Research Techniques and Extension Methods

Designed to provide a critical approach to research activities. The topics are selected from the following:
1. Advanced analytical techniques (eg, spectroscopy, X-ray diffraction, chromatography, mass spectroscopy. NMR, other optical and instrumental methods. **2.** Mathematical methods in the design and interpretation of experiments, eg, formulation and solution of equations; statistical evaluation of results; empirical equations and nomographs; analogue simulation; an introduction to programming and use of digital computers.

Students to be supplied with reading lists appropriate to individual requirements.

3.396G
Unit Operations in Waste Management

The unit operations and processes associated with modern waste management practices, i.e. the origin, nature, characterization, handling, transportation, size reduction and storage of various waste materials; reduction at source and disposal by composting, landfill, incineration and chemical processing; recovery and re-use of marketable products. Legal aspects; case histories.

Textbooks

Kirov N. Y. *Principles of Waste Management — Unit Operations and Processes* Dept of Fuel Technology, UNSW

School of Metallurgy

Undergraduate Study

4.001
Introduction to Materials Science L1

Forms part of 5.010 Engineering A.

The structure and properties of the main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.

Textbooks

Scientific American *Materials* Freeman

Gordon J. E. *The New Science of Strong Materials, or Why You Don't Fall through the Floor* Penguin

4.002
Introduction to Metallurgical Engineering L2

Forms part of 5.030 Engineering C.

History and significance of the exploitation of metals. Ores, mineral economics, mineral processing, and metal extraction and processing

methods illustrated by reference to the Australian mineral and metal industries. Properties, uses, and applications of metallic materials. The role of the metallurgist in industry and in processing and materials research, and in relation to conservation and the environment.

Textbook

Street A. & Alexander W. O. *Metals in the Service of Man* Penguin

4.0124
Metallurgy Report

A literature survey of approximately 10,000 words on a topic of relevance to the student's employment. The proposed topic must be submitted to the Head of School for approval before the end of the third week of Session 1 and the report submitted not later than the end of the seventh week of Session 2.

4.013
Metallurgy III — S1 L8T10 S2 L4T6

1. Development and application of metallurgical principles relating to the thermodynamics and kinetics of metallurgical processes; structural chemistry; the extraction and refining of the rarer metals; crystal imperfections, with reference to deformation, work hardening, annealing and radiation damage; X-ray and neutron diffraction; phase transformations; fracture mechanisms; and the design of engineering materials.

2. The application of metallurgical principles to industrial practice, with particular reference to welding, foundry practice, metal shaping, metal finishing, materials selection and non-destructive testing.

3. Seminar.

Textbooks

As for 4.011 Metallurgy I and 4.012 Metallurgy II.

4.024
Metallurgy Project

An experimental investigation of some aspects of metallurgy.

4.121
Principles of Metal Extraction — L2T1

The fundamental principles of metal extraction. Oxidation and reduction, roasting, slag reactions, distillation, leaching precipitation and electrolysis.

Textbooks

Pehlke R. D. *Unit Processes of Extractive Metallurgy* Elsevier
Rosenquist T. *Principles of Extractive Metallurgy* McGraw-Hill

4.131
Principles of Physical and Mechanical Metallurgy — L3T0

A condensed treatment of physical and mechanical metallurgy.

4.141
Experimental Techniques in Physical Metallurgy — L0T2

A condensed course of instruction in metallographic, crystallographic and X-ray diffraction techniques.

4.302
Chemical and Extraction Metallurgy I* — S1 L1T4 S2 L1T1

Metal extraction from ores in terms of unit operations and overall systems, illustrated by the extraction of iron, copper, aluminium and other metals. Elementary process analysis. Laboratory — analysis and solution of problems.

4.303
Chemical and Extraction Metallurgy II* — S1 L4T3 S2 L2T0

Metallurgical thermodynamics, application to equilibria involving liquid metals, slags, gases and the solid state. Electrochemistry; corrosion; hydrometallurgy. Kinetics applied to metallurgical processes. Process assessment and selection.

4.314
Chemical and Extraction Metallurgy IIIA* — L3T1½

Kinetics of interphase transfer in metallurgical systems. Advances in pyrometallurgy, related to fuel utilization, agglomeration, emission, recycling. Advances in hydrometallurgy. Corrosion and oxidation, selection of materials.

4.324
Chemical and Extraction Metallurgy IIIB* — L3T1½

A selection of advanced topics in chemical and extractive metallurgy.

4.374
Metal Extraction Processes — L2T1

Analysis of pyrometallurgical and hydrometallurgical extraction and refining processes using the principles of chemical equilibrium and kinetics.

Extraction and refining processes for commercially important ferrous and non-ferrous metals.

Nature of the inter-relationship between raw material, extraction process and product characteristics. Economic factors in process selection and operation; acceptance standards for ores and concentrates; smelter changes; penalties and bonuses; by-products.

Textbook

Newton J. *Extractive Metallurgy* Wiley

* Textbooks provided by the School.

4.402
Physical Metallurgy I* S1 L3T4 S2 L2T4½

The crystal structure of metallic phases. Crystal defects. Physical properties of solids. X-ray diffraction. Phase equilibrium in alloy systems. The genesis of microstructure. Mechanism of phase transformations, departures from equilibrium. Heat treatment of alloys.

4.403
Physical Metallurgy II* S1 L4T6 S2 L2T3

Diffusion in metals. Nucleation of solid phase transformations. Precipitation hardening. Metallography and properties of commercial alloys. Geometry of deformation in metals. Introduction to dislocation theory and its application to mechanical behaviour of alloys. Zone theory of solids — application to electrical, thermal and magnetic properties, and to theory of alloys.

4.414
Physical Metallurgy IIIA* L3T1½

Applications of dislocation theory to work hardening and annealing processes. Transformations in metals. Mathematical crystallography, reciprocal lattice, diffraction.

4.424
Physical Metallurgy IIIB* S1 L0T3 S2 L3T1½

Selection of advanced topics in physical metallurgy including radiation damage, martensitic transformations, neutron diffraction, internal friction, sintering.

4.504
Mechanical and Industrial Metallurgy* S1 L3T0 S2 L3T6

The application of metallurgical principles to industrial processing with particular reference to casting, welding, shaping; properties and selection of materials. Metal finishing. Metallurgical aspects in engineering design. Fracture mechanics, design against fatigue, brittle and ductile fracture.

4.602
Metallurgical Engineering I* S1 L2T0 S2 L3T3½

Mass and energy accounting in metallurgical processes. An introduction to the principles and applications of transport processes in systems with specific reference to industrial processes in primary and secondary metallurgy.

Mechanical metallurgy. Analysis of stress and strain. Stress-strain relationships in solids. Mechanical testing. Mechanical behaviour of metals. Effects of stress state, temperature and strain rate. Creep, fatigue and brittle fracture. Principles of metal shaping processes.

4.604
Metallurgical Engineering III* S1 L3T3 S2 L6T3

Theory of automatic process control. Process modelling and optimization. Process design, feasibility, costing and economics applied to metal extraction, refining, fabrication and finishing. Industrial practice. Case studies, design studies and assignments related to the design of integrated metallurgical process schemes.

4.613
Metallurgical Engineering IIA* S1 L1T0 S2 L1T2

The principles of metallurgical heating and cooling including fuels, refractories and furnace design and operation. Solidification in moulds, continuous casting. Flow and fracture of materials. Fractography. Theory of fracture. Flow of metals in metal working. Defects and their significance. Experimental stress analysis.

4.623
Metallurgical Engineering IIB* L3T3

Measurement in metallurgical processes. Continuous process theory. Materials handling. Metallurgical engineering design applied to mechanical, pyrometallurgical and hydrometallurgical extraction and refining processes, and to melting, casting and shaping processes. Design project.

4.703
Materials Science* L3T3

Extension of the structure — property relationships developed in earlier subjects to provide a unified physical, chemical and mechanical approach to the properties of materials.

4.802
Metallurgical Physics* L2T0

Development of physical principles for application in metallurgy — wave mechanics; electron theory; statistical mechanics; interaction of radiation with matter; solid state devices, instrumentation.

4.813
Mathematical Methods L2T1

1. *10.351 Statistics SM* (see Combined Sciences Handbook).

2. *Numerical Methods.* Roots of equations. Finite differences, numerical differentiation and integration. Solution of ordinary differential equations; series and finite difference methods. Solution of partial differential equations; finite difference and iterative methods. Systems of linear equations; least squares analysis.

* Textbooks provided by the School.

4.911
Materials Science — L1T½

The atomic structure of metals. The grain structure of metals; origin; modification. Structure of alloys, theory. Structure, properties and heat treatment of commercially important alloys based on aluminium, copper and iron in particular. Corrosion. Control of structure and properties, commercial alloys, materials selection.

Textbook

Barrett C. R. Nix W. D. & Tetleman A. S. *The Principles of Engineering Materials* Prentice-Hall

4.913
Materials Science — L2T1

The structure and properties of crystalline substances. Crystal structures, crystal planes and directions. Examination of crystals by X-ray, electron and neutron diffraction techniques. The properties of crystalline solids. Defect structure of crystals. Influence of defects on the behaviour of crystals. The properties of metals and metallic alloys in terms of modern theories. The development of alloys for specific engineering applications. The elastic and plastic properties of solids. The mechanisms of fracture in crystalline solids. Ductile and brittle fracture. Creep. Fatigue. Design of materials.

Polymer materials. The structure and properties of polymers. Mechanisms for the modification of properties. Ceramic materials. The structure and properties of ceramics. Similarities and differences with other crystalline solids. Ceramic-metal composites.

Textbook

Clark D. S. & Varney W. R. *Physical Metallurgy for Engineers* Van Nostrand

4.921
Materials Science — L1T0

(For students in Electrical Engineering.) This subject forms part of 8.111 Civil Engineering.

The atomic structure of metals. The crystalline nature of metals and its significance. The solidification of metals. Plastic deformation of crystalline materials and its effect on properties. Phase equilibria in metallic alloys. The heat treatment of some ferrous and non-ferrous alloys. Corrosion. The electron theory of metals. Conductors, semi-conductors and insulators. Magnetic materials — structure and properties.

Textbook

As for 4.911 Materials Science.

4.931
Metallurgy — L1½T½

For students of Civil Engineering. Part of 8.272 Civil Engineering Materials I.

The atomic structure of metals. The grain structure of metals; origin; effects of manufacturing processes. Structure of alloys — theory. Structure, properties and heat treatment of commercially important alloys. The selection and properties of structural steels. Corrosion.

Textbook

As for 4.911 Materials Science

4.941
Metallurgy for Engineers — L1T0

Solidification of metals, defects in cast metals, casting methods. Phase equilibrium in alloys. Strengthening mechanisms in metals. Elastic and plastic deformation of crystalline materials; mechanism of slip, dislocations. Fracture mechanisms, brittle fracture, fatigue and creep. Corrosion and oxidation of metals. Specification and selection of engineering alloys.

Textbook

As for 4.911 Materials Science

4.951
Materials Technology — L2T2

Materials selection, based on structure and properties. Equilibrium and kinetics in metallic systems. The structure of ceramics with particular reference to silicates. Structural changes. Electroplating processes considered from a theoretical and practical standpoint. Structure and testing of electro-deposits; electrochemical protection.

The structure, properties and technology of wood.

4.972
Materials for Mining Engineers — L1T½

Solidification of metals, structure and defects in castings and welds. Hard-facing techniques, powder metallurgical processes. Phase equilibrium in alloys and application to engineering materials. Non-equilibrium; heat treatment and modification of structure and properties. Elastic and plastic deformation. Mechanical processing. Fracture. Corrosion and corrosion protection in mining environments. Specification and selection of engineering materials.

Textbook

Barrett C. R. Nix W. D. & Tetleman A. S. *The Principles of Engineering Materials* Prentice-Hall

4.974
Mining Materials — S1 L1

Specification and selection of materials. Structural and constructional materials for buildings and plant; plain carbon, low and medium alloy steels, non ferrous alloys; repair and maintenance problems. Materials for mining and minerals processing plant; corrosion and heat-resistant alloys; wear-resistant materials; repair and maintenance. Failure analysis, fracture and corrosion failures. Corrosion prevention.

Textbook

Clark D. S. & Varney W. R. *Physical Metallurgy for Engineers* Van Nostrand

Graduate Study

4.211G
Metallurgical Practice

Detailed studies relating to one or more specialized areas of metallurgical practice, such as founding, welding, mineral treatment.

4.221G
Advanced Metallurgical Techniques

Lectures and laboratory instruction will be offered in advanced techniques including the following: X-ray metallography; Electron microscopy; Electron probe microanalysis; Quantitative metallography; Stress and strain analysis; Fracture toughness testing; Metal melting and casting; Mechanical testing; Electrochemical technique; Research techniques — physical; Research techniques — chemical; Mineral investigation techniques.

4.231G
Advanced Theoretical Metallurgy

Covers a wide range of theoretical topics drawn from physical metallurgy, chemical and extractive metallurgy, mineral chemistry, physics of metals and mechanical metallurgy.

4.241G
Graduate Metallurgy Project

An experimental or technical investigation or design related to a branch of metallurgy.

4.251G
Advanced Materials Technology

Principles of materials selection. Selection of materials based on engineering design criteria. Service performance. Modes of failure. Selection based on service performance criteria. Principles of the design of materials. Materials specifications. Acceptance testing. Principles and methods of non-destructive testing. Selection of test methods. N.D.T. laboratory procedure. Service performance analysis. Service failure investigations.

School of Mechanical and Industrial Engineering

Undergraduate Study

5.010
Engineering A — SS L4T2

Statics I: Composition and resolution of forces, laws of equilibrium. Friction. Statics of rigid bars, pin jointed frames and beams. Simple states of stress. Statics of fluids.

Introduction to Engineering Design: Engineering method, problem identification, creative thinking, mathematical modelling, computer-aided design, materials and processes, communication of ideas, the place of engineering in society.

Introduction to Materials Science: For subject description and textbooks see under 4.001.

Textbooks

Svensson N. L. *Introduction to Engineering Design* NSWUP

and

For *Introduction to Materials Science:*

Gordon J. E. *The New Science of Strong Materials or Why You Don't Fall through the Floor* Pelican

Scientific American Materials Freeman

Note: Text for Statics I to be advised

5.020
Engineering B — SS L4T2

Prerequisite: 5.010.

(For students in Applied Geology and Mining Engineering)

Engineering Dynamics: Kinetics of the plane motion of a particle; equations of motion, dynamic equilibrium, work and energy. Kinetics of systems of particles; impulse and momentum. Rotation of rigid bodies about a fixed axis. Belt, rope and chain drives, gear trains.

and

Mechanics of Solids I: Concepts of stress, strain. Stress and deformation due to axial force. Linear and non-linear problems, compound bars. Concepts of stiffness and flexibility. Bending moment and shear force in simple beams. First and second moments of area. Stress and deformation due to bending; linear and non-linear problems; use of step functions.

Textbooks

Engineering Dynamics: To be advised

Mechanics of Solids I: Hall A. S. *Introduction to Mechanics of Solids* Wiley

5.030
Engineering C

Engineering Drawing: Fundamental concepts of descriptive geometry, including reference systems, representation of point, line and plane; fundamental problems of position and measurement. Application of descriptive geometry to certain problems arising in engineering practice. Special emphasis on ability to visualize problems and processes involved in their solution. Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning. Orthographic and isometric projections.

and either

Introduction to Chemical Engineering (Compulsory for Chemical Engineering students): Routes to and end uses of industrial chemicals. Likely new industrial chemicals. A survey of several Australian chemical industries from the point of view of their historical and economic importance. Examination of the unit operations involved in the industry and the raw materials, equipment and services used. Environmental aspects of the chemical industry.

or

Introduction to Metallurgical Engineering: For subject description and textbook see under 4.002.

or

Introduction to Mining Engineering (Compulsory for Mining Engineering students): Mineral deposits; metallic, non-metallic and fuels. Elements of prospecting and exploration. Basic mining techniques. Mining phases; development, exploitation, beneficiation and withdrawal. Mining and the environment. Mining services. Relevance of basic science and engineering subjects to mining design and operations.

or

Introduction to Ceramic Engineering (Compulsory for Ceramic Engineering students): The nature of ceramics. Classification of materials. The materials science approach. History of ceramics. The ceramic engineer and society.

The origin, classification, physical properties and uses of clay minerals and other non-clay raw materials.

Principal unit operations used in the ceramic industry. Drying and firing of ceramics, melt forming, pot forming and other forming procedures.

or

Introduction to Chemical Technology (Compulsory for Industrial Chemistry students): Introduction to computation in chemical technology: process flow diagrams, information flow diagrams, flow charts in computer programming, development of algorithms.

Principle of operation of processors. Batch and real-time processing. Concepts of steady-state and unsteady-state simulation. Programming in Fortran IV and Real-Time Basic and of programmable calculators. Concepts of on-line data acquisition and reduction. Data processing of laboratory and plant data.

Textbooks

For *Engineering Drawing:*

Robertson R. G. *Descriptive Geometry* Pitman

Thomson R. *Exercises in Graphic Communication* Nelson

For *Introduction to Metallurgical Engineering:*

Street A. & Alexander W. O. *Metals in the Service of Man* Penguin

5.111
Mechanical Engineering Design I

Prerequisite: 5.010. Co- or prerequisites: 5.311, 5.611, 8.172 or 8.112, 8.259.

Introductory lectures illustrating the interdependence of design and technology. Mechanical technology. Interpretation of engineering drawing practice. Philosophy and technique of design. Simple creative design assignments. Basic engineering elements.

Textbook

DeGarmo E. P. *Materials and Processes in Manufacturing* Macmillan

5.311
Engineering Mechanics — SS L2½T1½

Prerequisites: 1.001, 5.010. Co- or prerequisite: 10.001.

Kinematics and kinetics of the plane motion of rigid bodies. Absolute motion, relative translational motion and relative angular motion; dynamic equilibrium.

Textbook

Meriam J. L. *Dynamics* Wiley

5.331
Dynamics of Machines I — F L1½T½

Prerequisites: 5.311, 10.022.

Dynamics of Planar Mechanisms: Analytical and graphical methods for the analysis of velocities, accelerations and forces in planar mechanisms. Kinematics of gear tooth profiles. Static and dynamic rotor balancing.

Mechanical Vibrations: Simple harmonic motion. One degree of freedom systems, free and forced vibrations, transmissibility and motion isolation. Whirling of shafts.

Textbook

Hirschhorn J. *Dynamics of Machinery* Nelson

5.411
Mechanics of Solids II — SS L2T2

Statics of frames and machines. Two dimensional stress components. Bending and shear stresses. Stresses due to combined loads. Three dimensional stress components. Stress-strain relations. Theories of static failure. Instability of elastic columns.

Textbook

Higdon A. Ohlsen E. H. Stiles W. B. Weese J. A. & Riley W. F. *Mechanics of Solids* Wiley

5.611
Fluid Mechanics/ Thermodynamics I — F L2T2

Prerequisites: 1.001, 5.010, 6.020, 10.001. Co- or prerequisites: 5.311, 10.022.

Dimensional systems, units, dimensional analysis, properties of substances. Statics of Fluids. One dimensional flow. Mass, energy and momentum equations. Laminar and turbulent motion. Flow in pipes. Elementary boundary layer theory. Drag. Fluid measurements. Angular momentum equation. Turbomachines. Concepts and conservation principles of thermodynamics. First and second laws of thermodynamics. Properties of ideal gases, liquids and vapours. Non-flow and flow processes. Ideal cycles. Factors limiting performance of real cycles.

Textbooks

Massey B. S. *Mechanics of Fluids* Van Nostrand

Wark K. *Thermodynamics* 2nd ed McGraw-Hill *or*

Lee J. F. & Sears F. W. *Thermodynamics* 2nd ed Addison-Wesley

Reynolds W. *Thermodynamics* 2nd ed McGraw-Hill

School of Electrical Engineering

Undergraduate Study

6.851
Electronics and Instrumentation — S1 L1T2

Prerequisite: 1.001.

An applications-oriented introduction to electronics and instrumentation. Provides a basis of circuit theory and elementary electronics and then treats analog computers, amplifiers, amplifier systems and electronic instrumentation. Included in the course is a project illustrating the application of electrical engineering to other disciplines.

Textbooks

No set texts. Printed notes are supplied during the course.

6.852
Electrical Machinery and Supply — S2 L1T2

Prerequisite: 6.851.

A user-oriented introduction to the usage of electrical power in industry, covering the characteristics and selection of electrical machinery, their interface with the prime power supply protection, electrical safety and compliance with Australian standards. Included in the course is an applications-oriented interdisciplinary project.

Textbooks

No set texts. Printed notes are supplied during the course.

School of Mining Engineering

Undergraduate Study

7.013
Principles of Mining — S1 L2T2

Mining Engineering terminology and definitions. Drilling techniques for production blasting and exploration. Explosives and rock fragmentation processes. Mine development, access to mineral deposits and their exploitation. Surface and underground techniques. Methods of working coal and metalliferous deposits. Methods of ground support. Offshore mining; the ventilation and drainage of mines; mine transport and materials handling. Mine safety engineering.

Textbooks

Brown G. G. *Unit Operations* Wiley

or

Coulson J. M. & Richardson J. F. *Chemical Engineering* Vol 2 2nd ed Pergamon

Gaudin A. M. *Principles of Mineral Dressing* McGraw-Hill

or

Taggart A. F. *Elements of Ore Dressing* Wiley

or

Pryor E. J. *Mineral Processing* 3rd ed Elsevier

7.023
Mineral Process Engineering — S1 L2T2

The necessity for minerals beneficiation. Mineralogical assessment. Comminution: fracture, liberation, size-criteria, energy-size relationships. Crushing, grinding and attrition. Screening and classification, cyclones. Concentration processes; density, electrical, magnetic and other physical methods. Interfacial phenomena. Surfactants. Flotation. Liquid-solid separation: flocculation, thickening, agglomeration, filtration. Materials balances.

Textbooks

As for 7.013 Principles of Mining.

7.111
Introduction to Mining Engineering — S2 L2

Forms part of 5.030 Engineering C.

Mineral deposts: metallic, non-metallic and fuels. Elements of prospecting and exploration. Basic mining techniques. Mining phases: development, expoitation, beneficiation and withdrawal. Mining and the environment. Mining services. Relevance of basic science and engineering subjects to mine design and operation.

Textbooks

Anon *Mining Explained* Northern Miner Press, Toronto

Thomas L. J. *An Introduction to Mining* Hicks Smith

Warren K. *Mineral Resources* Pelican

7.112 and 7.112R
Mineral Resources — S1 L1

Historical and economic introduction, definitions. Geological time scale. Renewable and non renewable resources. Types of mineral resources, their abundance, distribution and availability. The consumption and use of metals, precious stones, industrial minerals and rocks, fossil and nuclear fuels. Ownership and leasing of mineral rights.

Textbooks

Cummins A. B. & Given I. A. *Mining Engineering Handbook* SME/AIME

C'wealth of Aust *The Australian Mineral Industry Annual Review* Bureau of Min Res

Jones W. R. *Minerals in Industry* Pelican

Warren K. *Mineral Resource* Pelican

7.113
Mining Methods — F L2

Types of occurrence; stratified and non stratified deposits. Production development for underground and surface mines. Surface mining of coal, metalliferous ores and other minerals. Offshore and marine mining. Non-entry methods. Underground coal mining: partial and total extraction systems. Pillar, shortwall and longwall mining. Special methods for thin, thick and steeply inclined seams. Simultaneous mining and multiple seams. Working seams in close proximity. Underground metalliferous mining. Underhand and overhand techniques. Classification of stoping methods: open stopes, filled stopes and caving. Secondary mining. Utilization and disposal of mine waste.

Textbooks

Cassidy S. M. *Elements of Practical Coal Mining* SME/AIME

Cummins A. B. & Given I. A. *Mining Engineers Handbook* SME/AIME

Woodruff S. D. *Methods of Working Coal and Metal Mines* 3 Vols Pergamon

7.113R
Mining Methods — F L2T1

The syllabus is as for 7.113 with the addition of the following topics. *Non-entry mining methods and petroleum engineering:* Hydrocarbon accumulation, porosity and permeability of reservoir rocks. Flow through porous media. Darcy's laws. Permeability of beds in series and parallel. Gas solubility. Reservoir energy, volumetric and radial flow calculations. Secondary recovery. In-situ mining of sulphur, salt and potash. Underground leaching, retorting of oil shale, gasification of coal. Marine deposits, off-shore mining methods.

Textbooks

Cassidy S. M. *Elements of Practical Coal Mining* SME/AIME

Cummins A. B. & Given I. A. *Mining Engineers Handbook* SME/AIME

7.114 and 7.114R
Geotechnical Engineering — F L2T1

Determination of in-situ rock properties. Field instrumentation. Correlation of laboratory and field data. Structural surveys. Design of underground and surface mine openings. Magnitude and distribution of stresses. Modelling techniques. Initiation and propagation of failure in rock structures. Excavation stability; natural and artificial support, permanent and temporary support. Design of support systems. Slope stability. Ground control measurements. Rockbursts. Outbursts in coal. The effects, prediction and control of mining subsidence.

Textbooks

Coates D. F. *Rock Mechanics Principles* Mines Branch EMR Canada

Cummins A. B. & Given I. A. *Mining Engineers Handbook* Vol 1 SME/AIME

Jaeger J. C. & Cook N. G. W. *Fundamentals of Rock Mechanics* Methuen

7.122 and 7.122R
Mine Development — S2 L1

Selection of mining site. Geographic communications; transport links and services. Methods of exploratory and development boring. Provision of primary access, shaft sinking, drifts, adits and box cuts. Sinking and driving through water-bearing and unconsolidated ground. Temporary and permanent methods of supporting mine entries. The provision of shaft-bottom, inset and sub-level installations. Surface requirements for winding, hoisting, ventilation and drainage. Surface layout. Engineering, administration and welfare facilities. Environmental considerations, surface structures, spoil and effluent disposal. Land restoration, mining community requirements.

Textbooks

Anon *Symposium on Shaft Sinking and Tunnelling* ME London

Cumming J. D. *Diamond Drill Handbook* Smit, Toronto

Cummins A. B. & Given I. A. *Mining Engineering Handbook* SME/AIME

Fraenkel K. H. *Manual of Rock Blasting* Atlas Copco, Stockholm

Szechy K. *The Art of Tunnelling* Akadeniai Kiado, Budapest

7.123 and 7.123R
Geomechanics — F L1T2

Review of stress and strain analysis. Stress tensors. Rheological models Failure criteria. Classification systems for rocks and rock masses. Engineering properties of rocks and soils. Deformability, time, size and geometry dependent characteristics. Strength, dynamic properties, effects of pore water, permeability, bearing capacity. Strain measurement. Sampling and laboratory testing. Interpretation of data.

Textbooks

Jaeger J. C. & Cook N. G. W. *Fundamentals of Rock Mechanics* Methuen

Smith G. N. *Elements of Soil Mechanics for Civil and Mining Engineers* Crosby-Lockwood

7.124
Coal Face Mechanization — F L2T1

Physical and mechanical properties of in-situ and broken coal. Coal cutting mechanics. The principles of shearing, planing, milling and treparming applied to production and development machines. Methods of assessing the cutability of coal seams. Mechanization problems in thin, thick, steep and faulted seams. The stability, steering and control of face machines. The coal clearance sub-system. Face bunkerage. Face support systems. Packing and stowing. Manning and supervision. Materials and supplies. Performance criteria. Transferability and mobility of face equipment. Integration of production sub-systems of components.

Textbook

Evans I & Pomeroy C. D. *The Strength, Fracture and Workability of Coal* Pergamon

7.133 and 7.133R
Mine Transport — S2 L2T½

Transport requirements for minerals, waste, supplies and men. Mine winding systems for shafts and drifts. The mechanics of hoisting. Mine ropes and chains. Winding cycle diagrams and calculations. Surface and underground haulage arrangements. Secondary transport systems. Rope haulage, aerial ropeways, monorails, belt conveyors, locomotive haulage. Track mounted, crawler and trackless methods. Elements of soil vehicle mechanics applied to mining equipment. Primary systems. Chain, screw and bucket conveyors and elevators. Shaker and vibratory conveyors. Hydraulic and pneumatic transport methods. Chutes and bunkers. Design of transport systems.

Textbooks

Broughton H. H. *Electric Winders* SPON

Price A. B. *Winding Engine Calculations for the Mining Engineer* GEC

Szklarski L. et al. *Underground Electric Haulage* Pergamon

7.134
Metalliferous Mining Systems — F L2T1

Shaft and incline location and capacity. Disposition and dimensions of levels and main development openings. Cyclic and continuous production systems. System components and their integration. Optimum fragmentation. Ore and waste rock clearance. Location of ore passes. Flowability and degradation of ores. Draw control and loading. Pillar recovery. Preparation and placement of mine fills. Bulkhead design and dewatering of fill. Stope access and services. Crushing and storage of ores underground. Production and development scheduling. Multi-face production systems.

Textbook

Cummins A. B. & Given I. A. *Mining Engineers Handbook* SME/AIME

7.143
Mine Environment and Safety Engineering — F L1T1½

Natural and artificial ventilation. Air requirements. The design and analysis of ventilation networks. The characteristics, operation and installation of mine fans. Auxiliary ventilation systems. Psychrometry. Heat and humidity control in deep mines. Mine gases. Liquid and metallic poisons, their origins, detection, monitoring and control. Airborne dust sources and suppression. Physiological effects of vitiated and contaminated air. Spontaneous combustion, fires, explosions and inundations. Rescue and recovery. Mine water control and drainage. Pumping installations. Noise measurement and control. Illumination requirements. Design of mine lighting installations. Laws relating to safety and health. Study of accidents and methods of improving safety.

Textbooks

Anon *Control of Harmful Dust in Coal Mines* NCB UK

Anon *Quality of Mine Air* Transvaal Chamber of Mines

Barenbrug A. W. T. *Psychrometric Charts* Transvaal Chamber of Mines

Moss K. N. *Gases, Dust and Heat in Mines* Charles Griffin

Roberts *Mine Ventilation* Cleaver Hume

Skochinsky A. & Kamorov V. *Mine Ventilation* MIR Moscow

Coal Regulations Act of New South Wales

Mine Inspection Act of New South Wales

7.144
Surface and Offshore Mining — F L2T1

Opencast mining of coal and bedded deposits. Open pit mining for irregular and inclined deposits. Quarrying. Scale of operations, stripping ratio. Overburden removal, special blasting methods. Shovel, dragline and excavator calculations. Loading and haulage. Ground stability considerations, slopes, inclines and spoil heaps. Bench geometry. Haulage roads and tracks. Groundwater control. Climatic effects. Site restoration. Stream and offshore dredging for metals, minerals, gemstones and construction materials. Evaluation of marine deposits. Dredge design and operation. Beach sand mining. Deep sea mining. International agreements and law.

Textbooks

Cummins A. B. & Given I. A. *Mining Engineers Handbook* SME/AIME

Dubnie A. *Surface Mining Practice in Canada* Mines Branch EMR Canada

7.153 and 7.153R
Power Supply in Mines — S2 L1T½

Electrical power generation, distribution and control. Transformers and rectifiers. Motor characteristics. Starting and switching. Mine cables. Flame proofing and intrinsic safety. Signalling and communications. Compressed air generation and supply. Compressors and receivers. Distribution. Applications and equipment. Oil hydraulic power. Fluid characteristics. Emulsions, inverts and non inflammatory oils. Components and circuits. Pumps, motors, valves. Speed and torque control.

Textbooks

Cotton H. *Electrical Equipment in Mines* Pitman

Goodwin A. B. *Power Hydraulics* Cleaver Hume

7.154
Petroleum Engineering — F L2T1

Properties of liquid and gaseous petroleum. Exploration techniques. Elements of reservoir engineering. Drilling rigs. Cable tool, rotary and down the hole drilling. Bit design. Other drilling methods. Drilling fluids and muds. Directional drilling. Coring, core-analysis and logging. Well cementing and casing. Suction rod pumping. Well simulation.

Textbook

Gatlin C. *Petroleum Engineering* Prentice-Hall

7.163 and 7.163R
Excavation Engineering — F L1T1

Rock drilling and boring. Percussive, rotary, hybrid and exotic methods. Drilling patterns for shafts, headings, faces and benches. Classification of chemical explosives and their application. Detonation. Misfire procedures. Alternative explosive agents. Special blasting techniques including presplitting, profiling, trenching, casting and demolition. Environmental considerations, handling and storage of explosives, vibrations. Nuclear blasting. Rock fragmentation by machine. Principles of rock cutting mechanics. Drag picks and free rolling cutters. Hydraulic mining. Water jet cutting. Thermal, electrical, ballistic and other novel fragmentation techniques. Rock cutting tool materials. Effect of tool metallurgy on wear and fracture resistance. Methods of assessing rock cutability. The design of cutting arrays for machine mining.

Textbooks

Anon *Blasters Handbook* Du-Pont

Fordham S. *High Explosives and Propellants* Pergamon

Langefors W. & Kihlstrom B. *Rock Blasting* Wiley

Pfleider E. P. & Eugen D. *Surface Mining* AIME

7.164
Tunnel Engineering — F L2T1

Scope for tunnels. Site investigation. Primary excavation in soft and hard ground. Drilling and blasting. Tunnelling shields, full face boring, partial face machines. Hydrid systems. Debris disposal. Temporary and permanent support. Ground stability. Sub aqueous tunnels. Cut and cover tunnels. Immersed tubes. Compressed air working. Environmental considerations. Tunnel services, ventilation, drainage and lighting for road and rail tunnels.

7.173
Computer Applications in Mining — F L1T1

FORTRAN programming. Simulation of mining problems. Application of selected programs to mining exploration, operations, economics and design.

Textbook

Blatt J. M. *Basic Fortran IV Programming, Miditran Version* Computer Systems Aust

7.213 and 7.213R
Mine Surveying — S1 L1T1

Surveying methods applied to the development and extraction of minerals. Instruments of special value in mine surveying. Correlation of underground and surface surveys. Progress measurement. Determination of reserves. The surveying and logging of boreholes. Preparation of mine plans.

Textbooks

Staley W. W. *Introduction to Mine Surveying* 2nd ed Stanford UP

or

Winniberg F. *Metalliferous Mine Surveying* 5th ed Mining Publications

7.214 and 7.214R
Mine Economics and Planning — F L2T2

Aspects of micro- and macro-economics. Theory and practice of resource sampling. Valuation of mineral properties and mining projects, investment decision analysis, cash flow models. Sensitivity analysis. Marketing of minerals. Type of companies, private, public, no-liability, state ownership and participation. Financing of mining ventures. Contracts and project assessment. Selection procedures for systems and equipment. Obsolescence and replacement. Maintenance planning. Manpower planning, standards of performance, control of projects and technical reporting.

Textbooks

Anon *Work Study Handbook* NCB UK, Vol 1 *Method Study* Vol 2 *Work Measurement* and Vol 3 *Work Study Applications*

Baxter C. H. & Parkes R. D. *Examination and Valuation of a Mineral Property* Addison-Wesley

C'wealth of Aust *The Australian Mineral Industry Review* Bureau of Min Res

Stermole F. J. *Economic Evaluation and Investment Decision Methods* Investment Evaluations Corp

7.224
Operational Management — F L1T1

Elementary industrial psychology. Work measurement. Design of jobs and work methods. Incentive and remuneration. Trade unions. Communications and consultation. Disputes, conciliation and arbitration. Recruitment selection and training of operators and supervisors. Mine management structure and organization. Management of change. Operations research: control networks, decision analysis, linear programming, queueing theory, simulation, improvization. Management accounting and budget control. Grade control, estimation of cut-off grades. Purchasing and stores policies. Statutory responsibilities of management and mine officials.

Textbooks

Barnetson P. *Critical Path Planning* Butterworths

Battersby A. *Mathematics in Management* Pelican

Buffa L. S. *Basic Production Management* Wiley

Falk R. *The Business of Management* Pelican

Lupton T. *Management and the Social Sciences* Penguin

Singh J. *Operations Research* Pelican

Mines Inspection Act of New South Wales

Coal Mines Regulations Act of New South Wales

7.313
Minerals Engineering Processes — F L1T2

Beneficiation requirements. Scope of mineral processing. Sampling and mineralogical assessment. Cominution, fracture, liberation, size criteria, energy-size relationships. Crushing and grinding. Screening and classifying. Fluid dynamics of suspensions. Attrition. Concentration processes: density, electrical, magnetic and other physical methods. Cyanidation, amalgamation, leaching, solvent extraction and ion exchange. Interfacial phenomena. Surfactants. Flotation. Liquid-solid separation: flocculation, thickening, agglomeration, filtration. Drying. Materials balances.

Textbooks

Coulson J. M. & Richardson J. F. *Chemical Engineering* Vol 2 2nd ed Pergamon

Gaudin A. M. *Principles of Mineral Dressing* McGraw-Hill

or

Taggart A. F. *Elements of Ore Dressing* Wiley

or

Pryor E. J. *Mineral Processing* 3rd ed Elsevier

7.313R
Mineral Processing — F L2T3

A combination of 7.313, with selected topics from 4.374 and 7.314.

7.314
Mineral Process Technology — F L2T1

Broken Hill students take 7.313R

Physics and chemistry of surfaces. Measurement of surface properties. On-stream and laboratory analysis and measurements. Laboratory and pilot plant testing. Flowsheet design. Equipment selection. Plant layout. Monitoring and control systems. Process evaluation. Storage and blending. Materials handling. Waste disposal and pollution control. Waste treatment. Process simulation. Marketing.

Textbooks

Anon *Modern Mineral Processing Flowsheets* Denver Equip Co

Fuerstenau D. W. ed *Froth Flotation* SME/AIME

Gaudin A. M. *Flotation* 2nd ed McGraw-Hill

Jones M. P. & Fleming M. G. *Identification of Mineral Grains* Elsevier

Leonard J. W. & Mitchell D. R. *Coal Preparation* SME/AIME

Parkinson E. A. & Mular A. L. *Mineral Processing Equipment Costs and Preliminary Capital Cost Estimations* CIM Montreal

Shaw D. J. *Introduction to Colloid and Surface Chemistry* 2nd ed Butterworths

Taggart A. F. *Handbook of Mineral Dressing* Wiley

7.414
Minerals Industry Project F L1

Candidates will be required to submit a dissertation or thesis on a mining, minerals engineering or other topic approved by the Head of School. The work may take the form of an engineering analysis, experimental investigation, theoretical study or design project. Candidates may be required to present themselves for oral examination on the subject of their submission.

7.424
Industrial and Research Seminars F L1

The program will include two types of seminar. One will deal with research work being undertaken or recently completed by members of the School of Mining Engineering. The other will involve engineers and scientists from industry, other University Schools and research establishments discussing projects of special or topical interest in mining and allied fields.

School of Civil Engineering

Undergraduate Study

8.112
Materials and Structures S1 L1T2

Theory of Structures: Moduli of elasticity, simple stress and strain. Compound bars, temperature stresses. Thin shells. Stress at a point. Strain at a point. Principal stresses and strains. Relationship between load, shear force and bending moment. Moments of inertia, principal moments of inertia. Stresses due to axial force, bending moment, shear force, and torsion. Differential equations of simple beam theory. Deflection of beams. Statically indeterminate beams. Strain energy. Deflections at a single load. Shock loads. Theory of centrally loaded column and eccentrically loaded columns.

8.171
Mechanics of Solids I

Prerequisite: Statistics section of 8.003.

This subject forms part of 5.020 Engineering B.

Concepts of stress, strain. Stress and deformation due to axial force; linear and non-linear problems; compound bars. Concepts of stiffness and flexibility. Bending moment and shear force in simple beams. First and second moments of area. Stress and deformation due to bending; linear and non-linear problems; use of step functions.

Textbook

Hall A. S. *Introduction to the Mechanics of Solids* SI ed Wiley

8.172
Mechanics of Solids II SS L2T2

Structural statics. Bending moments, shear force and torsion. Stresses due to shear force in solid and thin-walled sections; shear centre. Torsion of circular, non-circular and thin-walled sections. Principal stresses and strains; yield criteria. Combined stresses. Concepts of instability.

Textbook

Hall A. S. *Introduction to the Mechanics of Solids* SI ed Wiley

8.250
Properties of Materials

Mechanical behaviour of materials. Response to static loading in tension, compression, shear and bending. Use of static test data in analysis and design; variability of material properties; factors of safety. Hardness tests. Creep in solid materials. Response to dynamic loading; fatigue; impact. Deterioration of engineering materials. Rheological classification of materials.

Textbook

Polakowski N. H. & Ripling E. J. *Strength and Structure of Engineering Materials* Prentice-Hall

8.259
Properties of Materials F L1T2

As for 8.250 Properties of Materials, *plus* the structure and properties of binary alloys; control of structure and properties, commercial alloys, materials selection.

Graduate Study

8.708G
Finite Element Methods in Civil Engineering I

The concept of finite elements. Energy principles. Finite elements of displacement type. Computer techniques for finite elements.

8.753G
Soil Mechanics I

Soil pedology, fabric studies, unsaturated soils, transient water flow in soils.

8.901G
Civil Engineering Elective I

A Session 1 occasional elective on a civil engineering topic, selected according to current demand and availability of local and visiting specialists.

School of Wool and Pastoral Sciences

Undergraduate Study

9.001
Biology of Grazing Sheep and Cattle

Introduces the principles of Wool and Pastoral Science. Covers the sheep and cattle industries and wool and meat as end products of these industries; production and use of pasture, nutrition of grazing ruminants; reproduction in sheep and cattle; climate and animal production; and introductory concepts of animal health.

Field excursions and laboratory work are integral parts of the course.

9.121
Livestock Production I — L2T1

The sheep and beef cattle industries and their place in the economic life of Australia; levels of production and trends. The physical, biological, managerial and economic conditions influencing production. Sheep producing zones. Sheep breeds for wool production. Crossbreeding, prime lamb production.

Sheep management; nutrition, reproduction, survival.

Textbooks

Alexander G. & Williams O. B. *The Pastoral Industries of Australia* Sydney U.P.

James B. J. F. ed *Animal Reproduction* Cheshire

9.122
Livestock Production II — L2

Statistics on beef production, home consumption and export markets. Breeds of beef cattle, crossbreeding and dairy-beef production.

Selection of breeding stock, factors affecting reproduction and performance recording. The effect of climate on beef cattle performance, applied and physiological aspects.

Carcass appraisal, methods of grading and quality aspects of meat. Artificial breeding and feedlotting of beef cattle. Management practices.

Textbooks

Alexander G. & Williams O. B. *The Pastoral Industries of Australia* Sydney U.P.

Cole V. G. *Beef Cattle (Production) Guide* 2nd ed Grazcos

Preston T. R. & Willis M. B. *Intensive Beef Production* Pergamon

Yeates N. T. M. & Schmidt P. J. *Beef Cattle Production* Pergamon

9.123
Livestock Production III — L2

The dairying and pig industries of Australia; patterns and trends. Principal breeds and their uses. Production of milk and milk by-products, and of pigmeats. Quality concepts of the various products.

Management of the dairy cow; selection and management of the dairy sire.

Selection of breeding pigs. Pig housing, management and feeding. Wastage and disease.

Textbooks

Cole D. J. A. *Pig Production* Butterworths

Lamond D. R. & Campbell A. *Dairy Cattle Husbandry* 2nd ed A & R

9.124
Livestock Production IV — L1T1

Principles of livestock production and their application in optimizing animal production; reproduction and fertility; growth and development. The meat industry; slaughter, meat inspection and preservation; utilization of by-products. Carcass conformation and composition and measurement techniques for predicting same. Meat quality.

Textbooks

James B. J. F. ed *Animal Reproduction* Cheshire

Sadleir R. M. *Ecology of Reproduction in Domestic Animals* Methuen

Tribe D. E. ed *Carcass Composition and Appraisal of Meat Animals* CSIRO

9.131
Animal Health I — L2T1

Managerial prevention and control of grazing livestock health, the animal species involved, the concept of economic approach to animal health. Introductory immunology. Skin health; sheep and cattle. Control of external parasites, particularly by insecticides. Reproductive health; sheep and cattle. Internal parasites; flukes, cysticercosis and tapeworms, nematodes. Legal and Public Health responsibilities; Acts of Parliament relating to animal health.

9.132
Animal Health II — L2T1

Use and misuse of products used in animal health work. Internal parasitism. External parasitism. Feedlot health. Transport health. Problems causing acute disease and deaths. Health of horses and dogs used in livestock management.

9.221
Agronomy — L2T2

Agricultural climatology, soil science, and soil conservation. Pastures in land use and land development. Principles of tillage, crop rotation, irrigation, conservation of fodder and fertilizer usage. Weeds and weed control. Practical work in the systematics of selected plant families.

9.231
Pastoral Agronomy L1½T1½

Pasture ecology. Establishment, management and utilization of pastures and fodder crops. Vegetation management in arid and semi-arid areas. Pasture research techniques.

Textbooks for 9.221 and 9.231

Barnard C. *Grasses and Grassland* Macmillan

Black J. M. *Flora of South Australia* Parts I-IV S Aust Govt Printer

Burbidge N. T. *Australian Grasses* Vols I, II & III A & R

CSIRO *The Australian Environment* MUP

Foth H. D. & Turk L. M. *Fundamentals of Soil Science* 5th ed Wiley

Leeper C. W. *Introduction to Soil Science* MUP

Molnar I. ed *Manual of Australian Agriculture* 2nd ed Heinemann

Spedding C. R. *Grassland Ecology* OUP

Whittet J. N. *Weeds* NSW Dept of Agriculture

Wilson B. *Pasture Improvement in Australia* Murray

9.232
Crop Agronomy L2

Field crop production associated with the pastoral industries. Crop physiology. Cropping practices. Pests and diseases.

9.311
Agricultural Economics I L2

The nature and development of agricultural economics and farm management. Theory and practical applications of production economics principles and the analysis of production functions.

Theory, construction and analysis of cost curves. Economies of size and the problem of optimum farm size.

Introduction to price theory. The nature and derivation of supply and demand relationships, and of factors which affect these relationships. Illustration of the role of price theory in the analysis of agricultural policies. Problems in the empirical estimation of supply and demand.

Textbooks

Bishop C. E. & Toussaint W. D. *Introduction to Agricultural Economic Analysis* Wiley

Heady E. O. *Economics of Agricultural Production and Resource Use* Prentice-Hall

Samuelson P. A. Hancock K. & Wallace R. *Economics: Australian Edition* McGraw-Hill

9.312
Agricultural Economics II L2

The structure and functions of agricultural marketing systems and institutions. Use of price theory in the examination of problems and policies affecting marketing systems. Effects on agricultural markets of subsidies, taxation, population growth and economic development.

Introduction to the theory of international trade and international monetary mechanisms. Interrelationships between trade policies and agricultural policies.

Review of current issues in agricultural policy: the small farm problem and declining industries; rural credit policies.

Textbooks

As for 9.311, plus:

Williams D. B. ed *Agriculture in the Australian Economy* Sydney UP

9.313
Farm Management I L2

Farm management planning methods: gross margins analysis; simplified programming; partial budgeting; parametric budgeting; whole-farm budgeting; development budgeting and cash flow budgeting. Discounting methods, taxation provisions and rural credit facilities affecting evaluation of rural investments.

Principles and practice of methods of valuation of rural assets. Land tenure and systems of title.

Financial and production records and accounts. Co-ordination of managerial accounts with taxation requirements. Current developments in managerial accounting for rural industries. Use of farm records as indicators of economic efficiency and as sources of information for normal farm planning methods.

Textbooks

Castle E. N. & Becker M. H. *Farm Business Management* Macmillan NY

Hardaker J. B. Lewis J. N. & McFarlane G. C. *Farm Management and Agricultural Economics* A & R

Joint Committee on Standardisation of Farm Management Accounting *Accounting and Planning for Farm Management* Dept Primary Industries Brisbane

Meredith G. G. Rickards P. A. & Pearse R. A. *Farm Management Accounting: A Commentary* Professional Farm Management Guidebook No 4 2nd ed UNE Armidale

Rickards P. A. & McConnell D. J. *Budgeting, Gross Margins & Programming for Farm Planning* Professional Farm Management Guidebook No 3 UNE Armidale

9.314
Farm Management II L2

Mathematical programming applications in agricultural industries: linear programming in static and development situations; parametric linear programming; Monte Carlo programming approaches; dynamic programming. Game theory, inventory analysis and other approaches to planning in uncertain or risky situations.

Textbooks

Dent J. B. & Casey H. *Linear Programming and Animal Nutrition* Crosby Lockwood

Heady E. O. & Candler W. *Linear Programming Methods* Iowa State UP

Throsby C. D. *Elementary Linear Programming* Random House

9.315
Farm Management III L2

Economic aspects of technical agricultural research, with emphasis on the evaluation and interpretation of research results at the farm level. Design and analysis of research projects for estimation of response relationships between rural resources and products. Problems in interpretation and application of these estimates.

Simulation of farm management systems and data requirements for simulation.

Textbooks

Dent J. B. & Anderson J. R. *Systems Analysis in Agriculture* Wiley

Dillon J. L. *The Analysis of Response in Crop & Livestock Production* Pergamon

Heady E. O. & Dillon J. L. *Agricultural Production Functions* Iowa State UP

Naylor T. H. Balintfy J. L. Burdick D. S. & Chu K. *Computer Simulation Techniques* Wiley

9.316
Analysis of Rural Development Projects L2

Justifications for public investment in rural development. Australian developments in Federal-State financial relationships affecting the planning and evaluation of public development projects.

Evolution of cost-benefit analysis techniques. Theory of cost benefit analysis, and problems in its application, illustrated by case studies.

Input-output models and measurement of the impact of development projects on regional and national economies.

Textbooks

American Economic Association & Royal Economic Society *Surveys of Economic Theory* Vol I 1967 *and* Vol III 1966 Macmillan

Commonwealth of Australia *Investment Analysis — Supplement to the Treasury Information Bulletin* Govt Printing Office Canberra

Davidson B. R. *The Northern Myth* MUP

Eckstein O. *Water Resources Development* Harv. UP

International Engineering Service Consortium *An Economic Study of Keepit Dam* Dept of Conservation Syd 1970

McKean R. N. *Efficiency in Government Through Systems Analysis* Wiley

Mishaw E. J. *Cost Benefit Analysis* Allen & Unwin

Patterson R. A. *The Economic Justification of the Ord River Project* 38th Cong ANZAAS 1965

Subcommittee on Benefits and Costs *Proposed Practices for Economic Analysis of River Basin Projects* Report to the United States Federal Inter-Agency River Basin Committee US Govt Printer 1950

9.411
Agricultural Chemistry I L1T3

An integrated course in various aspects of chemistry directed to the special interests of pastoral science. Experimental techniques, preparative and analytical, built around biological interest. Correlations of theoretical chemistry with biological processes.

Treatment of separation techniques, theory and design of chromatographic and distillation processes. Reaction principles, functional groups, analytical chemistry and roles in biological processes. Colorimetric and spectrophotometric control. Oxidation reactions and electron transfer. Separations and reactions of proteins, fats and carbohydrates, chemical and physical properties, cyanogenetic glycosides. Isomerizations and transesterification. Colloids and gel structures. Introductory heterocyclic chemistry, poisonous plants and alkaloid detection. Trace metals and soil analysis.

9.412
Agricultural Chemistry II L2T4

Proximate analysis of feeding stuffs, calorimetry, further work on fats, carbohydrates and proteins. Autoxidation and relationship to loss of animal nutritional factors. Antioxidants, natural and synthetic; correlations of *in vitro* and *in vivo* action to tocopherols and organo-sulphur and selenium compounds. Protein homogeneity, enzyme separation and assay. Sulphur reactions of proteins; thiolation and grafting. Free radical and ionic reactions of disulphides. Sulphydryl-disulphide interchange and displacement reactions. Partial oxidations.

Animal milks, analysis and heat treatment changes and detection. Roles of trace metals in biological processes, metal complexes with proteins and metal catalysis.

Anthelmintics; oxidation products and possible origin. Fungicides and herbicides, formulation and survey of commercial materials. Analysis and trace residue detection. Vitamins, enzymes and hormones. Photochemistry, energy transducers. Isotope techniques.

9.421
Animal Nutrition L3

Composition and classification of foodstuffs and pastures. Physiology of ruminant digestion. Digestion absorption and metabolism of carbohydrates, proteins, fats, minerals and vitamins. Digestibility of foodstuffs. Nutrient and energy balances and requirements of livestock. Feeding standards and the quantitative application of nutritional data with particular reference to Australian conditions. Utilization of forage by grazing ruminants. Supplementary and drought feeding. Consideration of disorders due to nutrition.

While particular emphasis will be given to nutritional requirements of sheep, those of other farm livestock will be dealt with in this section.

Textbooks

Crampton E. W. *Applied Animal Nutrition* Freeman

Dougherty R. W. et al *Physiology of Digestion in the Ruminant* Butterworths

9.531
Wool Technology I L4T3

Wool Study: The physical attributes of wool which in combination determine its manufacturing use and commercial value. Wool defects, wool in relation to district, breedtype and environment. Principles of wool classing. Wool marketing and procedures, broking, buying and central classing. Carbonising and fellmongering.

Wool Biology: Structure and function of skin. Follicle and fibre structure. Initiation and maturation of follicle and fibre populations. Wool growth. Significance of wool characteristics and their assessment.

Wool Textile Manufacture: Lectures and laboratory demonstrations cover the principles and practices involved in the conversion of raw materials to yarn. Weaving and finishing of fabrics.

Textbook

Henderson A. E. *Growing Better Wool* A. H. & A. W. Reed

9.532
Wool Technology II — L2

Practical wool sorting, wool classing and appraisal. Objective clip preparation, presale testing and sale by sample. The physical handling and composition of the Australian clip.

Textbook

Dawes K. *Objective Measurement of Wool* NSWUP

9.533
Wool Technology III — L1T2

Wool Metrology: Theories of sampling and measurement of wool characteristics. Laboratory procedures. Chemical and physical testing of raw wool. Estimation of wool damage.

Textbook

Aust. Wool Board *Objective Measurement of Wool in Australia* Parts I, II & III

9.534
Wool Technology IV — L2

Raw Materials: Fibres other than wool; their properties, uses and identification.

9.535
Wool Technology V — L1T1

Wool Study: Relationships between subjective appraisals and objective measurement. Sampling and testing of baled bulks from Field Stations and commercial clips. Developments in wool marketing.

Textbook

Dawes K. *Objective Measurement of Wool* NSWUP

9.536
Wool Technology VI — L2T2

Wool Science: Fine structure of the fibre, chemical composition, wool fibre physics, chemical reactivity, mechanical properties and developments in wool technology.

Textbook

Onions W. J. *Wool* Benn

9.601
Animal Physiology I — L2T3

Physiological systems of mammalia are treated with special attention to homeostasis. Cell membranes; blood and body fluids; the immune reaction. Cardiac control, functions and haemodynamics. Respiration. The endocrine system with particular emphasis upon growth, reproduction, lactation and stress. The nerve impulse, its excitation and transmission. Physiology of digestion, the gastro-intestinal tract and of the kidney. Heat tolerance and climatic adaptation.

Textbooks

Austin C. R. & Short R. V. eds *Reproduction in Mammals* Vol 1 *Germ Cells and Fertilisation* Vol 2 *Embryonic and Fetal Development* Vol 3 *Hormones in Reproduction* Vol 4 *Reproductive Patterns* CUP

Frye B. E. *Hormonal Control in Vertebrates* Macmillan

Fulton J. F. *Textbook of Physiology* Saunders

Perry J. S. *The Ovarian Cycle of Mammals* Oliver & Boyd

Sampson Wright *Applied Physiology* 10th ed OUP

9.602
Animal Physiology II — L2

Major aspects of mammalian physiology relevant to animal production, behavioural physiology, reproduction in the female and lactation, semen physiology. Introductory courses on environmental physiology, lower gut physiology, respiratory gas transport, renal function, the physiology of gene action, ageing and the problem of chemical residues will be given.

9.603
Animal Physiology III — L2T2

Mammalian physiology directed towards domestic livestock production and homeostatic mechanics. Emphasis will be placed upon techniques.

Active transport and allied membrane phenomena. Co-ordinator systems (neural, humoral), reproduction and lactation. Development physiology. General metabolism and its regulation: the physiology and metabolism of specific organs — heart, muscle, liver, kidney. The physiology of the mammalian digestive tract. Environmental physiology; adaptive mechanisms, especially in the newborn, and in heat tolerance, the immune reaction. Electrolyte physiology; acid-base equilibrium of the organism; use of clearance values in measuring renal and liver activity; respiration; physiology of the skin.

Textbooks

Donovan B. T. *Mammalian Neuroendocrinology* McGraw-Hill

Sampson Wright *Applied Physiology* 10th ed OUP

9.801
Genetics I — L2T½

Applied genetics in relation to sheep and other farm livestock. Mendelian inheritance. Chromosomes, linkage and the physical basis of heredity. Gene action in physiology, development and sex determination. Mutation. Principles of statistical genetics, strength of inheritance, selection, interrelationships, genetics and livestock improvement.

Textbooks

Bowman J. C. *An Introduction to Animal Breeding* Arnold

Falconer D. S. *Introduction to Quantitative Genetics* Oliver & Boyd

Fraser A. S. *Heredity, Genes and Chromosomes* McGraw-Hill

9.802
Genetics II — L2T2

Genetic structure of populations. Forces causing genetic change. Partition of genetic and phenotypic variation. Resemblance between relatives and estimation of genetic parameters. Direct and correlates selection responses. Aids to selection and selection indexes. Inbreeding and genetic drift. Genetic homeostasis. Genotype — environment interaction. Heterosis and its utilization. Interaction of natural and artificial selection. Limits of selective progress.

Textbooks

As for 9.801.

9.811
Biostatistics — L2T2

Random sampling. Estimation and tests of significance. Comparison of means. Regression and correlation. Analysis of variance and covariance. Factorial experiments. Multiple and curvilinear regression. Treatment of non-orthogonal data. Analysis of enumeration data. Distribution-free methods. Planning of experiments and surveys.

Textbook

Snedecor G. W. & Cochran W. G. *Statistical Methods* 6th ed Iowa State UP

9.901
Rural Extension — L2T2

Objective and agencies. Research-extension relationships. Educational, psychological and sociological aspects and principles. Program planning involving analysis of the situation, determination of objectives, establishment of priorities and assessment of rural-socio-economic factors. Presentation of programs including aims, educational procedures in presentation, channels and techniques. Evaluation of extension.

Textbook

Rogers E. M. *Diffusion of Innovations* Collier Macmillan

Graduate Study

9.105G
Advanced Livestock Production — L4

Advanced aspects of the principles of animal production with particular emphasis on physiology and endocrinology. Biostatistics and population genetics. Parasites. Management to maximize economic return.

9.503G
Wool Study — L2T4

Place of wool in world trade and the economic life of Australia. Wool quality, fleece defects. Principles of wool processing in relation to the preparation of the clip. Wool areas of the Commonwealth. Wool terms. Types, yield. Wool classing. Wool scouring and carbonizing. Vegetable fault. Methodology of wool commerce. Australian Wool Commission types and valuation.

9.711G
Advanced Wool Technology — L2T2

Biology of fibre growth: histology, fibre arrangement, morphology and fleece genetics. Modern concepts of fibre growth and structure. Advances in fibre physics and fibre chemistry. Wool metrology and conditioning house procedures. Principles of conversion of raw wool to finished goods. Impact of recent developments.

9.902G
Techniques of Laboratory and Field Investigation — L2T2

Experimental method. Design of experiments. The survey approach. Co-operative farm trials. Experiment station investigations. Controlled environmental work in the laboratory. Agronomic studies; plant ecology, plant improvement, field plots, fertilizer trials. Animal studies. Genetic investigations. Fertilization, growth and development. Conversion efficiency for wool, meat and milk. Quality concepts. Special techniques and instrumentation. Small animal techniques. Plant-animal relationships. Grazing management. Economic investigations. Statistical interpretations. Systems analysis and simulation methods.

School of Mathematics

Undergraduate Study

10.001
Mathematics I

Calculus, analysis, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

Preliminary Reading List

Allendoerfer C. B. & Oakley C. O. *Principles of Mathematics* McGraw-Hill

Bell E. T. *Men of Mathematics* 2 vols Pelican

Courant R. & Robbins H. *What is Mathematics?* OUP

Polya G. *How to Solve It* Doubleday Anchor

Sawyer W. W. *A Concrete Approach to Abstract Algebra* Freeman

Sawyer W. W. *Prelude to Mathematics* Pelican

Textbooks

Blatt J. M. *Basic Fortran IV Programming Miditran Version* Computer Systems (Aust)

Shields P. C. *Elementary Linear Algebra* 2nd ed Worth

Thomas G. B. *Calculus and Analytic Geometry* 4th ed Addison-Wesley

10.011
Higher Mathematics I

Calculus, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

Preliminary Reading List

As for 10.001 plus:

Arnold B. H. *Intuitive Concepts in Elementary Topology* Prentice-Hall

David F. N. *Games, Gods and Gambling* Griffin

Felix L. *The Modern Aspect of Mathematics* Science

Huff D. *How to Lie with Statistics* Gollancz

Reid C. *From Zero to Infinity* Routledge

Textbooks

Blatt J. M. *Basic Fortran IV Programming Miditran Version* Computer Systems (Aust)

Clark C. *The Theoretical Side of Calculus* Wadsworth

Thomas G. B. *Calculus and Analytic Geometry* 4th ed Addison-Wesley

10.021
Mathematics IT

Calculus, analysis, analytic geometry, algebra, probability theory, elementary computing.

Textbooks

Blatt J. M. *Basic Fortran IV Programming Miditran Version* Computer Systems (Aust)

Greening M. G. *First Year General Mathematics* NSWUP

Saltz D. *A Short Calculus* Goodyear

10.022
Engineering Mathematics II

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; introduction to numerical methods; matrices and their application to theory of linear equations, eigenvalues and their numerical evaluation; vector algebra and solid geometry; multiple integrals; introduction to vector field theory.

Textbook

Keane A. Senior S. A. Giles E. & Prokhovnik S. J. eds *Mathematical Methods* 3rd ed Science Press

10.031
Mathematics

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; multiple integrals, matrices and their application to theory of linear equations, eigenvalues; introduction to numerical methods.

Textbook

Keane A. Senior S. A. Giles E. & Prokhovnik S. J. eds *Mathematical Methods* 3rd ed Science Press

10.032
Mathematics

Vector calculus; special functions; convolution theorem and applications; complex variable theory; Fourier integrals; Laplace transforms with application to ordinary and partial differential equations.

Textbook

Keane A. Senior S. A. Giles E. & Prokhovnik S. J. eds *Mathematical Methods* 3rd ed Science Press

10.111A
Pure Mathematics II—Linear Algebra

Vector spaces, linear transformations and matrices, change of basis. Eigenvalues and eigenvectors, generalised eigenvectors. Functions of matrices. Linear systems of differential equations including the use of Laplace transform. Inner products, orthogonalization, projections. Unitary and self-adjoint transformations. Quadratic and Hermitian forms.

10.111B
Pure Mathematics II—Analysis

Real analysis: partial differentiation, multiple integrals. Analysis of real valued functions of one and several variables. Complex analysis: analytic functions, Taylor and Laurent series, integrals, Cauchy's theorem, residues, evaluation of certain real integrals, maximum modulus principles.

Textbook

Session 2

Churchill R. V. *Complex Variables and Applications* ISE McGraw-Hill

10.121A
Higher Pure Mathematics II—Algebra

Linear Algebra: vector spaces, commutative rings, polynomials, modules, linear transformations, eigenvectors, invariant subspaces, canonical forms, linear functions, bilinear and multi-linear algebra. Group Theory: sub-groups, quotient groups, isomorphisms, Lagrange's theorem, Sylow's theorem.

Textbooks

Clark A. *Elements of Abstract Algebra* Wadsworth

Hoffman K. & Kunze R. *Linear Algebra* Prentice-Hall

10.121B
Higher Pure Mathematics II—Real and Complex Analysis

Construction of reals; uniform convergence; implicit and inverse function theorems; analytic functions; Laurent and Taylor series; calculus of residues.

Textbooks

Session 1

Williamson R. E. & Trotter H. F. *Multivariable Mathematics: Linear Algebra, Differential Equations, Calculus* Prentice-Hall

Session 2

Knopp K. *Elements of the Theory of Functions* Dover

10.211A
Applied Mathematics II—Mathematical Methods

Review of functions of two and three variables, divergence, gradient, curl; line, surface, and volume integrals; Green's and Stokes' theorems. Special functions, including gamma and Bessel functions. Differential equations and boundary value problems, including vibrating string and vibrating circular membrane; Fourier series.

Textbooks

Boas M. L. *Mathematical Methods in the Physical Sciences* Wiley

Spiegel M. R. *Advanced Mathematics for Scientists and Engineers* Schaum

Spiegel M. R. *Theory and Problems of Vector Analysis* Schaum

10.221A
Higher Applied Mathematics II—Mathematical Methods

As for 10.211A but in greater depth.

Textbooks

Queen N. M. *Vector Analysis* McGraw-Hill

Rabenstein A. L. *Introduction to Ordinary Differential Equations* Academic Int ed

10.331 ✓
Statistics SS

An introduction to the theory of probability, with finite, discrete and continuous sample spaces. The standard elementary univariate distributions; binomial, Poisson and normal; an introduction to multivariate distributions. Standard sampling distributions, including those of χ^2, t and F. Estimation by moments and maximum likelihood (including sampling variance formulae, and regression); confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to experimental design: fixed, random and mixed models, involving multiple comparisons and estimation of variance components.

Textbooks

Statistical Tables

Freund J. E. *Mathematical Statistics* 2nd ed Prentice-Hall

or

Kreyszig E. *Introductory Mathematical Statistics* Wiley

School of Psychology

Undergraduate Study

12.001
Psychology I — F L3T2

An introduction to the content and methods of psychology as a behavioural science, with special emphasis on (a) the biological and social bases of behaviour, (b) learning, and (c) individual differences.

The course includes training in methods of psychological enquiry, and the use of elementary statistical procedures.

Textbooks

Lumsden J. *Elementary Statistical Method* revised ed WAUP

Mednick S. A. Higgins J. & Kirschenbaum J. *Psychology: Explorations in Behavior and Experience* Wiley

or

Morgan C. T. & King R. A. *Introduction to Psychology* 5th ed McGraw-Hill

Selected *Scientific American* reprints, as advised by the School

School of Textile Technology

Undergraduate Study

13.111
Textile Technology I

Testing: Principles and practice of sampling textile materials. Statistical techniques. Physical testing of fibres and yarns. *Yarn Manufacture:* Introduction, historical development. Principles and practices of manufacture of yarns on the cotton and worsted systems. *Fabric Manufacture:* Principles of weaving. The mechanics of shedding, picking and beating up. Secondary and auxiliary mechanisms of looms. Elementary cloth structures. Warp and weft yarn preparation. Principles of drafting. Cloth setting theories.

Textbook

Booth J. E. *Principles of Textile Testing* 3rd ed National Trade Press

13.112
Textile Technology II

Part A. Testing: Physical testing of fabrics. Evaluation of the serviceability of textile fabrics. Qualitative and quantitative assessment of damage in textile materials. *Part B. Yarn Manufacture:* Principles and practice of yarn manufacture for wool on the woollen system and for other natural fibres such as silk, flax, jute, etc. Fancy yarns, paper yarns, twistless yarns. Manufacture of yarns from man-made fibres and blends with natural fibres. *Part C. Fabric Manufacture:* Elements of woven fabric design. Compound cloths, extra threads. Jacquard woven

fabrics. Woven fabric analysis. Principles of knitting. Basic warp and weft knitted structures. Elementary knitted fabric geometry. The mechanics of loop formation. *Part D. Dyeing and Finishing:* General descriptions of properties of dyes, dyeing assistants, solvents used in dyeing, water supplies and water treatment, machinery used in dyeing, classification and methods of application of dyes, textile printing methods. Objects of finishing and typical flow diagrams, the principles underlying and the technology of processes concerned with: the removal of impurities and discoloration; the improvement and elimination of deficiencies in properties of textile fibres.

Textbook

Peters R. H. *Textile Chemistry* Vol 2 Elsevier

13.113
Textile Technology III

Part A. Testing and Yarn Manufacture: Functions of quality control. The organisation and integration of a quality control department in a textile factory. Fault investigation. Recent developments and trends in industrial textile testing methods. Recent research and development in yarn manufacture. *Part B. Fabric Manufacture:* Pile fabric production, tapestries, gauzes and carpets. Pirnless weaving. Narrow fabric weaving. Circular weaving. Tufting, non-woven fabrics. Double knit structures and mechanisms. Needle selection for fabric decoration. Loop transfer for decoration and garment shaping. Hosiery manufacture. Multi-bar warp knitting. Laid-in fabrics. Raschel knitting. Stitch bonded fabrics. Basic garment assembly. *Part C. Dyeing and Finishing:* The production of specified dimensions in textile fabrics. The development of specific properties: mechanical, surface finishes, protective finishes.

13.211
Textile Science I

Production, properties and uses of textile fibres. Fibres, rubbers and plastics. Addition and condensation polymerization. Chemical constitution and reactivity of the natural and man-made fibres. Optical microscopy and birefringence of fibres. Electron microscopy, X-ray diffraction and infra-red absorption. Molecular and morphological structure of fibres, crystallinity and orientation of polymers. First and second order phase transitions. Relationship between molecular structure and mechanical properties of fibres.

Textbook

Peters R. H. *Textile Chemistry* Vol 1 Elsevier

13.212
Textile Science II

Adhesion theory of friction, differential friction effects of wool, friction in textile processing. Static electrification of textile materials. Yarn structure, idealized helical yarn geometry, fibre migration, mechanics of twisted continuous filament and staple yarns. Structure of plied and blended yarns. Molecular interactions in fibres, elastomeric theory, viscoelasticity, spring and dashpot models. Eyring's theory of rate processes. Physical properties of macromolecular structures. Sorption in fibres. Polymerization kinetics, molecular weights of polymers, copolymers. Properties of surfactant solutions, micelle formation, surfactants as emulsifiers and detergents, detergency.

Textbook

Hearle J. W. S. Grosberg P. & Backer S. *Structural Mechanics of Fibres, Yarns and Fabrics* Vol 1 Intersci

13.213
Textile Science III

Mechanical properties and rheological behaviour of fibres and fibre assemblies. Physical properties of textile materials including water adsorption, electrical properties, heat and moisture transfer. Comfort of clothing. Thermal insulation properties. Geometry of woven, knitted and non-woven fabric structures. Composite materials. Aspects of colour, colour mixing and colour vision. Introduction to adsorptiometry, spectrophotometry and tristimulus colorimetry. Measurement and specification of colour. Applications of colour measurement.

Textbook

Wright W. D. *The Measurement of Colour* 4th ed Adam Hilger

13.223
Advanced Textile Chemistry

Chemistry of amino acids and proteins. Photochemistry of fibres and dyes. Physical-chemical concepts of dyeing.

Textbook

Bird C. L. & Boston W. S. *The Theory of Coloration of Textiles* Dyers Co Publ Trust

13.233
Advanced Textile Physics

(a) General analysis of textile structures. Flexure and torsion of a twisted yarn. Flexure and shear properties of fabrics. Mechanisms of fabric deformation.

(b) Varieties of macromolecules. Interactions with macromolecular structures. The physical properties of polymeric solids (including biopolymers). Absorption and the role of water in polymers.

13.311
Textile Engineering I

Mill illumination. Elements of strength of materials — tension, compression, shear, torsion and bending. Dynamics of rotary motion and mechanical power transmission. Industrial electricity.

13.312
Textile Engineering II

Fluid flow. Applied heat, steam, air and heat transfer, air conditioning. Elements of automatic control. Introduction to Methods Engineering.

13.313
Advanced Textile Engineering

(a) Same as (a) in 13.233 Textile Physics.
(b) Heat and mass transfer. Conveying of gases, fluids and solids.

School of Accountancy

Undergraduate Study

14.081
Introduction to Financial Analysis

Aims to provide students, other than those enrolled within the Faculty of Commerce, with an understanding of the basic concepts and principles necessary to make effective financial management decisions.

The nature of financial management; the business environment; financial analysis, planning and control; capital investment decisions; organization of the financial structure; operating and working capital management; growth and development; and the causes and prevention of financial instability and failure.

Specific industry studies.

Textbook

Pierson G. & Bird R. *Business Finance* McGraw-Hill

14.501
Accounting and Financial Management IA

The basic concepts of financial model building and information systems, including the double-entry recording system, the accounting cycle, income measurement and financial reporting, and an introduction to basic elements of taxation and auditing.

Textbooks

Carrington A. S. Battersby G. B. & Howitt G. *Accounting—An Information System* Whitcombe & Tombs

Haskell D. J. Kingston N. & Williams J. F. *Students Guide to Accounting and Financial Management* Jolyon

May R. G. Mueller. G. G. & Williams T. H. *A New Introduction to Financial Accounting* Prentice-Hall

14.511
Accounting and Financial Management IB

Development of basic concepts introduced in Accounting and Financial Management IA including management accounting and operations research, corporate reporting, business finance, system design, elementary computer programming and applications.

Textbooks

As for Accounting and Financial Management IA

14.602
Information Systems

Management information systems, including data collection and processing, internal control and internal reporting. System design and computer applications.

Textbooks

Alexander M. J. *Information Systems Analysis* Science Research Associates

Forkner I. & McLeod R. Jnr *Computerised Business Systems* Wiley

Grouse P. J. *An Introduction to Computer Programming in PL/1 Part 1 The Simple Subset* 2nd ed New College Publications

School of Economics

Undergraduate Study

15.001
Economics IA

Microeconomic analysis as related to some aspects of the Australian economy, including the concept of market demand, the theory of costs and production, supply and demand analysis, the determination of exchange rates, the effects of taxes, tariffs, subsidies and quotas, price and output determination under competitive and other market structures, an introduction to distribution theory and the application of economic analysis to contemporary problems.

Textbooks

Tisdell C. A. *Economics of Markets: An Introduction to Economic Analysis* Wiley

Tisdell C. A. *Workbook to Accompany Economics of Markets* Wiley

15.011
Economics IB

Macroeconomic analysis as related to some aspects of the Australian economy, including national income and product, money and banking, consumption, investment, liquidity preference, the Keynesian model of income determination and economic growth.

Textbooks

Australian National Accounts: National Income and Expenditure 1973-1974 Australian Bureau of Statistics 1975

Rowan D. C. *Output, Inflation and Growth* Aust ed Macmillan

15.002
Economics IIA

Microeconomic theory, including consumer theory, production theory, types of competition, market stability and general equilibrium.

Textbook

Hirshleifer J. *Price Theory and Applications* Prentice-Hall

15.022
Economics IIB

General equilibrium theory and welfare economics.

Textbooks

No set texts.

15.023
Economics IIIB

International trade and investment, tariffs and other restrictions, the balance of payments, external balance, the international monetary system.

Textbooks

Caves R. E. & Jones R. W. *World Trade and Payments: An Introduction* Little Brown

McColl G. D. ed *Overseas Trade and Investment* Pelican

15.042
Economics IIC

Extensions to the Keynesian model of income determination to include the government and overseas sectors and a more detailed examination of both demand and supply functions; money and financial institutions; an introduction to dynamic economics.

Textbooks

Nevile J. W. *Fiscal Policy in Australia* 2nd ed Cheshire

Rowan D. C. *Output Inflation and Growth* Aust ed Macmillan

Wrightsman D. *An Introduction to Monetary Theory and Policy* Free Press

15.043
The Soviet Economy

A study of how basic economic problems are solved in the contemporary Soviet economy within a socialist institutional framework. The emphasis is on analysis of the actual operation of the Soviet economy and on an assessment of the extent to which and the efficiency with which it meets its own posited goals. For comparative, illustrative and analytical purposes reference is also made to other East European socialist countries, including Yugoslavia.

Textbooks

Bernard P. I. *Planning in the Soviet Union* Pergamon Press

Campbell R. W. *Soviet-type Economics* Macmillan

Dirlam J. B. & Plummer J. L. *An Introduction to the Yugoslav Economy* Merrill

15.082
Labour Economics

The theory of the labour market and applications to the Australian situation, including labour supply and demand, with emphasis on structural changes in the labour force, and the effects of technology and migration; work-leisure preferences and job satisfaction; unemployment and underemployment; wage theory and practice, with reference to market forces, collective bargaining and government regulation; the Australian arbitration system and its interaction with other wage determinants; wage differentials.

Textbooks

Horn R. V. *Australian Labour Market Economics* Cheshire

McCormick B. J. & Smith E. O. eds *The Labour Market* Penguin

Niland J. R. & Isaac J. R. eds *Australian Labour Economics Readings* Sun Books

Rees A. *The Economics of Work and Pay* Harper & Row

15.053
Economic Development

The gap between the welfare of the rich and the poor nations. Earlier theories of development as a basis for an appreciation of the various economic and non-economic theories of underdevelopment; such as social and technological dualism, balanced and unbalanced growth, structural change and development. The general principles and techniques of development planning and their application in particular countries.

Textbooks

Bernstein H. *Underdevelopment and Development* Penguin

Sutcliffe R. B. *Industry & Underdevelopment* Addison-Wesley

15.003
Economics IIIA

Macroeconomic theory and policy, including an introduction to the theory of economic policy, the structure and dynamic characteristics of macro-models, recent developments in monetary theory and policy, theories of inflation and policy in a dynamic setting.

Textbooks

Makin J. H. *Macroeconomics* Holt Saunders

Nevile J. W. *Fiscal Policy in Australia* 2nd ed Cheshire

Nevile J. W. & Stammer D. eds *Inflation and Unemployment* Pelican

15.073
Natural Resource Economics

Nature of natural resources and rents, optimization of natural resource use in space and time, decision criteria in natural resource policy, natural resources and the intangible qualities of life.

Textbooks

Krutilla J. V. & Fisher H. C. *The Economics of Natural Environment. Studies in the Valuation of Commodity and Amenity Resources* Johns Hopkins UP

Pearce D. W. & Rose J. *The Economics of Natural Resource Depletion* Macmillan

15.093
Public Sector Economics

Public goods and social issues, such as poverty, health, education, transport and conservation. Analysis of case studies employing cost-benefit analysis to evaluate public projects and examine economic, social and environmental impacts of investment projects. The pricing policies of public utilities.

Textbook

Layard R. ed *Cost-Benefit Analysis* Penguin

15.501
Introduction to Industrial Relations

For students enrolled in Faculties other than Commerce and Arts. It is designed to provide a practical introduction to important industrial relations concepts, issues and procedures. Topics covered include the origins, evolution and operation of the Australian system of industrial relations, the structure and role of trade unions and employer bodies, the function of industrial tribunals such as the Australian Conciliation and Arbitration Commission and the N.S.W. Industrial Commission, wages structure and determination; employment, unemployment and retraining, the nature and causes of strikes and other forms of industrial conflict; the processes and procedures for conflict resolution.

Where appropriate to class composition, particular attention is paid to individual industries.

Preliminary Reading

Hyman R. *Strikes* Fontana*

Martin R. *Trade Unions in Australia* Penguin*

Portus J. H. *Australian Compulsory Arbitration 1900-1970* Hicks Smith

Textbooks

Isaac J. E. & Ford G. W. eds *Australian Labour Relations Readings* 2nd ed Sun Books*

Niland J. R. & Isaac J. E. eds *Australian Labour Economics Readings* Sun Books*

Rosow J. M. ed *The Worker and the Job: Coping with Change* Prentice-Hall*

15.601
Economic History IA — The Making of Modern Economic Society

The characteristics of industrial society; industrialization of the west in the nineteenth century; the 'early-starters', growth of the international economy before the first world war, 'late-starters'; integration of primary producers: the 'new imperialism', development of north America and Australasia; impact of the first world war and the breakdown of capitalism in the inter-war period; post-war reconstruction; development strategies and the problems of the 'third world'; the nature of modern capitalism.

Preliminary Reading

Hohenberg P. M. *A Primer on the Economic History of Europe* Random House *

Textbooks

Hughes J. *Industrialisation and Economic History* McGraw-Hill*

Kenwood A. G. & Lougheed A. L. *The Growth of the International Economy, 1820-1960* Australian Pub Co*

Cipolla C. ed *The Fontana Economic History of Europe* Vols III & IV Parts 1 & 2*

15.611
Economic History IB — Australian Economic Development in the Twentieth Century

The development of the Australian economy from the Long Boom and the deep depression at the end of the nineteenth century to the present day. Topics include: a general overview of Australian economic development and its main features; economic fluctuations and their consequences, especially the Great Depression of the 1930s; the rise of Australian economic institutions; changes in the philosophy of development and the role of the State; impact of war; migration and the development strategies of the States; the growth of manufacturing and the creation of an industrial base; problems of the rural sector; and changes in the Australian standard of living. Throughout the course particular attention is given to Australia's changing economic relations with other countries.

Preliminary Reading

Alexander F. *Australia since Federation* Nelson*

Textbooks

Boehm E. A. *Twentieth Century Economic Development in Australia* Longman*

Forster C. ed *Australian Economic Development in the Twentieth Century* Allen & Unwin*

Schedvin C. B. *Australia and the Great Depression* Sydney UP

Wheelwright E. L. & Buckley Ken eds *Essays in the Political Economy of Australian Capitalism* Vol 1 Australian and New Zealand Book Co*

Biological Sciences

Undergraduate Study

17.011
Biology of Mankind

Mankind Evolving: Primate evolution; background of early man.

Evolution of Technological Man: Biological problems associated with communication and tool-making; development of man as a hunting predator.

Development of Utilization of Natural Resources: Development of man as a pastoralist and farmer; animal and plant domestication.

Evolution of Urban Man, Culture, Society: Reproductive biology and genetics of man; population growth, fluctuation, control; natural history of disease, background of medical and industrial microbiology.

* Paperback.

Effects of Modern Society: Biology of social stress; effect of society in contemporary environments, planning and control.

Textbooks

Day M. H. *The Fossil History of Man* OUP

Miller G. T. *Living in the Environment* Wadsworth

Napier J. R. *Primates and their Adaptations* OUP

17.021
Comparative Functional Biology

Maintenance of the Organism: Gas exchange systems in plants and animals; transport inside organisms; uptake, digestions, absorption; enzymes structure and function; photosynthesis, process and structural relationships; metabolic systems, energy yields and pathways.

Developing Organisms: Sexual reproduction in plants and animals; general life cycle patterns; cell development and differentiation in flowering plants and mammals.

Control and Co-ordination in Organisms: Organisms and water, uptake and effects; control mechanisms, urinary systems and kidney structure and function; stimuli and responses, plant hormones, hormones in vertebrate animals, muscle activity and muscle structure, eye structure and vision mechanism; ear structure and hearing mechanism; nerves, central nervous system, nerve action, brain structure and functioning.

Textbooks

Abercrombie M. et al *A Dictionary of Biology* Penguin

Roberts M. B. V. *Biology: Functional Approach* 2nd ed Nelson

Department of Industrial Engineering

Undergraduate Study

18.121
Production Management F L3T0

Prerequisites: 10.031, 10.331.

Engineering Economy: Economic objectives of the firm. Economic measures of performance: net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment. *The Use of Human and Physical Resources:* Methods engineering, ergonomics, motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection. Plant location, factory layout. *Production and Quality control:* Control of jobbing, repetitive batch and continuous production. Manufacturing organizations, functions, inter-relationships and information flow. Sampling techniques in quality control, control charts. *Introduction to Inventory Control:* Analysis of some engineering planning decisions. *Introduction to Operational Research:* The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queuing theory, inventory models, simulation.

Textbooks

Lu F. P. S. *Economic Decision-making for Engineering and Managers* Whitcombe & Tombs

Mayer R. R. *Production and Operations Management* 3rd ed McGraw-Hill

Moore P. G. *Basic Operational Research* Pitman

18.551
Operations Research F L2T1

Prerequisites: either *5.071 and 18.021* or *10.031, 10.331 and 18.121.*

The formulating and optimization of mathematical models. The development of decision rules. Some techniques of operations research such as mathematical programming, queuing theory, inventory models, replacement and reliability models, and simulation will be introduced. These techniques will be applied to situations drawn from industrial fields, eg production planning and inventory control. Practical problems of data collection, problem formulation and analysis will be included.

Textbook

Taha H. A. *Operations Research: An Introduction* Macmillan

School of Chemical Technology

Undergraduate Study

22.101
Introduction to Chemical Technology S2 L2

An option in 5.030 Engineering C.

Philosophy and structure of courses in chemical technology. Materials of construction. Safety procedures. Environmental problems — air and water pollution, waste disposal, water recirculation. Preparation of flow sheets. Brief resume of some important industrial processes. The use of a computer as a tool. Writing of simple programs. Methods of supplying data. Use of programmable calculators. The Library: how it functions. The Library as a source of data. Machine based information retrieval.

22.112
Chemical Process Equipment F L1

Co- or prerequisite: 2.001.

Review of services in the chemical industry; the principles of operation, construction and fields of application of equipment used in carrying out various processes and operations in the chemical industry.

22.113
Industrial Chemistry Processes — F L1½T2

Prerequisites: 2.002A, 22.112. Co- or prerequisites: 2.002B, 2.042C.

A study of the production of inorganic industrial chemicals from the standpoint of the application of the basic principles of inorganic and physical chemistry (acid industries, alkali industries, industrial gases, electric furnace products, superphosphates, aluminium and glass); a study of some sections of the organic industrial chemical industry — cellulose, industrial alcohols, formaldehyde, phenol, urea, phenolic and urea resins, acetic acid, polymers based on ethylene and acetylene, elastomers.

Laboratory: Students will be required to attend lectures on Report Writing, carry out laboratory assignments and attend factory inspections at local and country centres as required.

Textbook

Kent J. A. *Riegel's Industrial Chemistry* Reinhold

or

Shreve R. N. *Chemical Process Industries* McGraw-Hill

22.114
Processes — S2 L2

Prerequisite: 22.113.

Topics selected from the following will be studied in depth: refractories, high-temperature processes, high pressure processes (especially ammonia synthesis — thermodynamics and equipment), nuclear metals, industrial polymers, fermentation industries (for details see 42.114 Fermentation Processes), applied electrochemistry, applications of thermodynamics to gas/solid and aqueous systems concerned with the processing of inorganic materials.

22.122
Instrumental Analysis — F L1T2

Prerequisites: 1.001, 2.001. Co- or prerequisite: 22.132.

Basic principles of volumetric and gravimetric analysis and the application of spectrometric and selected techniques to the analysis of process streams and quality control.

Textbook

Skoog D. A. & West D. M. *Fundamentals of Analytical Chemistry* Holt Rinehart

or

Skoog D. A. & West D. M. *Principles of Instrumental Analysis* Holt Rinehart

22.123
Chemical Thermodynamics and Kinetics — F L1½T1½

Prerequisites: 2.002A, 22.132. Co- or prerequisite: 22.133, 22.153.

Thermodynamics: the laws of thermodynamics, power cycles, thermodynamics of fluids, heterogeneous equilibrium, chemical reaction equilibrium, irreversible thermodynamics.

Kinetics: kinetics of homogeneous reactions, analysis of rate equations of reversible and irreversible reactions. Design fundamentals of industrial reactors during operation under isothermal, adiabatic and non-isothermal conditions. Kinetics of polymerization processes, control of polymer properties by kinetic considerations.

Textbooks

Smith J. M. *Chemical Engineering Kinetics* McGraw-Hill

Smith N. O. *Chemical Thermodynamics — A Problems Approach* Reinhold

22.124
Applied Kinetics — S1 L2T1

Prerequisite: 22.123.

The defect solid state; solid-state diffusion; heterogeneous catalysis and heterogeneous kinetics; continuous stirred tank reactors; semibatch reactors; tubular reactors; fixed bed catalytic reactors; optimization; scale-up of reactors; residence time distributions.

Textbook

Smith J. M. *Chemical Engineering Kinetics* McGraw-Hill

22.132
Industrial Chemistry Calculations — F L1

Prerequisites: 2.001, 10.001.

Conversion of units; the role of stoichiometry in industrial chemistry; the influence of the dynamic situation; transposition of chemical and physical data; evaluation of the accuracy of data from experimental analytical measurements. Development of algorithms for the solution of selected examples relevant to the process chemical industry.

22.133
Data Processing — S1 L2T1 S2 L2T2

Prerequisites: 10.331, 22.132.

Computer programming and numerical methods: Fortran IV and Basic II programming, solution of equations (Newton-Raphson), simultaneous linear algebraic equations, numerical differentiation and integration, interpolation, ordinary differential equations, partial differential equations, least squares approximations, matrix operations, numerical optimization (Simplex method), linear programming, linear models with one and more than one independent variable, non-linear models. Application of the principles of statistics to chemical problems (z test, t test, F test and χ^2 test), analysis of variance, design of experiments, correlation and regression, quality control. Use of graphical methods; fitting empirical equations to experimental data. Preparation of nomograms using constructional determinants.

Textbooks

Crow E. L. Davis F. A. & Maxfield M. W. *Statistics Manual* Dover

Dorn W. S. & McCracken D. D. *Numerical Methods with Fortran IV Case Studies* Int ed Wiley*

McCracken D. D. *A Guide to Fortran IV Programming* 2nd ed Wiley*

* Paperback.

22.134
Applied Thermodynamics — S1 L1T1

Prerequisites: 22.123, 22.153.

Calculation of thermodynamic properties, statistical methods for calculation of thermodynamic properties of gases from spectroscopic data, thermodynamics of non-ideal solutions, polymers and the glassy state, changing standard states. A study of heterogeneous equilibria in multi-component systems with particular emphasis on systems of practical importance.

22.143
Introduction to Analog Computation

A course of eight two-hour periods devoted to lectures, demonstrations and laboratory exercises.

Analog computation, theory and application of analog computing elements, analog computer programming, solution of linear differential equations with constant coefficients, equation ordering and the elementary principles of modelling. Illustration by examples.

22.153
Material and Energy Balances — S1 L1T2

Prerequisites: 2.002A, 10.031, 22.132. Co- or prerequisite: 22.123.

Units, material balances, gases, vapours and liquids, energy balances, combined energy and material balances, unsteady-state material and energy balances.

Textbook

Himmelblau D. M. *Basic Principles and Calculations in Chemical Engineering* 2nd ed Prentice-Hall

22.154
Process Simulation — S2 L2T2

Prerequisites: 3.111, 22.113, 22.123, 22.133, 22.153, 22.163.

The application of the hybrid computer to the study of the dynamics of processes encountered in the chemical industry.

Textbooks

Karbowiak A. E. & Huey R. M. eds *Information, Computers, Machines and Man* Int ed Wiley

Luyben W. L. *Process Modelling Simulation and Control for Chemical Engineers* McGraw-Hill

Mearns A. M. *Chemical Engineering Process Analysis* Oliver & Boyd

22.163
Instrumentation and Process Control I — S2 L1½T1½

Prerequisites: 1.922, 10.031, 22.122 or 2.002D.
Co- or prerequisites: 22.113 or 22.233.

Analog computation: theory and application of basic analog computing elements, magnitude scaling and time transformation, application to solution of linear differential equations with constant coefficients.

Transducers.

Measuring instruments, indicators and recorders: analog type instruments, digital measuring instruments, data-logging systems.

Introduction to process control: block diagrams, feed-back, transfer functions, final control elements and characteristics, introduction to controllers, empirical timing of controllers.

Textbooks

Karbowiak A. E. & Huey R. M. eds *Information, Computers, Machines and Man* Int ed Wiley

Luyben W. L. *Process Modelling Simulation and Control for Chemical Engineers* McGraw-Hill

22.164
Instrumentation and Process Control II — S1 L2T3

Prerequisite: 22.163.

Analog computation: programming techniques, representation of non-linear phenomena, application to non-linear differential equations. Process dynamics: first order processes, response of single and multiple first-order systems to a variety of forcing functions, second and higher-order processes, state variable presentation of processes, the complex plane, frequency response of linear systems, identification of ill-defined processes from analysis of indicial response data. Dynamics of closed-loop systems: closed loop transfer functions, derivation of characteristic equation, performance criteria, non-linear and linear controllers, transient response of linear control systems.

Analysis and design of simple control systems: root locus method, Naslin's Method.

Textbooks

Karbowiak A. E. & Huey R. M. eds *Information, Computers, Machines and Man* Int ed Wiley

Luyben W. L. *Process Modelling Simulation and Control for Chemical Engineers* McGraw-Hill

22.174
Seminars — F T3

Co- or prerequisite: 22.184.

Students will be required to deliver two lecturettes on selected topics, one related to some aspect of chemical technology, and the other to their research project. The intention is to develop skill in oral expression, as well as ability in critical evaluation and logical presentation. Opportunity will be taken, where appropriate, to arrange for guest lecturers.

22.184
Process Analysis — S1 T1 S2 T2

Prerequisites: 22.113, 22.133, 22.163. Co- or prerequisites: 22.124, 22.134.

An assignment on the integrated design of process flow diagrams involving specification of basic chemical reactions and physico-

chemical parameters, selection of types of equipment required, statement of variables to be measured for the control of raw materials, process conditions and final product, and the preparation of a process model suitable for automatic control.

Textbook

Mearns A. M. *Chemical Engineering Process Analysis* Oliver & Boyd

22.194
Project — S1 T6 S2 T8

An experimental or technical investigation related to some aspect of industrial chemistry. Prerequisites and/or co-requisites will be determined depending on the nature of the project.

22.213
Chemical Ceramics — S1 L2T2 S2 L2T4

Prerequisites: 2.002A, 2.002C, 2.002D.
Co- or prerequisites: 22.123A, 22.233, 25.201.

Structural principles: crystal chemistry, structure of glasses, defect solid state: phase equilibria and transformations; diffusion; solid state reactions. A systematic treatment of the chemistry of ceramic products.

Students are required to take part in a series of factory inspections.

Textbook

Ford W. F. *Institute of Ceramics Textbook Series, IV Effect of Heat on Ceramics* Maclaren

22.224
Physical Ceramics — F L3T3

Prerequisites: 22.213, 22.233.

Physical Ceramics: Application of the principles of physical chemistry and solid-state physics to a study of the preparation and properties of ceramic materials. *Clay Mineralogy:* Structures and properties of the various clay minerals; techniques employed in the identification of clay minerals; composition and properties of the ceramic clays of New South Wales.

Textbooks

Budworth D. W. *An Introduction to Ceramic Science* Pergamon

Kingery W. D. *Introduction to Ceramics* Wiley

22.231
Introductory Ceramic Engineering — S2 L2

An option in 5.030 Engineering C.

The nature of ceramics. Classification of materials. The materials science approach. History of Ceramics. The ceramic engineer and society. The origin, classification, physical properties and uses of clay minerals and other non-clay raw materials. Principal unit operations used in the ceramic industry. Drying and firing of ceramics, melt forming, pot forming and other forming procedures.

22.233
Ceramic Process Principles — F L1T2½

Prerequisites: 22.231, 22.232.

Review of raw materials and principal unit operations used in the ceramic industry. Plasticity in a clay-water system. Drying and firing calculations. Polymorphism. Firing and heat transfer considerations. Effect of porosity on fired ceramics. Calculations involving ceramic suspensions. Glass, glaze and porcelain enamel calculations. Relationship between the composition and physical properties of glasses. Rational analysis of clay and fluxing materials. Body formulation. Testing methods and instrumentation in quality control.

Students are required to take part in a series of factory inspections.

Textbooks

Ford R. W. *Institute of Ceramics Textbook Series, III Drying* Maclaren

Griffiths R. & Radford C. *Calculations in Ceramics* Maclaren

Moore F. *Institute of Ceramics Textbook Series, II Rheology of Ceramic Systems* Maclaren

Worral W. E. *Institute of Ceramics Textbook Series, I Raw Materials* Maclaren

22.232
Ceramic Engineering I — S2 L2

Co- or prerequisites: 3.311, 7.023, 22.232.

The principles of operation, construction and fields of application of equipment used in the mining, preparation, and fabrication of raw materials, and the drying and firing of ceramic products.

22.234
Ceramic Engineering II — F L2T2

Prerequisites: 3.111, 8.112, 22.233, 22.232.

Advanced treatment of fluid flow and heat transfer: non-Newtonian fluids and unsteady-state heat transfer. A detailed study of ceramic engineering unit operations: filtration, forming, drying and firing. Ceramic engineering design including design of dryers, kilns and glass tanks. Design of simple steel structures. Power transmissions. Pollution control equipment.

Students are required to take part in a series of factory inspections.

22.294
Project — S1 T6 S2 T9

An experimental or technical investigation or design related to some aspect of ceramic engineering. Prerequisites and/or co-requisites are determined depending on the nature of the project.

22.303
Polymer Science — S1 L2 S2 L2T2

Prerequisites: 2.002A, 2.002B, 10.031, 10.331.
Co- or prerequisites: 3.111, 22.113.

Polymerization processes; stepgrowth and chain growth (free radical and ionic), stereospecific catalysts. Methods of polymerization: bulk suspension, emulsion, solution, high pressure. Industrial examples. Principles of analysis of polymers using chemical and instrumental methods.

Molecular weight applied to macromolecules: Number-, weight-, viscosity- and z-average molecular weights. Molecular weight distribution. Thermodynamics of polymer solutions, theta solvent. Measurement of molecular weight. Fractionation methods.

Conformation of a polymer chain. The crystalline state. The amorphous state. Stress/strain behaviour. Creep. Impact. Rubber elasticity. Dynamic mechanical properties. Principles of operation of polymer processing equipment; safety procedures. Polymer compound design.

Textbooks

Lenz R. W. *Organic Chemistry of Synthetic High Polymers* Wiley

Cowie J. M. G. *Polymers, Chemistry and Physics of Modern Materials* Intertext

Treloar L. R. G. *The Physics of Rubber Elasticity* Clarendon

McKelvey J. M. *Polymer Processing* Wiley

22.314 Polymer Chemistry — S2 L1

Prerequisite: 22.303

Inorganic polymers, polymers for high temperature service, the use of modern instrumental methods for establishing composition and structure of high polymers.

22.324 Physical Chemistry of Polymers II — S2 L1

Prerequisite: 22.303.

Selected topics from basic texts and the original literature, covering anionic polymerization, polymer degradation, polymer rheology, polymer visco-elasticity, fracture and environmental stress cracking, polyelectrolytes.

22.334 Polymer Physics II — S2 L2

Prerequisite: 22.303.

Rubber elasticity, extrusion plastometry, rheological aspects of polymer processing operations.

Textbook

McKelvey J. M. *Polymer Processing* Wiley

22.341 Statistical Techniques — S1 L1T1

Prerequisite: 10.331.

The application in the Polymer industry of the z test, t test, χ squared test and F test, correlation of one and two variables, single factor and two factor analysis of variance.

Textbook

Crow E. L. Davis F. A. & Maxfield M. W. *Statistics Manual* Dover

Graduate Study

22.110G Process Evaluation — F L1T2

Critical scientific and economic evaluation of industrial chemistry processes and research and development procedures. Process methodology, physico-chemical data and their implications, equipment and control parameters. Novel and controversial chemical processes relevant to the Australian chemical industry.

22.120G Machine Computation In Chemical Technology — S1 or S2 L2T4

Applied numerical methods for solution of industrial chemistry problems; statistical methods including non-linear and multiple regression; model discrimination and experimental design methods; plant tests and product quality control experiments; numerical optimization techniques.

22.130G Chemical Reactor Analysis and Control — S1 or S2 L2T4

Concepts of heat and mass transfer; analysis of fixed-bed catalytic reactors; fluidized beds and catalytic risers; residence time distributions; maximum mixedness and segregated flow; multiple steady states; control of tubular and stirred tank reactors.

22.131G Catalysts and Applied Reaction Kinetics — S1 or S2 L2T4

Methods of catalyst preparation and characterization; adsorption theories; general mechanisms for gas-phase reactions catalyzed by solids; poisoning and catalyst decay; effectiveness factors; techniques in catalytic research; special topics in reaction kinetics including gas-solid non-catalytic reactions, polymer kinetics, electrochemical reaction kinetics and electrocatalysis; industrial catalytic processes; application of statistical methods to the solution of complex chemical data.

22.140G Chemical Process Simulation — S1 or S2 L2T4

The simulation of chemical process models using analog and digital computers. Analog and digital computer simulation techniques. The role and application of hybrid computers to the chemical industry, including simulation techniques.

Optimization of chemical reactions by simulation. The economics of simulation. Practical simulation studies of selected industrial chemical processes.

22.141G
Modelling In Chemical Technology — S1 or S2 L2T4

Basics of modelling methods and their relationship to chemical industry.

The modelling of dynamic physico-chemical processes common to the chemical industry including the systems and subsystems approach; continuous- and discrete-time physical process models; lumped- and distributed-parameter models; evolution of models from fundamental physico-chemical principles. Approximation methods for complex and ill-defined chemical processes. Integrated chemical process models.

22.142G
Chemical Process Control — S1 or S2 L2T4

Data acquisition from chemical instrumentation and its application to the control of chemical processes. Modern control techniques in the chemical industry including non-linear control, linear digital control, multivariable process control systems, and optimal control.

22.150G
Instrumental Analysis for Industry — F L1T2

Role of analysis in process optimization. Accuracies of analytical methods compared to needs for quality control. Frequency of analysis in relationship to control and analytical costs. Importance of speed of analysis for information feed-back. Case studies for selected processes in relation to selecting the analytical method.

22.160G
Industrial Electrochemistry — S1 or S2 L2T4

Fundamentals of electrodes, the Butler-Volmer equation, current/potential laws in relationship to reaction mechanism. Electrocatalysis, gas evolution and co-deposition. Technological aspects of electrochemistry; energy conversion systems, storage systems and plating. Industrial processes—cell design and side reactions, gas bubble effect, current distribution and mass transfer effects. Developments in electrode technology, diaphragms and cell construction. Automation and control for optimum conditions.

22.161G
Electrochemical Techniques for Control and Analysis — S1 or S2 L2T4

In-depth study of selected electroanalytical methods with respect to theoretical principles, instrumentation and practical utilization. The importance of adsorption and reaction mechanism on accuracies and application. Steady state and rapid scan voltammetry, stripping voltammetry, chronopotentiometry, chronocoulometry, classical coulometry and potentiometry. Instrument design and modification for specific needs.

22.210G
Solid State and Mineral Chemistry — F L2

Principles of crystal chemistry; structures of selected crystal types and glasses. Thermodynamics of solid systems; phase relations. Defects in crystals; non-stoichiometry. Solid state diffusion. Thermodynamics and kinetics of solid state reactions. Hydrothermal reactions.

Stability of compounds at elevated temperatures; effect of heat on clay minerals; hydrothermal reactions between silica and lime; volatility of compounds; reactions in nuclear fuels; solid state electrolytes; biodegradation of rocks and minerals. Chemical strengthening of ceramics.

22.220G
Refractory Technology I — S1 or S2 L4T2

Chemical Property and Service Behaviour: This subject deals with the study of chemical reactions occurring between refractories and reaction products produced in typical industrial situations. It will provide a basis for evaluating the predicting refractory performance in the manufacture of ferrous and non-ferrous metals, glass, enamels and cements. A detailed consideration of the chemical reactions occurring between refractories and solid, liquid and vapour phases will be made. Laboratory experiments and demonstrations will form part of the course.

Candidates will be expected to have a background knowledge equivalent to that expressed in the syllabus for 22.213 Chemical Ceramics (Session 1).

22.221G
Refractory Technology II — S1 or S2 L4T2

Engineering Properties and Applications: This subject deals with the philosophy and methods of development of refractories, the thermodynamic stability and volatility of high temperature materials and the manufacture and testing of refractory materials in industry. A detailed consideration is given to the composition, structure, and properties of typical refractory materials such as silica, alumino silicate, high alumina, basic and zirconia materials and special single and mixed oxides, carbide, nitrides and oxynitrides. Furnace and kiln design is studied with respect to limitations imposed by the refractories used. Laboratory experiments and demonstrations will form part of the course.

Candidates will be expected to have a background knowledge equivalent to that expressed in the syllabus for 22.233 Ceramic Engineering I.

22.230G
Chemistry of Glass Melting — S1 or S2 L3T3

Pre- or co-requisites may be specified depending on student's background

Glass structure—property relations; melting reactions and rates; refining; analytical techniques; economics of glass compositions; melting and refining agents; process chemistry; chemical durability; glass colour; glass-refractory reactions; phase transformations. Laboratory exercises.

22.300G
Polymer Science — S1 or S2 L6T4

Polymer Processes

Classification of polymers; methods of polymerization: bulk, solution, emulsion, suspension, high pressure; processes: step growth, chain growth; the chemistry and applications of polymer systems including polyesters, polyamides, phenolic condensation resins, vinyl polymers, synthetic elastomers. Natural polymers.

Mechanism and Kinetics

Step growth polymerization, kinetics, structure effects; chain growth polymerization. Free radical polymerization, chemistry and properties of free radicals and initiators; kinetics of propagation and termination reactions; co-polymerization; monomer radical structure and reactivity. Cationic and anionic polymerization; stereoregular polymers.

Polymer Characterization

Molecular weight: averages and distributions; thermodynamics of polymer solutions; theta temperature; fractionation methods; measurement of number-average molecular weight and weight-average molecular weight.

Polymer Physics

Principles of operation of conventional polymer processing equipment; safety procedures; polymer compound design; stress/strain behaviour of polymers in tension, compression, shear and flexure; elementary rheological behaviour of polymers; rubber elasticity; thermal characteristics of polymers.

22.310G
Analytical Characterization of Polymers — S1 or S2 L4T4

Composition of formulated polymeric material. Group reactions, specific and colour reactions. Instrumental characterization of polymers, and co-polymers and associated additives eg plasticizers, antioxidants etc. by UV and IR spectrophotometry and pyrolysis gas chromatography. Analysis of films by transmission and reflectance spectrophotometric methods. Thermal analysis.

22.330G
Polymer Engineering — S1 or S2 L4T2

Natural and synthetic elastomers; vulcanization, theory and method. Cross-linked thermoplastics. Extrusion. Press, injection and transfer moulding. Adhesives. Heat sealing and welding. Latices. Films. Cellular polymers. Fibre reinforced plastics. Mould design. Physical testing-standards and air conditioning; basic principles; testing machines; thermal, electrical and optical properties; accelerated ageing; preparation of standard test compounds; creep; dynamic mechanical tests; rubber in shear; abrasion; flammability. Polymer engineering applications and design data.

22.340G
Polymer Physics — S1 or S2 L4T2

Chain dimensions. Diffusion and viscosity. Segmental motion and the glass temperature Tg: factors affecting Tg. Crystallinity, thermodynamic and kinetic parameters. Viscoelastic behaviour of polymers; creep. Maxwell fluid and Kelvin-Voigt solid models. Boltzmann superposition principle; stress relaxation, relaxation and retardation time spectra, WLF curves; dynamic behaviour, elastic hysteresis, damping. Stress/strain behaviour in polymers. Chemical stress relaxation in elastomeric networks. Fracture mechanisms and impact strength of polymers. Kinetic theory of rubber elasticity.

22.900G
Major Project

A substantial experimental project on some aspect of industrial chemistry, ceramic engineering or polymer science involving at least 6 hours study per week for one year or its part-time equivalent.

22.901G
Minor Project

A minor experimental or technical investigation on some aspects of industrial chemistry, ceramic engineering or polymer science involving attendance for not less than 3 hours per week for one year or its part-time equivalent.

School of Nuclear Engineering

Graduate Study

23.051
Nuclear Power Technology — L2½T½

Nuclear processes, reaction rates, fission and energy release. Neutron multiplication, slowing down and diffusion. Nuclear reactor criticality and burnup, neutron kinetics and reactor control.

Thermal and fast reactor types, operation, environmental and safety aspects. Nuclear fuel enrichment and utilization, nuclear power costing and economics.

Heat generation and removal, fluid dynamics and heat transfer aspects of gas and liquid coolants, boiling, two phase flow and burnout. Structural mechanics in reactor technology, thermomechanical performance of fuel pins and pressure vessels.

School of Applied Geology

Undergraduate Study

25.011
Geology I

Physical Geology: The origins, structure and main surface features of the earth; geological cycle: processes of erosion, transportation, sedimentation and lithification. Surface and sub-surface water. Weathering, lakes, rivers, glacial phenomena. Vulcanism, earthquakes, orogenesis and epeirogenesis, integrated theory of plate tectonics and continental drift.

Crystallography and Mineralogy: Crystal symmetry, systems, forms, habit, twinning. Occurrence, form and physical properties of minerals. Mineral classification. Descriptive mineralogy. Principal rock forming minerals. Basic structures of silicate minerals.

Petrology: Field occurrence, lithological characteristics and structural relationships of igneous, sedimentary and metamorphic rocks. Coal, oil and ore deposits.

Stratigraphy and Palaeontology: Basic principles of stratigraphy; introductory palaeontology. The geological time scale. The geological history of the Australian continent and more specifically that of New South Wales in introductory outline.

Practical Work: Preparation and interpretation of geological maps and sections. Map reading and use of simple geological instruments. Study of simple crystal forms and symmetry. Applied stereoscopic projection. Identification and description of common minerals and rocks in hand specimen. Recognition and description of examples of important fossil groups. Supplemented by four field tutorials, attendance at which is compulsory.

Textbooks

Black R. M. *Elements of Palaeontology* CUP

Judson S. Deffeyes K. S. & Hargraves R. B. *Physical Geology* Prentice-Hall

Rutley F. *Elements of Mineralogy* Read H. H. ed Murby

Tyrrell G. W. *The Principles of Petrology* Methuen

25.012
Geology IIA

Structural Geology: Origin, classification and description of structures in sedimentary, igneous, and metamorphic rocks. The stereographic projection of structural elements, and analysis of simple fracture and fold systems. Tectonics.

Mineralogy, Igneous and Metamorphic Petrology: Principles of optical crystallography and the use of the polarizing microscope. Chemical and physical properties of the main groups of minerals. Occurrence, genesis and classification of igneous rocks. Magmatic crystallization and differentiation. Simple binary and ternary systems. Origin and classification of metamorphic rocks. ACF and AKF diagrams and metamorphic facies. *Practical:* Mesoscopic and microscopic examination of rock forming and ore minerals, igneous and metamorphic rocks.

Photogeology: The use of air photos for geological mapping and geomorphological evaluation of land. Techniques and principles of photo interpretation, multi-band photography; landform genesis and photo interpretation of folds, faults, joints, bedding, limestone, intrusive igneous rocks, volcanics, alluvial fans and terraces, slopes, landslides, coastal arid and tropical landforms; relations between geology, drainage, soil and vegetation; orebody expression, gossans, colouration halos.

Textbooks

Structural Geology

Ragan D. M. *Structural Geology—An Introduction to Geometrical Techniques* 2nd ed Wiley

Hobbs B. E. Means W. D. & Williams P.F. Outline of Structural Geology Wiley

Mineralogy, Igneous and Metamorphic Petrology:

Bloss F. D. *An Introduction to the Methods of Optical Crystallography* Holt Rinehart & Winston

Mason B. & Berry L. G. *Elements of Mineralogy* Freeman

Hyndman P. W. *Petrology of Igneous and Metamorphic Rocks* McGraw-Hill

Fyfe W. S. *Geochemistry* OUP

Deer W. A. Howie R. A. & Zussman J. *An Introduction to the Rock Forming Minerals* Longman

Photogeology:

Von Bandat H. F. *Aerogeology* Gulf Pub

25.022
Geology IIB

Stratigraphy and Palaeontology

Stratigraphy: Flow regime and bedding forms including flume experiments, sedimentary structures. Modern and ancient environments of deposition: fluvial, deltaic coastal, shelf, slope and deep sea environments. The facies concept. Stratigraphic principles. Fold belts, geosynclines and their interpretation by plate tectonics models. Stratigraphic and structural development of a fold belt (Lachlan Fold Belt) and an intraeratonic basin (Sydney Basin).

Palaeontology: Morphology and stratigraphic distribution of the Protozoa, Porifera, Coelenterata, Bryozoa, Brachiopoda and Mollusca. Practical examination of representative fossils from each phyla.

Textbooks

Blatt H. Middleton G. & Murray R. *Origin of Sedimentary Rocks* Prentice-Hall

Brown D. A. Campbell K. S. W. & Crook K. A. W. *Geological Evolution of Australia and New Zealand* Pergamon

Dunbar C. O. & Rodgers J. *Principles of Stratigraphy* Wiley

Moore R. C. Lalicker C. G. & Fischer A. G. *Invertebrate Fossils* McGraw-Hill

25.013
Geology IIIA

Economic Geology A: Principles and theories of ore formation. Magmatic, hydrothermal, submarine exhalative ore, and vulcanicity. Ore deposits and modern global tectonics. Biogenic processes, sedimentary ore deposits. Alluvial and residual deposits. Description of specific deposits illustrating various types of mineralization.

Laboratory: Hand specimen study of ores and associated features; introductory mineragraphy.

Mineralogy and Petrology

Mineralogy: Further optical crystallography; determination of refractive indices. Laboratory methods of mineral separation. Principles of X-ray diffraction; simple application of X-ray powder cameras and diffractometers.

Igneous Petrology: Igneous activity at convergent and divergent plate boundaries. High pressure and low pressure fractionation. Influence of H_2O, CO_2 and O_2 on melting relationships. Primary magmas. Magmatic lineages. Mantle inhomogeneity. Significance of trace element and isotope studies.

Sedimentary Petrology: The influence of transportation, deposition and diagenesis on the composition, texture and structure of detrital sedimentary rocks including limestones. The classification of the detrital sedimentary rocks. The chemically formed sedimentary rocks including the phosphates, zeolites, evaporites, ferruginous and siliceous deposits. Introduction to coal petrology.

Textbooks

Economic Geology A

Park C. F. & MacDiarmid R. A. *Ore Deposits* 2nd ed Freeman

Stanton R. L. *Ore Petrology* McGraw-Hill

Mineralogy and Petrology

Carmichael I. S. Turner F. J. & Verhoogen J. *Igneous Petrology* McGraw-Hill

Blatt H. Middleton G. & Murray R. *Origin of Sedimentary Rocks* Prentice-Hall

25.023 Geology IIIB

Geophysics

Global Geophysics: The physics, shape, structure and constitution of the earth: seismology, gravity, geology, geothermy, geomagnetism, palaeomagnetism, geo-electricity and geochronology. Geotectonics and geodynamics: geophysical expression and relation to geology and geochemistry. *Exploration Geophysics:* Introductory course in exploration geophysics covering the following methods: seismic, electrical, electromagnetic, gravity, magnetic and radioactive with applications mining, petroleum, engineering, hydrology and well logging.

Stratigraphy and Palaeontology

Stratigraphy: Theoretical stratigraphy including stratigraphic classification, reference points and stratotypes, correlation by fossil zones and physical methods. Continental margins, mobile zones, with a detailed study of the New England Fold Belt. Comparison between mobile zones and intracratonic basins. Intracratonic basins of Western and Southern Australia and effects of the dispersal of Gondwanaland. Mesozoic to Recent sedimentation in Papua New Guinea. Stratigraphic and structural development of aulacogenes. *Palaeontology:* Principles of systematics. Theory of evolution. Functional morphology and biostratigraphic significance of arthropods, echinoderms and graptolites. Introduction to Palaeobotany. Practical applications of palaeontology.

Field Mapping

Geological mapping in a complicated geological terrain with emphasis on stratigraphical and structural interpretation. Geological report writing and cartography.

Textbooks

Geophysics

Bott M. H. P. *The Interior of the Earth* Arnold

Dobrin M. B. *Geophysical Prospecting* McGraw-Hill

Stratigraphy and Palaeontology

As for Stratigraphy and Palaeontology in 25.022 with:

Krumbein W. C. & Sloss L. L. *Stratigraphy and Sedimentation* Freeman

25.033 Geology IIIC

Mathematical Geology and Geological Surveying

Mathematical Geology: An introduction to the mathematical techniques and concepts which may be applied to the analysis of geological data. Measurement scale, probability axioms, frequency analysis and basic geostatistics. Sampling theory and techniques. FORTRAN computer programming forms a substantial part of the course with programming exercises in the analysis of map information and other geological data. Quantitative map interpretation with emphasis on trend surface analysis and automatic contouring techniques.

Geological Surveying: Levels, tacheometers and theodolites. Field techniques. Precision of angular measurements. Stadia surveying. Levelling. Field computations. Topographic maps.

Geochemistry and Petrology

Geochemistry: Some modern methods of rock and mineral analysis. Accuracy, precision and quality of geochemical data. The distribution of elements in terrestrial rocks. Norms.

Clay Mineralogy: The structures and properties of the clay mineral groups including the kandites, illites, smectites, chlorites, mixed layered and fibrous clay minerals. Techniques for the identification of the clay minerals. Clay-water systems and ion exchange. Chemical weathering and the origin of the clay minerals.

Metamorphic Petrology: Facies series. Metamorphic reactions. Isograds. Mineral assemblages as geobarometers and geothermometers. Fluids in metamorphism. Fabric. Relationships of deformation and recrystallization. Metamorphic petrology of Australia.

Practical: Macroscopic and microscopic study of igneous and metamorphic rocks.

Advanced Structural Geology

Analysis of structural elements at the microscopic, mesoscopic and macroscopic scales. Modern methods of analysis, especially petrofabric analysis and A.V.A. Detailed studies of the analysis of metamorphic terrains, e.g. Otago Schists; Cooma Complex.

Sedimentary Basin Analysis and Geology of Hydrocarbons

Basin evolution. Analysis of sedimentary and palaeoecological systems in fluvial deltaic, nearshore and deepwater environments. Structural systems formed by tensional, compressional and strike-slip tectonics. Geochemistry of hydrocarbons and formation fluids. Factors critical to occurrence of oil, gas and coal. Typical Australian and overseas occurrences. Techniques of exploration, assessment and development of reserves.

Field Mapping and Remote Sensing

Field Mapping: Field mapping in a complex geological terrain, with concentration on the structural geology of deformed and metamorphosed sequences. Writing geological reports, and drafting geological maps.

Remote Sensing:

Exercises in the combined usage of air photos and ERTS imagery for the interpretation of regional and structural geology.

In addition, one of the following topics are selected after consultation with the Head of School:

1. *Economic Geology B, Mineragraphy, Experimental Petrology*

Economic Geology B: Detailed study of selected major deposits representing particular types of mineralization—geological setting, petrology, mineralogy and genetic aspects. Experimental work in ore genesis—isotope studies, trace elements, phase equilibria, inclusions in minerals.

Mineragraphy: Reflected light optics: orthoscopic and conoscopic rotation phenomena, determinative methods, textural interpretation of ores.

Experimental Petrology: Theoretical Petrology. Phase diagrams. Application of thermodynamics to petrological problems. Experimental petrology.

Laboratory: Economic Geology and Mineragraphy: Study of regional setting, current research, petrology and mineragraphy of selected deposits dealt with in lectures.

2. *Micropalaeontology*

Morphology, stratigraphic distribution and significance of the principal microfossil groups: foraminifera, ostracoda, conodonts, spores and pollen, dinoflagellates, coccoliths and chitinozoa. Extraction techniques.

3. *Surficial Geology*

Processes—weathering and landforms, mass movement, gully and sheet erosion. Fluvial processes and drainage development. Aeolian, glacial, periglacial and coastal processes. Neotectonics. Soil and surficial sediment evaluation—pedological processes, gilgai formation. Soil fabric analysis at all scales. Principles of surficial stratigraphy.

Map analysis and preparation—contour patterns of landforms; geological and geomorphic interpretation of topographic maps. Soil classification, soil map preparation, lithogeomorphic maps. Problems of mapping Quaternary geology.

Quaternary geology—methods of dating, sea level change, glacial sequences, surficial geology of non-glaciated areas of Australia—especially the Riverine Plain. Quaternary sequences in Canada and Europe.

Textbooks

Mathematical Geology and Geological Surveying

Davis J. C. *Statistics and Data Analysis in Geology* Wiley

Blatt J. *Introduction to FORTRAN Programming* Prentice-Hall

Davis R. E. Foote F. S. & Kelly J. W. *Surveying* McGraw-Hill

Geochemistry and Petrology

Ahrens L. H. *Distribution of the Elements in our Planet* McGraw-Hill

Zussman J. *Physical Methods in Determinative Mineralogy* Academic

Loughnan F. C. *Chemical Weathering of the Silicate Minerals* Elsevier

Miyashiro A. *Metamorphism and Metamorphic Belts* Allen & Unwin

Advanced Structural Geology

As for Geology II together with:

Turner F. J. & Weiss L. E. *Structural Analysis of Metamorphic Tectonites* McGraw-Hill

Sedimentary Basin Analysis and Geology of Hydrocarbons

As for Structural Geology II and Stratigraphy II & III together with:

Ager D. V. *Principles of Palaeoecology* McGraw-Hill

Economic Geology B, Mineragraphy and Experimental Petrology

Economic Geology of Australia and Papua New Guinea Aus Inst Min Met Melbourne

Edwards A. B. *Textures of the Ore Minerals* 2nd ed Aus Inst Min Met Melbourne

Ehlers E. G. *The Interpretation of Geological Phase Diagrams* Freeman

Micropalaeontology

Glaessner M. F. *Principles of Micropalaeontology* MUP 1955 Hafner reprint 1963

Surficial Geology

Hunt C. B. *Geology of Soils, Their Evolution, Classification and Uses* Freeman

Thornbury W. D. *Principles of Geomorphology* 2nd ed Wiley*

Geology IV

The course consists of 25.014, 25.024, 7.023 *or* 25.074, plus *one* option chosen from 25.034, 25.044, 25.054 and 25.064.

25.014 Advanced Applied Geology

Computer Applications in Geology: Advanced methods in mathematical geology, including time series analysis, Markov chain analysis, deterministic simulation of sedimentary processes such as delta formation. Classification procedures including R & Q cluster analysis techniques, factor analysis as applied to facies delineation. A major section of the course is devoted to processing geological data using library programs available on the computer.

Exploration Geophysics: An introductory course in the practice, theory and interpretation of geophysical methods of exploration in petroleum, mineral deposits and engineering geology, extending beyond Exploration Geophysics of Geology III.

Seminar: A weekly participatory activity.

Textbooks

Computer Applications in Geology

Davis J. C. *Statistics and Data Analysis in Geology* Wiley

Exploration Geophysics

Dobrin M. D. *Introduction to Geophysical Prospecting* 2nd ed McGraw-Hill.

Parasnis D. S. *Mining Geophysics* 2nd ed Elsevier

25.024 Project

An individual field assignment carried out under supervision and consisting essentially of geological mapping plus supporting laboratory work.

Options

25.034 Engineering Geology

Introductory Geomechanics: Engineering classification behaviour, and tests of rocks and soils. Stress and strain: elasticity and plasticity, stress distribution in virgin rock masses, about excavations, and beneath foundations.

Hydrogeology: Hydrological cycle; aquifers: fluid flow in rocks and soils; hydraulic properties of rocks. Hydrogeological mapping and maps. Pollution of groundwater. Arid zone hydrology.

Environmental Geology: Geology in urban development and regional planning. Terrain evaluation, with special reference to beaches. Rehabilitation.

Site and Material Investigations: Methods and field tests. Petrography, physical and chemical properties of concrete aggregates, road and earth construction materials. Quarry sites and borrow areas.

Engineering Geology: Geology in civil engineering investigations. Geological factors in the design and construction of various civil engineering undertakings. Stability of slopes and open cuts.

Geological Surveying: Triangulation. Closed and open traverses. Coordinates and their computation. Plane tabling. Hydrographic surveying. Mine surveying. Principles of cartography and map projections. Principles of photogrammetry.

Textbooks

Heath R. C. & Trainor F. W. *Introduction to Groundwater Hydrology* Wiley

Krynine D. P. & Judd W. R. *Principles of Engineering Geology and Geotechnics* McGraw-Hill

Davies R. E. Foote F. S. & Kelly J. W. *Surveying* McGraw-Hill

* Paperback.

25.044
Mineral Exploration

Mineral Exploration: Theory and application of exploration techniques, including geochemical prospecting and soil-gas geochemistry; remote sensing and radiometric surveys. Geological appraisal, exploratory drilling. 'Proving' ore discoveries. Cost factors in exploration.

Geochemistry: Sampling and sample preparation. Principles of the analysis of silicate rocks by X-ray fluorescence spectrometry; accuracy and precision. Acquisition and interpretation of geochemical data. A field and laboratory project is an essential part of the course.

Students taking this option are required to take 7.023.

Textbooks

Lawrence L. J. *Exploration and Mining Geology* Aus Inst Min Met Melbourne

Jenkins R. & de Vries L. *Practical X-ray Spectrometry* 2nd ed Philips Tech Library Eindhoven

25.054
Sedimentary Basins

Lectures, tutorials and a laboratory project in Advanced Sedimentology, Palaeontology, Palaeoecology and Petroleum Geology.

Textbooks

Levorsen A. I. *Geology of Petroleum* 2nd ed Freeman

Loeblich A. R. & Tappan H. *The Treatise on Invertebrate Palaeontology* Part C *Protista* Geol Soc America 1964

25.064
Applied Geophysics

Exploration and applied geophysics, its practice, theory and interpretation in petroleum, mining and engineering exploration and in applied geology.

Textbook

Grant F. S. & West G. F. *Interpretation Theory in Applied Geophysics* McGraw-Hill

25.074
Special Project

A field-laboratory project related to the option selected by the student.

25.0303
Geology for Geomorphologists and Pedologists

Prerequisites: Geoscience II A and B

Clay Mineralogy: The structure and properties of clay minerals. Techniques for their recognition. Clay-water systems and ion exchange. Some applied aspects of clay mineralogy. Laboratory work to illustrate the above course.

Sedimentary Petrology: The chemistry of rock weathering. The chemically formed sedimentary rocks including the phosphates, zeolites, evaporites, ferruginous and siliceous deposits. The distribution of trace elements in sedimentary rocks.

Sedimentology: Methods of sediment analysis and sediment parameters. Laboratory flume experiments. Selected stratigraphic topics.

Textbooks

Folk R. L. *Petrology of Sedimentary Rocks* Univ of Texas Press

Loughnan F. C. *Chemical Weathering of Silicate Minerals* American Elsevier

Milner H. B. *Sedimentary Petrography* 4th ed Arnold

25.101
Geology for Engineers I

Outline of the main branches of geology and their application to Mining Engineering. Introduction to geomorphological processes and resulting landforms. Fundamentals of the atomic structure of minerals including major rockforming minerals and ore minerals, their crystal symmetry, their physical and chemical properties. *Igneous Rocks:* formation, texture, composition and classification of the more important igneous rocks. *Sedimentary Rocks:* processes of formation and depositional environment, composition and classification. *Metamorphic Rocks:* metamorphic processes and metamorphic structures, classification and description of metamorphic rocks. Physical properties of rocks including porosity, permeability and capillarity. Weathering processes of rocks and minerals. Deformation of rocks and the resulting effects such as folds, faults, joints and foliation. An introduction to modern theories of tectonism. Integration of geological observations.

Practical Work: Laboratory work consists of exercises related to the Lecture course: geological mapping including structure contour problems. Study of minerals and rocks in hand specimens.

Field Tutorials: Two field tutorials are conducted at which attendance is compulsory. Satisfactory reports must be submitted.

Note Total hours: 56. The course is divided equally between lectures and laboratory work. Field Tutorial hours are additional.

Textbooks

Blyth F. G. H. & Defritas M. H. *A Geology for Engineers* 6th ed Arnold

Ernst W. G. *Earth Materials* Prentice-Hall

Rutley F. *Elements of Mineralogy* Read H. H. ed 26th ed Murby

25.102
Geology for Mining Engineers II

Palaeontology and Stratigraphy: Principles of stratigraphy. The uses of fossils in stratigraphic correlation and bore logging.

Structural Geology: Elements of structural geology. Stereographic projection and fracture analysis applied to mining operations.

Geology of Fuels: Origin of coal, oil and natural gas. Stratigraphic and structural considerations of oil and coalfields.

Hydrogeology: Principles of hydrogeology. Transmission of ground water in rocks and soils applied to mining operations.

Ore Deposits: Mineralogy of industrially important metallic and non-metallic minerals. Theories of ore formation including secondary enrichment processes.

Exploration Procedures: Theories and application of exploration techniques in mineral and coalfield exploration including geological and geophysical methods.

Field Tutorial: A geology field excursion will be held at the end of Session 1. Attendance is compulsory.

Textbooks

Brown D. A. Campbell K. S. & Crook K. A. W. *The Geological Evolution of Australia and New Zealand* Pergamon

Ragan R. *Structural Geology* 2nd ed Wiley

Rutley F. *Elements of Mineralogy* Read H. H. ed 26th ed Murby

Park F. Jr. & MacDiarmid R. A. *Ore Deposits* 2nd ed Freeman

Lawrence L. J. *Exploration and Mining Geology* Vol 2 VIII Comm Min and Met Congress 1965

25.1021R
Geology for Mining Engineers IIA

Prerequisite: 25.101

Elements of stratigraphy, palaeontology and petrology. Environments of formation and tectonic setting of sedimentary, metamorphic and igneous rocks. Descriptive structural geology. Interpretation of geological maps. Ore genesis. Descriptive mineralogy of ore deposits. Introductory mineragraphy. Weathering and element redistribution. Geological, geochemical and geophysical aspects of exploration. Processing of exploration data.

Laboratory Work: Examination of rocks in hand specimen and thin section. Examination of hand specimens of economic minerals. Mineragraphic examination of ore mineral suites. Study of geological maps of economic mineral deposits.

25.1022R
Geology for Mining Engineers IIB

Prerequisite: 25.101

Structural geology; Wulff and Schmidt net problems and rose diagrams. Applications of structural analysis in the study of structure of ore deposits and mine design. Regional stress distribution in rock masses. Residual stress fields. Occurrence of placer ore deposits. Descriptive mineralogy of non-metallic deposits such as phosphates, clays, shales, limestones, rock construction materials, abrasives, and refractories. Groundwater geology: pressure, flow and storage of water in rocks, with particular reference to fissured rock masses. Energy resources: the geology of coal, oil, natural gas, uranium and geothermal power. Sampling: statistics, errors, limitations and methods.

Laboratory Work: Exercises in structural analysis including the analysis of structure of an ore deposit. Hand specimen examination of non-metallic economic minerals. Exercises in groundwater hydrology.

25.141
Advanced Engineering Geology

Prerequisite or co-requisite: 8.272 Civil Engineering Materials I

The fabric of rocks at various scales; fabric analysis at the mesoscopic scale; the influence of anisotropy on rock properties; engineering applications. The role of geological structure in determining the stability of slopes and excavations; probability analysis of structures in slope studies; case histories. Petrography of rock and earth construction materials; fabric changes with weathering; soil fabrics; engineering aspects and engineering classification of weathered rocks.

Textbook

Ragan D. M. *Structural Geology* 2nd ed Wiley

25.201
Mineralogy (Applied Science Course)

Crystallography, crystalline state and crystal growth of minerals. Fundamentals of the atomic structure of minerals, with examples of Bravais lattices and introduction to space lattice group theory. Physical properties of crystals; cleavage, gliding, secondary twinning, elasticity. Elements of crystal optics in polarized light. Classification, descriptive mineralogy and occurrence of primary and secondary minerals with special emphasis on economic metallic and non-metallic minerals. Introduction to petrology. Mode of formation of minerals and ores in the igneous, sedimentary and metamorphic cycles. Examples of principal types of economic mineral deposits, their mode of formation, paragenesis, textures and intergrowths. Elements of fuel geology, construction and refractory materials. *Laboratory: Crystallography*—Examination of crystals and crystal models for symmetry. Stereographic projection of crystals. *Optical Mineralogy*—Examination of minerals and rocks in transmitted and incident light using the polarizing microscope. Determination of refractive indices of crystal fragments by the immersion method. *Descriptive and Determinative Mineralogy*—Macroscopic examination of common minerals with emphasis on economic minerals. Study of texture and intergrowths of common mineral parageneses including the principal rock types in which they occur.

Textbooks

Hurlbut C. S. ed *Dana's Manual of Mineralogy* Wiley

Rutley F. *Elements of Mineralogy* Read H. H. ed 26th ed Murby

Graduate Study

25.121G
Engineering Geology

Design and execution of site investigation projects. Terrain evaluation. Discontinuities in rock masses; analysis, influence on engineering properties of rocks. Microfabric and microtexture of rocks. Residual tectonic stresses. Engineering classification and description of weathered rocks and soils. Discontinuities, anisotropy, and weathering in design and construction. Residual tectonic stress fields. The geological and geomorphic bases of slope stability analyses. Transmission of vibrations through rock and soil. Aseismic design. Laboratory work will be related to the lecture course.

Textbook

Phillips F. C. *The Use of the Stereographic Projection in Structural Geology* Arnold

25.331G
Applied Geophysics I

Seismic Methods: The theory, interpretation, application and practice of seismic exploration. Seismic ray theory: the propagation, reflection and refraction of seismic waves. Analysis of seismic records and the interpretation of seismic travel-time data in terms of depths and velocities of the layers with plane and irregular interfaces. Seismic sources and recording systems in marine and land applications. Basic instrumental, field and computing techniques of signal enhancement. Synthetic seismograms. Geological interpretation in petroleum engineering and other applications and case histories.

Electrical Methods: Introduction to galvanic and electromagnetic methods in geophysics with applications to mineral, groundwater and other engineering applications. Electrical properties of rocks and minerals. Quantitative interpretation of conduction methods. Electrochemical mechanisms of spontaneous and induced polarization effects. The effect of electrode arrays in galvanic methods. Time and

frequency domain equivalents in induced polarization and electromagnetic methods. Theory of electromagnetic induction and electromagnetic induction methods: Natural and applied electromagnetic field methods, including audio-frequency, magneto-telluric, continuous wave and transient systems in ground and airborne applications. Basic instrumentation and field procedures. Qualitative and quantitative interpretation of the above techniques; their interrelation and integration with other geophysical methods in exploration and their geological interpretation.

Gravity and Magnetic Methods: Field procedures, instrumentation, measurement and reduction in gravity and magnetic methods. Relevant physical properties of rocks and minerals. Introduction to potential theory, Laplace and Poisson equations, and their application in geophysical exploration. Spherical harmonics. Continuations and second derivatives of potential fields and introductory filter theory. Interpretation of anomalies due to distributions having simple geometrical shapes and two and three dimensional distributions of arbitrary shapes. Determination of depths and the qualitative interpretation of aeromagnetic surveys. Case histories and applications in petroleum and mineral exploration.

Radioactive, Thermal and Other Ancillary Methods in Ground and Airborne Remote Sensing Applications: The application of geophysical techniques to bore-hole logging in petroleum engineering and mineral exploration.

Textbooks

Grant F. S. & West G. F. *Interpretation Theory in Applied Geophysics* McGraw-Hill

Keller G. V. & Frischknecht F. C. *Electrical Methods in Geophysical Prospecting* Pergamon

25.333G
Applied Geophysics IIA

A more advanced treatment of seismic, electrical, electromagnetic, gravity and magnetic methods of geophysical exploration.

Seismic: Wave theory and the propagation of elastic waves in continuous, layered and inhomogenous media; direct, reflected, refracted, surface and guided waves. Interpretation techniques with variable velocity conditions. Advanced computer processing of seismic data and specialized instrumental, field and computer techniques of signal/noise improvement and data enhancement. Further geological interpretation in petroleum and engineering applications. *In situ* and laboratory determination of elastic properties of rocks.

Electrical Methods: A more advanced treatment of galvanic and inductive methods of geophysical exploration. Analog and digital modelling and interpretation in galvanic and inductive methods. Considerations of design and application of various electrical methods to geological problems; geological interpretation of electrical and other integrated geophysical methods in exploration.

Magnetic and Gravity Methods: An advanced treatment of filter theory in potential methods: the design and use of specific filters in data reduction. Further treatment of the interpretation of potential field anomalies due to two and three dimensional distributions. Computer applications in the reduction, processing and interpretation of magnetic and gravity data. Geological interpretation of geophysical potential field data.

A More Advanced Treatment of Radioactive and Thermal Remote Sensing Techniques, and of Downhole Geophysical Methods: Practical interpretation of well log data.

Textbooks

Grant F. S. & West G. F. *Interpretation Theory in Applied Geophysics* McGraw-Hill

Keller G. V. & Frischknecht F. C. *Electrical Methods in Geophysical Prospecting* Pergamon

25.335G
Applied Geophysics Project Assignment

A project involving interpretation of geophysical field data which may be collected by the students.

25.337G
Geophysical Procedures

Selection of geophysical methods, field procedures, features and limitations of geophysical methods, interpretation of results, the place of geophysical methods in integrated exploration programs, geophysical case histories, costs and logistics.

25.338G
Computer Applications in Exploration and Mining Geology

Probabilistic approaches to regional exploration and target area delineation; systems approach to exploration planning; drilling patterns and intersection probability; computerized ore reserve computation; optimum mine design and discounted cash flow analysis.

25.339G
Geology in Exploration

Ore genesis theories in exploration, ore environments, ore environment extrapolation in time and space, synthesis in exploration, regional patterns of ore occurrence in relation to modern tectonic theory, guides to mineralization. Evaluation of outcrops and size and depth predictions. Geology and evaluation of detrital deposits and of non-metallic deposits.

25.340G
Geochemical Prospecting

Review of geochemical methods; geochemical prospecting as related to types of mineralization, topography and climate; soil, rock and soil gas geochemistry; stream and stream sediment geochemistry; airborne methods; biogeochemical and geobotanical prospecting; geochemical case histories, costs and logistics.

25.341G
Remote Sensing

The electromagnetic spectrum and the physics of remote sensing, active and passive sensing, conventional photography in exploration, black and white and colour infra-red photography in exploration, low sun-angle photography, side-looking air radar, gamma ray spectrometry, thermography, ERTS, case histories in remote sensing.

25.343G
Mineral Economics, Leasing Law and Management

Principles of mineral economics, metal prices, price fluctuations, imports and exports, policy formulation by companies and by governments; mining law in Australia with special reference to land tenure and lease acquisition; organizing and managing a mineral exploration venture, personnel management.

25.344G
Field and Laboratory Methods in Exploration

Tutorials and demonstrations both in the field and the laboratory in the use of various instruments relevant to mineral exploration. The work in this course is directed particularly, but not exclusively, toward the Field Project.

25.402G
Hydrogeology

Surface and sub-surface methods of geological and geophysical investigation; well logging; lithology and structure of rocks in relation to groundwater storage and quality. Geological characteristics of aquifers. Hydrogeological maps. Hydrogeological systems analysis, including computer methods. Hydrogeology of arid and semi-arid zones. Groundwater resources evaluation. Case history studies. The laboratory work will include the study and interpretation of hydrogeological data. A field tutorial is included in the course.

Textbooks

Walton W. C. *Groundwater Resource Evaluation* McGraw-Hill

Davis S. N. & De Wiest R. J. M. *Hydrogeology* Wiley

Heath R. C. & Trainor F. W. *Introduction to Groundwater Hydrology* Wiley

25.404G
Environmental Geology

Geological hazards: seismic risk, landslides, subsidence, floods, erosion, volcanic eruptions, discrete and continuous hazards, event return time. Geological resources and their management: types of resources, use and potential environmental conflict, resource economics and policy formulation. Waste disposal and the mineral industry, reclamation and rehabilitation of land used for extractive purposes. Swamp drainage. Geology and urban planning: map preparation, multiple land use principle, aesthetic criteria for landscape evaluation. Coastal environmental geology: sand mining, land use conflicts, off shore mining and impact of engineering works, estuarine pollution, investigation techniques. Environmental impact of dams, roads, explorative and extractive stages of mining, impact statement techniques, case studies. Communication of geological information to technical and non-technical people. Geological legislation for water resources and waste disposal.

25.421G
Foundation Geology

Mechanics of failure in rock and soils. The distribution of stress beneath foundations. Geological factors in the design of building, bridge, and dam foundations. Foundations of airfield runways, and of roads. Groundwater and foundations.

Textbook

Krynine D. P. & Judd W. R. *The Principles of Engineering Geology and Geotechnics* McGraw-Hill

25.701G
Subsurface Geology and Pollution Control

Lithology of main rock types involved in subsurface waste disposal; mass properties of rocks affecting fluid flow, porosity, permeability, capillarity and their inter-relationships. Elements of structural geology, stratification, lenticularity, folding, faulting, unconformities; use of structural contours in subsurface geology; interpretation of simple geological maps. Hydrostatic and hydrodynamic conditions in subsurface flow of liquids and gases; reservoir engineering topics, compressibility, rock pressure. Design and cementation of casing strings; importance of preservation of subsurface waters, especially fresh water aquifers; rational exploitation of subsurface water for domestic and industrial use. Technology of subsurface disposal of wastes — liquid, gaseous and solid, including radioactive wastes. Some ethical considerations and statutory requirements of governmental bodies. Investigation of sedimentary basins and individual structures for waste injection. Case histories, eg, Rocky Mountain Arsenal Well.

School of Geography

Undergraduate Study

27.001
Applied Physical Geography L2T4

Introduces the physical basis of geography. Principles of meteorology. Climatic types and world climate patterns. Hydrologic cycle and water balance. Geologic and climatic factors in landforms and soils. Mass movement and slope form, river action and valley features. Concepts of landscape evolution. Coastal processes and forms. Soil properties, classes and distribution. Soils in the landscape. Spatial organization of plants and animals over the earth's surface and the processes underlying their organization. Characterization of plant communities and ecosystems. Composition, structure, dynamics and classification of vegetation and ecosystems. Vegetation dynamics and patterns. Land systems illustrating the interaction of physical and biological factors. Man as a geographic agent. Weather recording and analysis of climatic data. Use of maps and air-photos. Elementary map-making. Methods of describing soils, vegetation and land systems.

Includes three compulsory one-day field excursions equivalent to twenty-four tutorial hours.

Textbooks

Bridges E. M. *World Soils* CUP*

Corbett J. R. *The Living Soil* Martindale

Miller A. *Meteorology* Merrill*

Twidale C. R. *Geomorphology* Nelson*

Whittaker R. H. *Communities and Ecosystems* Macmillan*

* Paperback.

27.011
Applied Economic Geography I — L2T4

Session 1: Basic concepts and approaches employed in the study of space economy. Spatial interaction and the analysis of movement patterns; location, land use, rent theory and comparative advantage; location of manufacturing; location of service activities and the central place system; spatial aspects of economic growth and development. Australian case studies are stressed. Laboratory classes deal with acquisition and handling of data.

Textbooks

Hammond R. & McCullagh P. S. *Quantitative Techniques in Geography* OUP

Hurst M. E. *A Geography of Economic Behaviour* Duxbury

Session 2: The role of urban areas as focal points in the structure and organization of the space economy. The spatial structure and growth of urban networks and the internal characteristics of urban areas. Topics include: the evolution of city systems; urban growth processes; location, size and spacing of urban areas; the internal structure of cities; an economic analysis of urban problems; urban and regional policy. Laboratory classes deal with statistical methods in economic geography.

Textbooks

Hammond R. & McCullagh P.S. *Quantitative techniques in Geography* OUP

Yeates M. & Garner B. *The North American City* 2nd ed Harper & Row

27.002
Applied Economic Geography II — L3T3

Classical and more recent adaptations of location theory, in particular those of Weber, Greenhut, Losch and Isard; spatial price theory and the location of the firm. Methods of location analysis: comparative cost analysis, input-output, spatial interaction models, linear programming, resource assessment in economic terms. Location policies and problems in differing economic systems.

27.013
Advanced Methods in Economic Geography — L1T1½

Student projects based on instruction in research design, data sources, field methods; collection, classification and analysis of data. Mathematical background to regression, multivariate techniques and linear models. Laboratory work includes use of CYBER and HP 30 digitizer and plotter.

27.003
Applied Economic Geography III — L3T3

Models of urban economic structure; the structural growth of cities with particular consideration given to residential location and urban renewal. Cost-benefit analysis. Urban transportation problems and planning. Urban poverty and public policy. Urban public finance and the distribution of urban functions in multi-level government; urban revenue sources. Public finance in relation to resource allocation and growth. The course deals exclusively with Australia.

Textbook

Hirsch W. Z. *Urban Economic Analysis* McGraw-Hill

27.014
Advanced Methods in Physical Geography — L1T1½

Student projects based upon instruction in research design, data sources, field methods, collection, classification and analysis of data. Includes a mathematical background to regression, multivariate techniques, linear models. Laboratory work includes use of CYBER and HP 30 digitizer and plotter.

Textbook

King L. J. *Statistical Analysis in Geography* Prentice-Hall

27.023
Population Geography — L2T3/4

Population growth and contrasts in growth patterns between underdeveloped, modernizing and developed countries. Growth dynamics and their relation to physical and human resources. The demographic transition as a unifying theme. Population densities in urban and rural areas: case studies are drawn mainly from Western Europe, Southeast Asia and Australia. Social and economic factors in international and internal migration. Spatial interaction between the populations of rural areas and cities, and between cities. Fertility and mortality variations within and between regions, countries and cities. Urbanization of population. Stable and stationary population theory. World population problems. Workshop tutorials are concerned with session projects.

Textbooks

Demko E. J. Rose H. M. & Schnell G. A. *Population Geography: A Reader* McGraw-Hill*

Wilson M. G. A. *Population Geography* Nelson*

Zelinsky W. Kosinski L. A. & Mansell R. *Geography and a Crowding World* OUP

27.103
Climatology — L2T3½

Components of the radiation and heat balance of the earth surface as affected by differing atmospheric, soil and surface cover conditions. Factors controlling evaporation and transpiration under freely-available and restricted water supply conditions, and methods for the measurement and estimation of evapotranspiration. Characteristic patterns of energy and water exchange for differing types of natural or man-modified land surface. Man's modification of factors affecting the local climate in rural and urban settings. Climatic change.

Laboratory work is directed toward developing an appreciation of the operational principles and limitations of instruments commonly used in radiation and water balance studies. An introduction is given to the practical application of energy and water balance models for evaluation of the climatic environment as related to catchment hydrology, agricultural productivity and land resource management problems.

Textbook

Sellers W. D. *Physical Climatology* Chicago UP.

27.104
Bioclimatology — L2T3½

Energy exchange between organism and environment in typical habitats of distinctive plant communities. Characteristics of water balance components as related to plant community attributes and meteorologi-

* Paperback.

cal factors. Wind profiles and aerodynamic characteristics as affected by height, density and structure of plant communities. The soil microclimate: thermal and moisture characteristics, soil aeration properties; their relation with biological processes. Periodic biological phenomena as related to climate (phenology), and climatic factors in the migration of organisms and the transport of insects, spores and pathogens. Models for assessment of plant growth and development. Climate as related to human physiology and comfort.

Laboratory work consists of measurements and observations of the aerial and soil microclimate and interpretation of environmental data for purposes of bioclimatic assessment and classification.

27.113
Urban Geography — L2T3/4

The geography of cities in the context of economic and cultural systems, social and political processes, and historical perspectives. Foundations of urban geography; the city in under-developed countries and planned economies; the city as an eco-system; problems of urban size; growth centres and urban planning; interurban and intraurban movement and linkages; urban residential preferences and spatial differentiation; urban environmental quality and the perceived urban environment. Weekly seminars, and laboratory and field work of a practical nature to include urban survey techniques.

27.124
Geographic Thought and Perspectives — L1T2

A series of seminars throughout the year on the development of geographic thought and ideas. In Session 1 the seminars are concerned with topics related to students' projects, while in Session 2 the major geographic traditions and emergent theories related to students' special interests are discussed.

27.203
Biogeography — L2T3½

Ecosystems, their structure and dynamics. Energy flow and biogeochemical cycles. Comparative photosynthetic capacity of plants. Productivity, exploitation, pollution, management and conservation of ecosystems. Man as as ecological agent.

Quantitative sampling, measurement and description of vegetation. Spatial distribution (pattern) of individual species. Association between species.

Ecology of tropical and sub-tropical regions with special reference to Australia. Floristic composition, structure and physiognomy of the principal vegetation formations of Australia (rain forest, woodland, shrubland, heath and grasslands). Geographical affinities of component species. Environmental and biotic controls. Adaptations of plants to humid and arid conditions. Vegetation management under humid and arid conditions.

Field work forms an integral part of the course.

Textbooks

Kershaw K. A. *Quantitative and Dynamic Plant Ecology* 2nd ed Arnold

Odum E. P. *Fundamentals of Ecology* 3rd ed Saunders

27.204
Advanced Biogeography — L3T6

Taxonomic biogeography. Variation and delimitation of species. Dispersal, distribution and discontinuities of taxa. Endemic and relict species. Geological, ecological and biotic determinants of species distributions. Biotic regions and the problem of their reality and definition. Oceanic islands, evolution and biogeographic theory.

Community biogeography. Quantitative analysis of vegetation. Variation and delimitation of communities. Survey, classification, ordination and mapping of vegetation. Correlation with environment. Identification of environmental and other controls determining the distribution of vegetation and of individual component species.

Aspects of applied biogeography. Assessment and management of natural resources. Conservation of ecosystems. Use of vegetation in ground water, mineral and geological survey and exploration in Australia. Medical geography and human ecology. The role of statistics in the study and utilization of biogeographical variation and covariation.

Two field tutorials: a field project of about one week to investigate plant communities in a selected environment and a two-day excursion for comparative study of a contrasting environment.

Textbooks

Good R. *The Geography of the Flowering Plants* 3rd ed Longman

Greig-Smith P. *Quantitative Plant Ecology* 2nd ed Butterworths

Orloci L. *Multivariate Analysis in Vegetation Research* W. Junk The Hague

Usher M. *Biological Management and Conservation: Ecological Theory, Application, Planning* Chapman & Hall

27.303
Transportation Geography — L2T3/4

The analysis of the transportation system in terms of its relationships with economic and geographic indicators. Focus on network analysis, flow studies, modal systems, circulation theory, impact studies, transport and economic development, and the urban transportation problem.

Laboratory classes involve practical application of pertinent methodology, while seminars stress the consideration of major problem areas in transportation in Australia.

Textbook

Eliot-Hurst M. E. *Transportation Geography* McGraw-Hill*

27.304
Advanced Economic Geography — L4T2

Approaches to the study of the space economy with emphasis on the spatial problems of economic growth and development. Problems raised are viewed from a planning perspective.

Textbooks

Bolch B. & Huang C. *Multivariate Statistical Methods for Business and Economics* Prentice-Hall

Richardson H. *Regional Growth Theory* Macmillan

* Paperback.

27.323
Marketing Geography L2T3/4

The relationship between consumer spatial behaviour and the pattern or structure of marketing establishments. Organization and operation of the marketing function with emphasis upon the pattern of consumer orientated enterprises and the structure of market areas in intra-urban areas. Spatial behaviour of consumers including search and decision processes. Workshop seminars on term project, analytical techniques and issues raised in lectures.

Textbooks

Engel J. F. Kollatt D. T. & Blackwell R. D. *Consumer Behaviour* Holt Rinehart & Winston
Scott P. *Geography and Retailing* Hutchinson*

27.333
Agricultural Geography L2/3T3

Physical, economic, political, and other cultural factors involved in origin and change of agricultural landscapes. Spatial patterns of agriculture as the result of individual and group decisions. Innovation diffusion as the process of farming change. Problems of agricultural modernization in South East Asia. Planning in rural areas, especially the impact on agriculture of competing land uses. Examples mainly drawn from Australasia.

Workshop/seminar classes include treatment of methods of inquiry into agricultural geographical problems and discussion of selected topics.

Textbooks

Morgan W. B. & Manton R. J. C. *Agricultural Geography* Methuen*
Powell J. M. ed *The Making of Rural Australia* Sorrett*

27.413
Geomorphology L2T4

Advanced work in selected areas of coastal and fluvial geomorphology. The characteristics of waves in deep and shallow water. Beaches and coastal barrier systems; lagoons and estuaries. Rock platforms. Quaternary sea-level changes. Drainage basin morphometry; hill-slope geometry and hydrology. Runoff and sediment yields and their controlling factors. Variations in geomorphic processes between regions; the impact of human activity. Field projects are undertaken in both coastal and fluvial components. Laboratory time is devoted to statistical exercises using data collected from maps, airphotos and in the field.

Textbooks

Bird E. F. C. *Coasts* ANUP*
Gregory K. J. & Walling D. E. *Drainage Basin Form and Process* Arnold

27.423
Pedology L2T4

History of Pedology. Morphological, physical and chemical properties of soil. Soil forming processes; rock weathering, silicate formation. Great Soil Groups; soil classification; soil-landscape relations and periodicity. Physical and chemical aspects of soil fertility; nutrient cycles; soil microbiology. Laboratory classes upon the measurement of soil properties; soil profile description; soil survey and mapping; analysis of soil maps. Up to five days field tutorials are an essential part of the course.

27.414
Advanced Geomorphology L3T4

The history of geomorphology and the development of geomorphic thought. The application of model studies and the monitoring of process and change in hillslope, shoreline, fluvial or dune environments. Studies of correlative sediments. Absolute dating of landforms and determination of rates of denudation with special reference to Australian geochronology. Applied geomorphology. There will be supporting laboratory and tutorial classes, and a field tutorial of about one week before the beginning of Session 1 traversing geomorphic environments in south-eastern Australia.

27.424
Advanced Pedology L3T4

Experimental pedology including clay mineral transformations and micromorphology. Soil physical and chemical properties; their interrelationships, including physical and chemical stability of soil aggregates, soil water and its movement, soil strength. Soil erosion and its control. Modern techniques of mapping and classifying soil; land assessment. Practical applications of soil studies to environmental problems.

27.504
Projects in Applied Geography

Biogeography and Bioclimatology: study of the vegetation in an area, and detailed consideration of a problem arising from this survey, preferably with an applied aspect, or a study of the climate of some well defined plant or animal habitat as related to characteristics of the vegetative cover and substrate. *Economic Geography:* a problem in applied economic geography involving experimental design, the acquisition and manipulation of field data, and the presentation of a report. *Geomorphology and pedology:* an area study introducing soils-landscape relationships in a dynamic or chronologic sense; or a systematic study which may be primarily geomorphic or pedologic, but with some interdisciplinary aspect.

To include a field element and a supporting laboratory program.

27.801
Introduction to Physical Geography L2T2½

Mechanisms of the physical environment, with particular reference to Australia and to the Sydney region. Geologic controls of landform development; fluvial, slope and coastal processes and their landforms; cyclic and equilibrium approaches to landform studies. Global energy and atmospheric circulation; weather and climate in Australia and the Sydney region. The hydrologic cycle; processes and factors of soil formation and soil profile development. The ecosystem; controls of vegetation in the Sydney region

Laboratory classes include the study and use of topographic maps, geological maps, and air photographs; the use of climatic data and the weather map; soil description; basic cartographic methods. Two field tutorials, equivalent to 16 tutorial hours, are a compulsory part of the course. Students must provide basic drawing equipment.

Textbook

Van Riper J. E. *Man's Physical World* McGraw-Hill

* Paperback.

27.862
Australian Environment and Land Resources — L2T3

Regional patterns of natural land resources of Australia. Climatic, geomorphic, soil and biotic factors affecting past, present and potential modes of land use and stability of primary production. Physical environmental conditions favouring or impeding productive utilization and further development of land, marine, freshwater and energy resources under a changing technology. Problems of avoiding degradation of land quality and natural ecosystems. Case studies from distinctive environmental settings in Australia.

Laboratory/workshop sessions include study of maps and airphotos of typical environments. Local environmetal problems are investigated in the field.

Textbook

CSIRO *The Australian Environment* MUP

Graduate Study

27.901G
Geomorphology for Hydrologists — L1½T1½

Geomorphological controls in the initiation of drainage systems. Drainage networks as geomorphological systems. Types of drainage channel. River floodplains and terraces. Drainage systems of arid regions. Geomorphology of representative basins and vigil catchments. Geomorphology in the assessment of water resources. Landforms produced by underground water. Airphoto and map analysis of drainage features and map and field study of a vigil catchment.

Textbooks

Gregory K. J. & Walling D. E. *Drainage Basin Form and Process* Arnold

Leopold L. B. Wolman M. G. & Miller J. P. *Fluvial Processes in Geomorphology* Freeman

Morisawa M. *Streams* McGraw-Hill*

27.902G
Meteorological and Hydrological Principles — L3T0

1. *Meteorology:* Heat and water balances of earth-atmosphere system. Global pressure, wind and climatic patterns. Atmospheric stability, temperature inversions, aerological diagrams. Synoptic and local wind systems, dispersal of atmospheric pollutants under various conditions of stability and wind. Precipitation and precipitation fallout. Weather forecasting with particular reference to forecasting pollution potential.

2. *Hydrology:* Catchment morphology. Precipitation: streamflow relationships; frequency analyses in hydrology. Drought and low flow analyses. Channel morphology and stream velocity characteristics, tidal estuaries, ocean currents. Dispersal of pollutants in flowing water.

Textbook

Bureau of Meteorology *Manual of Meteorology* Part 1 *General Meteorology*

27.904G
Geomorphology for Engineering Geologists — L1½T1½

Landform expression of lithology and structure. Hillslope forms and processes. Climate, erosion and landforms. Landform evolution and systems theory. Geomorphology and soil erosion. Geomorphological background to coastal engineering problems. Forms of rivers and alluvial floodplains. Geomorphological approach to terrain evaluation. Exercises in the analysis and systematic description of terrain types from maps and airphotos. Field excursion on terrain assessment.

School of Marketing

Undergraduate Study

28.012
Marketing Systems

A conceptual introduction to marketing from the systems viewpoint. Discusses the evolution and characteristics of marketing systems, buyer behaviour, marketing channel flows (equalizing supply and demand, communication, ownership, finance, physical distribution), marketing activities in the firm (planning the marketing program, coordination and control of marketing activities, problem solving, product planning, promotion and pricing, physical distribution management), resources allocation by competition, the expanding role of government, social performance of marketing and social efficiency of marketing.

Textbook

Gist R. G. *Marketing and Society* 2nd ed Holt Rinehart & Winston

28.022
Marketing Models

Quantitative analysis in marketing decision-making in business situations. The derivative (pricing for profit maximization, inventory policy for cost minimization); linear programming (designing programs to maximize profits); techniques of planning (product launch using PERT); probability competitive bidding theory; market decision-making under conditions of uncertainty; assignment algorithm (allocation of salesmen to territories); physical distribution (total system costing, etc.).

The program is designed to provide students with the opportunity to develop their ability to apply quantitative methods to practical marketing problems.

Textbook

King W. R. *Quantitative Analysis for Marketing Management* McGraw-Hill

* Paperback.

28.042
Consumer Behaviour

The specific sociological and psychological topics in behavioural science are applied to the problem of understanding the consumer in the marketing context. The following areas are covered: proximal and distal environmental inputs; motivation and arousal; consumer behaviour as a decision process; problem recognition; search behaviour; choice behaviour; purchasing processes; post-purchase behaviour

Textbooks

Engel J. F. Kollat D. T. & Blackwell T. S. *Consumer Behaviour* Holt Rinehart & Winston

Kassarjian H. H. & Robertson T. S. eds *Perspectives in Consumer Behaviour* Rev ed Scott Foresman

School of Surveying

Undergraduate Study

29.441
Surveying for Engineers

Part A. Ordinary levelling. Angle measurement. Linear measurement (bands). Theodolite traversing. Tacheometry. Contour and detail surveys. Areas and volumes.

Part B. Levelling (other methods). Linear measurement (electronic). Applications of survey techniques: control surveys, provision of information for design, setting out, engineering works, etc. Outline of photogrammetry.

Textbook

Bannister A. & Raymond S. *Surveying* 3rd ed Pitman*

29.491
Survey Camp

A one-week field camp for students studying 29.441 Surveying for Engineers.

Department of Behavioural Science

30.032
Behavioural Science

Major concepts and research in the behavioural sciences which reveal the dynamics of human behaviour and the variety of viewpoints that can be adopted in explaining behaviour. The nature and scope of behavioural science; concepts of man in psychology and sociology; culture; social institutions; groups, social class; interpersonal and mass media communication; learning; perception; personality.

Textbook

Morgan C. T. *A Brief Introduction to Psychology* McGraw-Hill

School of Town Planning

Undergraduate Study

36.411
Town Planning

The urban planning process. The industrial and urban revolution. Regional planning concepts. Housing and new towns. Civic design. Human environment. Social planning: societal values and societal organization. Social planning: public participation, quality of life. Planning law and administration. Levels of planning and types of plans. Ecological land use planning. Uses of the Lowry Model. Metropolitan planning concepts with particular application to Sydney and Canberra. Neighbourhood planning. The future city.

School of Food Technology

Undergraduate Study

38.121
Food and Man — S2 L3T3

Introduction to food in history, food preservation and human nutrition. Foods of affluent and developing countries; world food trade. Australian and world food agencies. *Food Chemistry:* Nature and occurrence of carbohydrates, proteins, lipids, vitamins, minerals and other constituents of foods of plant and animal origin. *Human Nutrition:* Role of nutrients in human structure and function. Recommended daily allowances, food groups, tables of food composition. Nutritional information, consumer needs and food standards. *Microbes and Food:* The beneficial and deleterious consequences of microbial/food associations. Food hygiene, principles of public health. *Aesthetic and Social Aspects of Foods:* Parameters of food quality; perception and assessment of colour, taste, odour, texture by sensory and instrumental techniques. Food choice and social behaviour; food prejudices, taboos, fads and fallacies; food and society.

Inspection of bulk food handling facilities in areas of horticultural products, milk, meat and eggs; assessment of modern food retailing systems; quality and nutritional assessment of foods by instrumental and panel techniques.

38.131
Food Technology II — L1½T3

Introduction to food microbiology. Principles of food preservation. Thermal processing, process evaluation. Technology of frozen and dehydrated foods. Preservation by the use of salt, sugar, acid and chemical preservatives. Juices, concentrates, non-alcoholic fermentations. Use of ionizing radiations.

Paperback.

Textbooks

Duckworth R. B. *Fruit and Vegetables* Pergamon

Earle R. L. *Unit Operations in Food Processing* Pergamon

Frazier W. C. *Food Microbiology* 2nd ed McGraw-Hill

Hersom A. C. & Hulland E. D. *Canned Foods: an Introduction to their Microbiology* Churchill

38.132
Food Technology III — L2T6

The science and technology of meat, fish, eggs, milk, fats and oils, cereals, sugars; their derived products, with particular reference to sources, structure and composition, microbiological and biochemical aspects, their reactions and modifications during processing and storage. Food package requirements. Food spoilage, its diagnosis and control

Textbooks

Frazier W. C. *Food Microbiology* 2nd ed McGraw-Hill

Kent N. L. *Technology of Cereals* 2nd ed Pergamon

Knight J. W. *The Starch Industry* Pergamon

Lawrie R. A. *Meat Science* 2nd ed Pergamon

38.140
Food Technology Project — L0T8

The student will undertake an individual project involving a literature survey, an experimental investigation, and the final preparation of a detailed report on a selected topic in food science or technology.

38.141
Food Technology IV — L3T4

The characteristics of food quality. Colour, texture, flavour, their subjective and objective assessment. Food additives and toxicology, product development, quality control and factory management. Public health, food hygiene and food legislation. Utilization and disposal of food process wastes. Oenology. Principles of nutrition.

38.142
Oenology — L1T2

History and nature of grape wines; grape and wine statistics; concept of cultivars within *Vitis vinifera*; other *Vitis* species; vine and grape physiology and biochemistry; maturity assessment and significance; influence of climate, soil, and other factors on wine quality; harvesting procedures; oenological procedures including crushing, sulphiting, pressing and draining, fermentation procedures, maturation and storage, stabilization and clarification, bottling, packaging, and distribution; wine types and composition; quality assessment; quality control and analytical procedures; distillation and production of fortifying spirit and brandy; world wine industry, wine organizations, wine literature; social uses of alcohol.

38.143
Cereal Technology — S2 L2T4

A treatment in greater depth of the following topics dealt with in graduate and undergraduate courses: Production, storage marketing and quality of cereal grains; current trends in these areas; technology of bread, biscuit and cake manufacture; chemical, physical and biochemical interactions in wheat flour doughs; flour milling and assessment of flour quality. Additional topics include cereal protein analysis, properties and behaviour; wheat variety identification; meat-cereal combinations; cereal enzymes; non-food uses of cereals; preparation and uses of cereal protein, starches and lipids.

38.144
Treatment and Utilization of Food Processing Wastes — L2T1

Aspects of water pollution; ecological effects of waste discharges into marine environment. Purification of water for domestic and industrial applications; water re-use; process modifications for effluent reduction. Origin, composition, treatment, disposal and utilization of wastes from food processing operations. Sewage treatment. Legal and economic aspects of waste disposal. Inspections of water and waste treatment plants. Seminars, assignments.

38.341
Public Health and Food Legislation — S2 L2T0

History and international occurrence of food borne diseases. Microbiological safety and quality of foods. Definition, recognition and detection of 'food poisoning'. Differentiation of infection and intoxication. Taxonomy and ecology of the food borne pathogens. *Salmonella, Shigella, Escherichia, Vibrio, Clostridium, Bacillus, Staphylococcus, Brucella.* Mechanisms of pathogenicity. Microbial toxins, nature, chemistry mechanisms of action and production. Mycotoxins. Methods of enumeration and detection of food borne pathogenic organisms. Methods of prevention and control of food borne diseases; preslaughter animal treatment, processing plant design, food distribution, consumer handling. Food hygiene. Microbiological standards for foods, codes, international, national and local legislation.

Textbook

Food Borne Microorganisms of Public Health Significance Vol I and II AIFST Food Microbiology Group, CSIRO Division of Food Research, UNSW School of Food Technology

38.342
Laboratory Methods for Food Borne Pathogens — S2 L0T6

Preparation of foods for microbiological analysis. Sampling procedures. Evaluation of the various methods of counting microorganisms in foods. Detection, isolation and identification of the various food borne pathogens using selective differential media. Biochemical tests and identification. Demonstration of the problems of sub-lethal injury and requirements for recovery. Toxin detection. Fluorescent antibody techniques for the rapid detection of organisms and toxins. Phage typing and sero-typing.

38.343
Brewing Science — S1 L2T2

History of brewing; styles and types of world beers. Physiology of barley; chemical and biochemical aspects of barley malting; the technology of malting. Water quality. Chemistry and biochemistry of mashing and wort formation; mashing technology. Hops, chemistry and contribution to beer flavour. New trends in brewing.

38.440
Food Technology Project (Chemical Engineering) L0T6

Project in Food Technology for students in Chemical Engineering.

38.442
Food Technology (Chemical Engineering) L4T3

The science and technology of foods of plant and animal origin — fruit and vegetables, meat, fish, eggs, milk, fats and oils, cereals, sugars; their derived products with particular reference to microbiological aspects, their modification during processing and storage. Principles of food preservation with particular reference to unit processes and limiting parameters. Food spoilage, its diagnosis and control, foods in relation to disease. Food additives, food packaging. Quality characteristics of foods. Elements of human nutrition. Food regulations. Utilization and disposal of food process wastes.

38.541
Nutrition S1 L2T1

Nutritional adequacy of traditional and modern diets in various social and cultural groups; the impact of technology. Problems arising from deficient, imbalanced and excessive nutritional intakes; corrective measures applicable to individuals and mass situations. Role of nutritional consideration in the development of new foods; in the introduction of unfamiliar foods; case histories factors; nutrient fortification and labelling.

Graduate Study

38.151G
Introductory Food Science S1 L2T0

An introduction to the history of food preservation and human nutrition. Current world food patterns, organisations and trade. Food chemistry and the role of nutrients in human nutrition; elements of food microbiology, food hygiene and public health aspects of foods. Parameters of food quality; food choice and social behaviour; food and society.

38.152G
Food Process Laboratory L0T3

An integrated series of laboratory and pilot plant exercises illustrating the principles and procedures involved in processing of foods.

38.153G
Food Technology Seminar L0T2

Students present material arising from literature and/or laboratory assignments and/or plant investigations in the food and related industries. Critical assessments are made of the results of research in food science and technology.

38.154G
Food Technology L4T0

Introduction to food technology. Principles of food preservation. The science and technology of foods of plant and animal origin, their derived products, with reference to biochemical and microbiological aspects. Food spoilage, foods in relation to disease, food additives, food packaging. Waste disposal.

38.155G
Dairy Technology L1T1

A detailed review of trends in dairy industries at the national and international levels. The microbiology and biochemistry of dairy products with particular reference to the technology of milk, butter and cheese production. The development of new dairy products, the use of dairy products in other foods. Emphasis is placed upon the use and development of new technologies in the broad areas of dairy product processing.

38.156G
Oenology L1T0

History of wine production, statistics and classification. Viticulture. Grape composition. Technology and biochemistry of production of table wines, sparkling wines, vermouths, sherries; quality control procedures. Legal, cultural, climatic factors in French, Spanish, Portuguese, Italian, German, Californian and Australian wine production. Principles of sensory testing and evaluation of wines.

38.157G
Technology of Cereal Products L1T0

World production of cereals; cultivation, diseases, harvesting and storage of cereal crops. Grain morphology and components, cereal quality, quality and yield improvements by breeding. Milling of wheat, flour types, flour testing, suitability for different purposes, flour component interactions in doughs, flour bleaches and dough improvers, baking technology. The use of non-wheat flours in bread and baked goods. Pasta products and breakfast cereals. Nutritional aspects of cereals. Starch-gluten separation, starch syrups. Malting, brewing, distilling and industrial alcohol production from cereals. Preparation, properties and uses of modified starches.

38.158G
Marine Products L1T0

World fisheries, oceanographic factors and fish populations. Biochemistry and microbiology of growth, culture, harvesting and post-harvest handling. Cultivation of fish molluscs, crustacea — modern and traditional methods. Biochemistry and microbiology of marine products in relation to freezing and preservation by the use of heat, chemicals and fermentation, quality control parameters and fish inspection. Role of marine products in world nutrition. Possibilities for further exploitation of marine resources.

38.159G
Treatment and Utilization of Biological Effluents L2T0

Parameters of water pollution, ecology of waste disposal. Treatment and use of water in food processing. Composition and treatment of sewage. Origin, composition, treatment, disposal and utilization of wastes from food and other biological industries. Legal and economic aspects. Plant and field inspections.

38.160G
Food Quality Assessment — L1T0

The characteristics of food quality. Colour, its subjective and objective assessment, standards and grades in food products. Flavour, the physiology of flavour perception, theories of taste and odour perception, the characterization of food volatiles. Texture and consistency of foods, their subjective and objective assessment. The use of taste panels and evaluation of results. Principles of consumer testing.

38.161G
Food Additives and Toxicology — L1T0

Functions, modes of action of food additives, consequences of use; ethical and legislative considerations. National, State and international attitudes and standards. Principles of toxicological testing, the evaluation of results.

38.351G
Public Health and Legislative Aspects of Foods — L1T2

Sanitation in food processing, distribution and handling. Water supplies, utilization and disposal, insect and rodent control. Cleaning, disinfection, sanitation programs. Food poisoning and food-borne infections of chemical, plant, animal and microbiological origin. Food hygiene with particular reference to food service operations. Food Legislation. State and Codex standards and regulations, Pure Food Acts, Public Health Act.

38.551G
Nutrition — S2 L1T2

Human physiology and metabolism: the role of the nutrients in human structure and function. Nutritional disorders: primary and conditioned nutritional diseases especially as occurring in developing countries. Public health nutrition: socioeconomics of food supply and nutrition; assessment of nutritional status; nutrition of vulnerable groups particularly women and infants; nutritional requirements; nutritional rehabilitation and improvement; nutrition policy; nutrition education.

Techniques of anthropometric and dietary assessment; recognition of chief signs of nutrition disorders. A literature review of the food and nutrition situation of a selected developing country and the presentation of a seminar.

38.900G
Master of Applied Science Major Project — L0T6

38.901G
Master of Applied Science Minor Project — L0T3

School of Biochemistry

Undergraduate Study

41.101
Introductory Biochemistry

Prerequisites: 17.021 and 2.001.

The chemical properties of amino acids, peptides and proteins, carbohydrates, nucleic acids and lipids and the biological roles of these compounds. The nature and function of enzymes. The intermediary metabolism of carbohydrates, lipids and nitrogenous compounds. The molecular mechanism of gene expression and protein synthesis. Photosynthesis. Practical work to amplify the lecture course.

Textbook

Stryer L. *Biochemistry* Freeman

41.111
Biochemical Control — S2 L2T4

Prerequisite: 41.101.

The relation between structure and function of enzymes, hormones, vitamins and membranes. Metabolic networks and control mechanisms. Practical work to amplify the lecture course.

Textbooks

As for 41.101A, plus

White A. Handler R. & Smith E. L. *Principles of Biochemistry* 5th ed McGraw-Hill

41.102A
Biochemistry of Macromolecules

Polysaccharides and glycoproteins including bacterial cell walls. Chemistry and biology of polynucleotides. Methods of amino acid and nucleic acid sequence analysis. Protein structure and synthesis. Active centres of some proteins. Sub-unit organization of proteins. Membrane structure. Cellular degradation. Practical work to illustrate the lecture course and to provide experience in modern biochemical techniques.

Textbooks

Scientific American *The Chemical Basis of Life. An Introduction to Molecular and Cell Biology* Freeman

White A. Handler R. & Smith E. L. *Principles of Biochemistry* 5th ed McGraw-Hill

41.102B
Physiological Biochemistry — S2 L3T9

Prerequisites: 41.101 and 2.002B.

Haemoproteins and electron transport, photosynthesis, photophosphorylation and oxidative phosphorylation. The nature and function of co-enzymes. Inter-relationships in mammalian intermediary metab-

olism. Biochemical control mechanisms including hormones and allosteric interactions. Enzyme kinetics. Selected aspects of differentiation and development in higher organisms. Practical work to illustrate the lecture course and to provide experience in modern biochemical techniques.

Textbooks

As for 41.102A.

41.102C
Plant Biochemistry

Prerequisites: 41.101 and 2.002B.

The biochemistry of the major pathways characteristic of plants will be studied; topics include the energetics and carbon path of photosynthesis, glyoxalate cycle, growth hormones and regulatory phenomena, nitrogen fixation and assimilation.

Experimental work to illustrate and amplify the course will utilize radioactive isotopes and a number of newer techniques.

Textbooks

No set texts. A list of references is provided by the school.

41.102D
Biosynthesis of Plant Metabolites S2 L2T4

Prerequisites: 41.101 and 2.002B. Co-requisite: 41.102C.

This unit complements 41.102C and is taken with it. Topics covered: cell wall formation and the synthesis of mobilization of reserve materials; biosynthesis of amino acids, its regulation, and their conversion into non-protein materials, eg. alkaloids and cyanogenètic glycosides; aromatic ring formation and the isoprene pathway as a source of rubber, steroids, carotenes and essential oils. Flower pigments and phytoalexins will be discussed briefly.

Practical work, combined with 41.102C illustrates and amplifies the course and includes a wide range of the latest techniques.

Textbooks

No set texts. A list of references is provided by the school.

School of Biological Technology

Undergraduate Study

42.101
Introduction to Biotechnology S2 L2T4

An introduction to biotechnology as a multidisciplinary subject dealing with the application of biological systems in industry, agriculture and medicine. The application of the techniques and methodologies of mathematics, the physical sciences and engineering to the understanding and optimization of biological processes. An outline of the field and scope of biotechnology in relation to the development of microbial processes for the production of special chemicals such as antibiotics and enzymes and the production of single cell protein as an alternate protein source. The role of biotechnology in relation to pollution control and waste disposal. Biotechnological aspects of alternate energy sources. Likely contributions of biotechnology to the problems of developing countries.

The laboratory component will place emphasis on identification and manipulation of different classes of microorganisms (bacteria, fungi, algae) involved in traditional fermentations, industrial processes and waste treatment.

Textbooks

No set texts.

42.102A
Biotechnology A S1 L2T4

The basic principles involved in the operation of microbial processes on an industrial scale, including: the selection, maintenance and improvement of microorganisms; the influence of physical and chemical factors on the microbial environment; the control of environmental factors; the effects of operational patterns on batch and continuous flow cultivation; aeration and agitation; scale-up of microbial processes; air and media sterilization; the harvesting, purification and standardization of products. Discussion of the principles involved in microbial processes for chemical, pharmaceutical and food production, microbial waste treatment and environmental control. The laboratory component includes manipulation of microorganisms, laboratory-scale fermenter operation, microbial enzyme isolation, visits to industrial fermentation plants and industrial seminars.

Textbooks

Aiba S. Humphrey A. E. & Millis N. *Biochemical Engineering* 2nd ed Academic

Pirt S. J. *Principles of Microbe and Cell Cultivation* Blackwell

42.102B
Biotechnology B S2 L2T4

Application of principles of biotechnology to the analysis and design of microbial processes of industrial relevance (antibiotics, microbial enzymes, single cell protein from carbohydrates and hydrocarbons, fermented foods and beverages, amino acids and vitamins, microbial polysaccharides, activated sludge and photosynthetic processes for waste treatment, microbial leaching of low-grade minerals). Emphasis on quantitative approach: mass and heat balance calculations, kinetic and thermodynamic analysis, detailed equipment design and specification, process design and layout, process simulation, plant location, application of optimization techniques. The economics of microbial processes will be considered and comparison made with alternative modes of production or treatment. The economics of agro-industry in Australia using microbial processes. Marketing of fermentation products, clinical trials required, legal constraints, patent rights. Technical and economic feasibility studies, and a design project, will be major components of the course.

Textbook

Aiba S. Humphrey A. E. & Millis N. *Biochemical Engineering* 2nd ed Academic

Graduate Study

42.211G
Principles of Biology

The characteristics of living systems including a functional treatment of cytology, metabolism, bioenergetics; structure, function and characteristics of single and multicellular systems; growth; cell division; reproduction; heredity and evolution.

Textbook

Villee C. A. *Biology* 6th ed Saunders

42.212G
Principles of Biochemistry

A condensed treatment of biochemistry comprising the following aspects: the elemental and molecular composition of living organisms; the chemistry and roles of the biological elements and molecules; the thermodynamics and enzymatic catalysis of metabolism; catabolic, anabolic, amphibolic and anaplerotic processes, with emphasis on hydrolysis and synthesis of polymers, glycolysis and gluconeogenesis of glucose, β-oxidation and synthesis of fatty acids, deamination and decarboxylation of amino acids, the tricarboxylic acid cycle, electron transport and oxidative phosphorylation; metabolic regulation and integration.

Textbook

Conn E. E. & Stumpf P. K. *Outlines of Biochemistry* 4th ed Wiley

42.213G
Biochemical Methods

A laboratory program in practical biochemistry. The basic instrumentation and methodology of the biochemist will be introduced by practical exercises and demonstrations. A comprehensive treatment of the relevance and applicability of biochemical techniques will be covered in tutorials.

Textbooks

No set texts.

42.214G
Biotechnology

The selection, maintenance and genetics of industrial organisms; metabolic control of microbial synthesis; fermentation kinetics and models of growth; batch and continuous culture; problems of scale-up and fermentor design; control of the microbial environment involving computer/fermentor interactions. Industrial examples will be selected from: antibiotic and enzyme production, alcoholic beverages, single cell protein (SCP), microbial waste disposal and bacterial leaching.

Tutorial/practical sessions include: problem solving, instrumentation, continuous culture techniques, and mathematical modelling and simulation of industrial processes.

Textbooks

Aiba S. Humphrey A. E. & Millis N. *Biochemical Engineering* 2nd ed Academic

Pirt S. J. *Principles of Microbe and Cell Cultivation* Blackwell

School of Botany

Undergraduate Study

43.101
Genetics

Prerequisites: 17.001 or 17.011 and 17.021.

Various aspects of molecular, organismal and population genetics, including: meiotic and non-meiotic recombination, genome variations, mutagens and mutation rates, cytoplasmic inheritance, gene function, genetic code, gene structure, collinearity of polynucleotide and polypeptide, control of gene action, genes and development, population genetics, genetics and improvement of plants and animals.

Textbook

Patt D. I. & Patt G. R. *An Introduction to Modern Genetics* Addison-Wesley

43.111
Flowering Plants

Prerequisites: 17.001 or 17.011 and 17.021.

The vegetative and floral morphology of Angiosperms with special reference to variations in morphology, elements of biological classification, nomenclature and identification of native plants. Week-end field work is part of the course.

Textbooks

Bell C. R. *Plant Variation and Classification* Wadsworth

Esau K. *The Anatomy of Seed Plants* Wiley

43.112
Plant Taxonomy*

Prerequisites: 43.111, prerequisite or co-requisite 43.101.

Considers the assessment, analysis and presentation of data for classifying plants both at the specific and supra-specific level with emphasis on vascular plants. Field work is part of the course.

Textbooks

Beadle N. C. W. Carolin R. C. and Evans O. D. *Flora of the Sydney Region* Reed

Jeffrey C. *An Introduction to Plant Taxonomy* Churchill

Jeffrey C. *Biological Nomenclature* Arnold

Sporne K. R. *The Morphology of the Gymnosperms* Hutchinson

* Note: **1.** The Unit 43.112 Plant Taxonomy, alternates with 43.162 The Plant Kingdom. (43.162 The Plant Kingdom commences in 1977.)

2. 43.112 Plant Taxonomy and 43.142 Environmental Botany. These units may be taken in either second or third year of the Science course provided that prerequisites have been completed.

43.121
Plant Physiology

Prerequisites: 17.001 or 17.011 and 17.021.

The physiology of the whole plant: photosynthesis, the role of phytochrome in plant morphogenesis and flowering, inorganic nutrition transport, translocation, physiology of growth and development, seed physiology and plant growth substances and their application in agriculture.

Textbooks

Galston A. W. & Davies P. J. *Control Mechanisms in Plant Development* Prentice-Hall

Richardson M. *Translocation in Plants* Arnold

Sutcliffe J. *Plants and Water* Arnold

Whittingham C. P. *Photosynthesis* OUP

43.142*
Environmental Botany

Prerequisites: 17.001 or 17.011 and 17.021, 1001 (This unit may be taken as a co-requisite in some circumstances).

The soil and atmospheric environments in which plants live and the interaction of plants with their environment. Emphasis is placed on the role of environmental sciences in food production. Students are required to attend three week-day field excursions as part of the practical course.

School of Microbiology

Undergraduate Study

44.111
Microbiology F L1T2

The general nature, occurrence and importance of microorganisms. A systematic review of the major groups of microorganisms: the eucaryotic protista (microalgae, protozoa and fungi); procaryotic protista (blue-green algae, 'higher' bacteria, typical unicellular bacteria and small bacteria-like forms); plant, animal and bacterial viruses. The relationship between microorganisms and their environment; ecological considerations. Interactions between microorganisms and higher organisms.

This is a subject for those who do not wish to proceed further in microbiology and who may have less biological and biochemical background than is required for other microbiology courses.

Textbooks

Brock T. D. *Biology of Microorganisms* Prentice-Hall

or

Mitchell, R. *Introduction to Environment Microbiology*

or

Brock T. D. & Brock K. M. *Basic Microbiology and Applications* Prentice-Hall

44.142
Microbiology for Food Technologists S1 T6

Prerequisite: 44.141.

A laboratory course of six hours per week (Session 1), covering the following topics: microscopy, choice and preparation of media, application of aseptic techniques, quantification of microbiological growth, isolation and identification of microorganisms important to food processing. Principles of sterilization, heat resistance of vegetative cells and spores, food spoilage, food-borne organisms.

Assessment is continuous and grading is based upon the number of objectives achieved.

Textbooks

No set texts, but specific reading assignments are given.

44.143
Microbiology AS S1 L4T6

Prerequisites: 17.011 and 17.021.

The history, general nature, occurrence and importance of microorganisms. General features of procaryotic and eucaryotic protista. Basic microbiological methodology; bacterial anatomy and cytology: cell walls, flagella pili, nucleus, inclusions, capsules, endospores. Microbial growth: methods of measuring; growth curves; batch, continuous and synchronous cultures. Microbial nutrition and metabolism: autotrophs and heterotrophs; photosynthesis, fermentation and respiration; biosynthesis. Bacterial genetics: adaptation, mutation and mutagens; conjugation; plasmids and drug resistance factors; genetic engineering concepts. Bacterial virology; lytic phages, lysogeny, transduction, phage typing. Bacterial, taxonomy, ecology and diversity, basic principles and review of the major bacterial genera and groups. Yeasts and fungi: general ecology, morphology and modes of reproduction; mycotoxins. Immunology and serology: antigens, antibodies and their interactions; applications to identification. Medical microbiology: microbes as pathogens. Applied microbiology. Microbiology of soils and waters, nitrogen fixation, industrial fermentations, alcoholic beverages, single cell protein, food microbiology.

Textbook

Krueger R. G. Gillham N. W. & Coggin J. H. *Introduction to Microbiology* Macmillan

* See this footnote on previous page.

School of Sociology

Undergraduate Study

The order in which courses 53.101 and 53.102, described below, are presented is notified at the beginning of the year.

53.101
Sociology 1A

An introduction to sociology that focuses on the thought of four seminal theorists. The course treats the work of Marx, Weber, Durkheim and Simmel in some detail. Students are expected to examine salient aspects of these writings and present written and oral assignments during the session.

Textbooks

Bottomore T. B. & Rubel M. eds *Karl Marx, Selected Writings in Sociology and Social Philosophy* Penguin

Durkheim E. *Elementary Forms of Religious Life* Allen & Unwin

Gerth H. H. & Mills C. W. eds *From Max Weber* Routledge

Giddens A. *Selected Writings of Durkheim* CUP

Kurt W. ed *The Sociology of Georg Simmel* Free Press

Marx K. *Economic and Philosophic Manuscripts* Foreign Languages Publishing House Moscow

53.102
Sociology 1B

Prerequisite: 53.101.

An introduction to three issues prominent in the study of contemporary industrial society, ie work, inequality and socialization studied in the context of both theory and empirical evidence. Students will be expected to present written and oral assignments during the session.

Textbooks

Berger P. *The Noise of Solemn Assemblies* Doubleday

Beteille A. *Social Inequality* Penguin

Burns T. ed *Industrial Man* Penguin

Dickson D. *Alternative Technology* Fontana

Encel S. *Equality and Authority* Cheshire

Firestone S. *Dialectic of Sex* Bantam

Freud S. *Civilization and its Discontents* Hogarth

Mead G. H. *Mind, Self and Society* Chic UP

Oakley A. *Sex, Gender and Society* Temple Smith

Wild R. *Bradstow* Cheshire

53.206
Science, Technology and Society

The attention of students is drawn to this subject given in the School of Sociology. Details are given in the Faculty of Arts Handbook. This subject may be taken as an alternative to an advanced elective in General Studies, with the permission of the Head of the School of Sociology. Interested students should apply to the School of Sociology before the beginning of Session 1.

School of Education

58.061
Methods of Teaching I

Application of principles of educational philosophy and educational psychology to learning in sheep and wool technology, eg, a discussion of aims, verbal learning, learning of skills, procedures to assist learning such as lesson planning and the use of audio-visual aids. Methods of teaching special aspects of sheep and wool technology.

58.062
Methods of Teaching II

An introduction to curriculum theory. The planning of units of work and programming. Evaluation of the outcomes of instruction. A continuation of the methods of teaching special aspects of sheep and wool technology.

58.512
Introduction to Education

The subject serves as a basis for study in greater depth of educational psychology, philosophy and theory of education and sociology of education in succeeding years and shows the contribution of each to the practice of teaching. This contribution is discussed in lectures and seminars and illustrated by school visits which take place at various times throughout the year.

The time allocation for the subject includes 14 hours spent in field work involving the visits to schools.

58.513
Education IA

Prerequisite: 58.512.

This subject covers Educational Psychology, Philosophy and Theory of Education, Research Methods and Sociology of Education. *Educational Psychology:* The Educational Psychology strand of the subject includes learning, cognition and individual differences. *Philosophy and Theory of Education:* Curriculum theory and curriculum development, theory in education with reference to educational objectives, and an analysis of values leading to a concept of education. Various concepts within the context of theory and values, such as: responsibility and punishment, indoctrination, equality, creativity. *Research Methods in Education:* The theory and practice of research methods in education in both the parametric and non-parametric fields, including: measures of central tendency and dispersion, graphical representation of data, normal curve theory, tests of differences between statistics, correlation, tests and examinations, analysis of variance, regression and the nature of experiments. *Sociology of Education:* The sociology of education. The role of education in Australian society with particular attention to inequality, adolescent groups including a study of deviants and cultural deprivation. A sociological analysis of classroom groups including group interaction, reference group theory and role theory. An analysis of social structure in the secondary school and the school in the local community. A study of teacher groups with particular attention to role and professionalism.

58.514
Education IIA

Four options, each of which occupies two hours per week of class time for one session. The options may be chosen from those given below. However, whether a given option is offered depends on the availability of staff in a given year and other options may be added from time to time.

Options in Educational Psychology

Educational Measurement: The purposes and methods of measurement available to the classroom teacher, including the use of standardized tests. The place of Guidance Counsellors in an evaluation program. *Motivation in the Classroom:* Observations of various forms of communication in the classroom suggestive of inner needs. Procedures to facilitate awareness of motives and possible methods for satisfying or controlling them. *Personality:* Structure and culture; normal and abnormal behaviour; adjustment and readjustment; attitudes and traits; analysis and measurement; a further look at empathy, role playing, and sensitivity training in the classroom.

Options in Philosophy and Theory of Education

Ethical Theory and Moral Education: The educational implications of the major ethical theories: the structure of ethical theories; educational implications consistent with a given structure; and practical issues concerned with moral education.

Justification for Teaching: Certain broad aims of education and expectations of teachers; the extent of their justification and their practical possibility. The stated aims of the Wyndham Scheme are then put to the theoretical and practical test, and students are asked to defend the teaching of certain subjects with special reference to science and industrial arts by showing what benefits will be brought to their pupils. (This option does not duplicate material covered in curriculum and instruction strands.)

Methodology for Criticism: **1.** Develops methods and techniques whereby meaningful discussion of educational issues can take place; **2.** Critical discussion on issues such as: examinations, assessments, schooling, discipline, equality of opportunity, university degrees, authority, curricula, subjects, and indoctrination.

Moral Education in the Schools: What is moral education? How best can it be brought about? Should schools be concerned with moral education? Do schools confuse moral with practical, prudential, religious and even aesthetic issues, and what might be the consequences and implications of this?

Social Philosophy and Education: Some of the main themes in social philosophy, including the social principles of democracy, freedom and authority, constraint, the individual and society, equality of opportunity. The social functions of the school, and the problems of the above concepts within the closed society of the school.

Philosophy of the Curriculum: How is knowledge involved in education? Are there structures of knowledge which could structure the curriculum? What are the connections between knowledge and skill and knowledge and understanding? What is meant by 'integration of the curriculum'? What is at issue between the advocates of specialized versus general education? Should there be a compulsory curriculum? What is the importance of psychological and sociological considerations in the curriculum formation?

The Aims of Education in Theory and Practice: The theories of some influential educationists and some attempts to apply them. Progressive theories and schools, and the de-schooling movement.

Philosophy of Science and the Teaching of Science: Post 'classical' philosophy of science with an emphasis on the work of Kuhn, Lakatos and Feyerabend, and some elements of Karl Popper's work as a background. What is scientific activity? Evaluation of School Science courses, and ways in which they can be improved. The social dimensions of science and recent work on values, goals, purposes in scientific activity, encompassing wide ranging issues from rationality in science; religion and science. Are Marxism and Freudianism scientific enterprises? What bases are there for the 'Science for the People' movement? What influences science in a capitalist society?

Science and Religion in Education: Comparison of religious beliefs with science, the place of science and religion in the school. Do science and religion conflict? Are religious beliefs like scientific beliefs? Are they rational? How can they be supported? Can faith replace reason? Is there a God? Can there be miracles? Has the teaching of religion a place in schools? Should a science teacher avoid disturbing religious belief? Has the teacher a right to argue for a religious or atheistic viewpoint? The problem of evil.

Option in Research Methods in Education

Educational Research: Provides a basis in some depth for applied educational research. It forms a sequence with the research methods strand in 58.513 Education IA.

Options in Sociology of Education

Australian Education Systems: An Historical and Sociological Analysis: The historical development of Australian education and the application of the sociological perspective to investigate whether Australian education systems are meeting the needs of Australian society.

Society Today and Tomorrow: Implications for Education: Some major characteristics of and trends in society, such as urbanization, social change, bureaucratic organization, the counter culture, community vs. association, and work and leisure patterns, with special reference to the ecological situation and to the significance of values and value transfer. Possible curriculum implications and some of the fundamental questions these social issues raise concerning the role education plays in society.

Socio-cultural Influences on the Education of Adolescents: The application of the sociological perspective to the education of adolescents.

The Education of Disadvantaged Groups: The education of disadvantaged groups in Australia, in particular women and migrants.

Student's Timetable

Time	Monday		Tuesday		Wednesday		Thursday		Friday	
	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2
9-10										
10-11										
11-12										
12-1										
1-2										
2-3										
3-4										
4-5										
5-6										
6-7										
7-8										
8-9										

Student's Timetable

Time	Monday		Tuesday		Wednesday		Thursday		Friday	
	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2
9-10										
10-11										
11-12										
12-1										
1-2										
2-3										
3-4										
4-5										
5-6										
6-7										
7-8										
8-9										

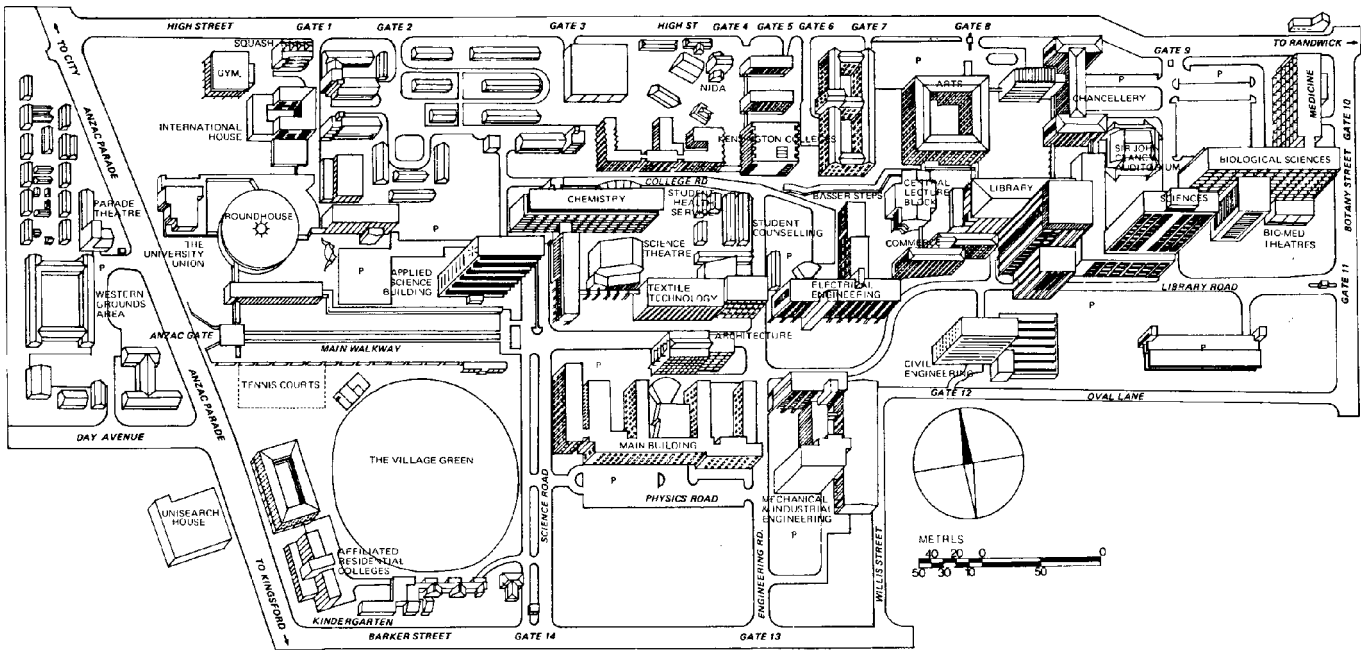
The University of New South Wales Kensington Campus 1977

Buildings

Applied Science F10
Architecture H14
Banks F22
Basser College C18
Biological Sciences D26
Biomedical Lecture Theatres E27
Central Lecture Block E19
Central Store B13
Chancellery C22
Civil Engineering H20
Classroom Block H3
Dalton (Chemistry) F12
Electrical Engineering G17
Electrical Engineering Theatre F17
Goldstein College D16
Golf House A27
Gymnasium B5
House at Pooh Corner N8
International House C6
John Goodsell (Commerce) F20
Keith Burrows Lecture Theatre H14
Kensington Colleges C17
Main Building K15
Maintenance Workshop B13
Mechanical and
Industrial Engineering J17
Medicine (Administration) B27
Menzies Library E21
Metallurgy E8
Morven Brown (Arts) C20
New College (Anglican) L6
Newton J12
Old Main Theatrette J14
Parade Theatre E3
Parking Station H25
Philip Baxter College D14
Robert Heffron (Chemistry) E12
Sam Cracknell Pavilion H8
Sciences F23
Sciences Lecture Theatre Block D23
Science Theatre F13
Shalom College (Jewish) N9
Sir John Clancy Auditorium C24
Sir Robert Webster
(Textile Technology) G14
Squash Courts B7
Unisearch House L5
University Regiment J2
University Union
(Roundhouse) — Stage I E6
University Union
(Blockhouse) — Stage II G6
University Union
(Squarehouse) — Stage III E4
Wallace Wurth School of Medicine C27
Warrane College (Roman Catholic) M7
Wool and Pastoral Sciences B8

General

Accountancy C20
Admissions Office B23
Anatomy C27
Applied Geology F10
Applied Physics H12
Applied Science (Faculty Office) F10
Appointments Office B23
Architecture
(including Faculty Office) F10
Arts (Faculty Office) D20
Australian Graduate
School of Management F23
Biochemistry D26
Biological Sciences (Faculty Office) D26
Biological Technology D26
Biomedical Library F23
Bookshop G17
Botany D26
Building H15
Cashier's Office B23
Centre for Medical Education
Research and Development F24
Chemical Engineering F10
Chemical Technology F10
Chemistry E12
Child Minding Centre N8
Civil Engineering H20
Closed Circuit Television Centre F19
Commerce (Faculty Office) F20
Community Medicine E25
Computer Services Unit F21
Drama D9
Economics F20
Education G1
Electrical Engineering G17
Engineering (Faculty Office) K17
English C19
Examinations and Student Records B22
Fees Office B23
Food Technology F10
French C20
General Studies C20
Geography K17
German C20
Health Administration C22
History C20
History and Philosophy of Science C19
Industrial Arts B1
Industrial Engineering J17
Institute of Administration G2
Institute of Languages G14
Institute of Rural Technology B8
Law (Faculty Office) F21
Law Library F21
Librarianship B10
Library E21
Marketing F19
Mathematics F23
Mechanical Engineering J17
Medicine (Faculty Office) B27
Metallurgy E8
Microbiology D26
Mining Engineering K15
Music B11
National Institute of Dramatic Art C15
Nuclear Engineering F18
Optometry H12
Pathology C27
Patrol and Cleaning Services F20
Philosophy C20
Physics K13
Physical Education and
Recreation Centre (PERC),
see *Gymnasium* and *Squash Courts*
Physiology and Pharmacology C27
Political Science C19
Postgraduate Committee
in Medical Education B27
Postgraduate Extension Studies
(Closed Circuit Television) F19
Postgraduate Extension Studies
(Radio Station and Administration) F23
Psychology F23
Public Affairs Unit C23
Regional Teacher Training Centre F24
Russian D20
Science (Faculty Office) K14
Social Work F1
Sociology C20
Spanish and Latin American Studies D19
Student Amenities and Recreation E15
Student Counselling and Research E16
Student Employment C22
Student Health E15
Students' Union E4
Surveying H20
Teachers' College Liaison Office F16
Tertiary Education Research Centre E16
Textile Technology G14
Town Planning K15
University Union G6
Wool and Pastoral Sciences B8
Zoology D26


HIGH STREET
GATE 1
GATE 2
GATE 3
HIGH ST
GATE 4
GATE 5
GATE 6
GATE 7
GATE 8
GATE 9
TO RANDWICK
TO CITY
ANZAC PARADE
SQUASH
GYM.
NIDA
INTERNATIONAL HOUSE
KENSINGTON COLLEGES
ARTS
CHANCELLERY
MEDICINE
SIR JOHN PEACE AUDITORIUM
BIOLOGICAL SCIENCES
SCIENCES
BIO-MED THEATRES
GATE 10
BOTANY STREET
GATE 11
PARADE THEATRE
ROUNDHOUSE
THE UNIVERSITY UNION
COLLEGE RD
CHEMISTRY
STUDENT HEALTH SERVICE
BASSER STEPS
CENTRAL LECTURE BLOCK
LIBRARY
STUDENT COUNSELLING
SCIENCE THEATRE
COMMERCE
APPLIED SCIENCE BUILDING
TEXTILE TECHNOLOGY
ELECTRICAL ENGINEERING
LIBRARY ROAD
WESTERN GROUNDS AREA
ANZAC GATE
MAIN WALKWAY
ARCHITECTURE
CIVIL ENGINEERING
GATE 12
OVAL LANE
TENNIS COURTS
DAY AVENUE
MAIN BUILDING
THE VILLAGE GREEN
PHYSICS ROAD
SCIENCE ROAD
MECHANICAL & INDUSTRIAL ENGINEERING
ENGINEERING RD.
WILLIS STREET
UNISEARCH HOUSE
AFFILIATED RESIDENTIAL COLLEGES
TO KINGSFORD
KINDERGARTEN
BARKER STREET
GATE 14
GATE 13
METRES
40 20 0 0
50 30 10 50

This Handbook has been specially designed as a source of reference for you and will prove useful for consultation throughout the year.

For fuller details about the University—its organization, staff membership, description of disciplines, scholarships, prizes, and so on, you should consult the Calendar.

The Calendar and Handbooks also contain a summary list of higher degrees as well as the conditions for their award applicable to each volume.

For detailed information about courses, subjects and requirements of a particular faculty you should consult the relevant Faculty Handbook.

Separate Handbooks are published for the Faculties of Applied Science, Architecture, Arts, Commerce, Engineering, Law, Medicine, Professional Studies, Science (including Biological Sciences and the Board of Studies in Science and Mathematics), the Australian Graduate School of Management (AGSM) and the Board of Studies in General Education.

The Calendar and Handbooks are available from the Cashier's Office. The Calendar costs $3 (plus postage and packing, 90 cents). The Handbooks vary in cost. Applied Science, Arts, Commerce and Sciences are $1.50; Architecture, Engineering, Law, Medicine, Professional Studies and AGSM are $1.00. Postage is 40c in each case. The exception is General Studies, which is free.