UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

FACULTY OF PHYSICAL SCIENCES

1990

PUBLIC AFFAIRS AND PUBLICATIONS UNIT
ISSN 1030 5947

UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

Faculty of Physical Sciences

1990
Handbook

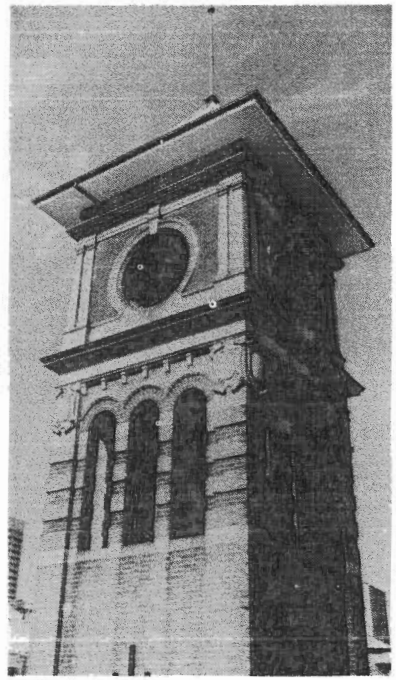
UNIVERSITY OF TECHNOLOGY, SYDNEY

The University of Technology, Sydney, was established as the New South Wales of Technology in 1965 and became a university in 1988. It amalgamated with Kuring-gai College of Advanced Education and the Institute of Technical, Adult and Teacher Education on 1 January 1990. Over 15,000 students study in over 70 courses at UTS. At postgraduate level the University offers Graduate Diplomas, Masters by coursework, Masters by thesis courses and Doctoral programmes.

All courses are vocationally oriented and the close relationship between a student's academic study and the realities of the work situation is stressed. Particular attention is paid to the needs of part-time students and the structure of their study programmes. In a number of courses, special programmes involving "sandwich" attendance enable the student to alternate between periods of full-time study and full-time professional experience.

The University occupies five campuses close to the business district of Sydney. The main campus is at Broadway, with others at North Shore, Haymarket, Balmain and Kuring-gai.

The Faculty of Physical Sciences is located at Broadway.



Full-time, Part-time and Sandwich Courses

Most courses offered by UTS can be undertaken with part-time attendance. A number of courses are also offered with full-time and sandwich attendance (see table of courses). Students are usually allowed to transfer from one attendance pattern to another at the end of a stage. This is subject to the Head of School's approval and class space availability. The University does not offer external or correspondence courses.

It should be noted that admission to courses on a sandwich attendance pattern basis does not require students to be employed at the time of enrolment.

Further Information

The University publishes a Calendar which may be purchased from the Co-operative Bookshop, or consulted at the University Library or UTS Information Service.

The 1990 Calendar is published in two volumes and should be read in conjunction with this and other UTS Faculty Handbooks. Volume 1 contains other course information, lists of officers and staff, general information and regulations. Volume 2 covers the Kuring-gai campus only.

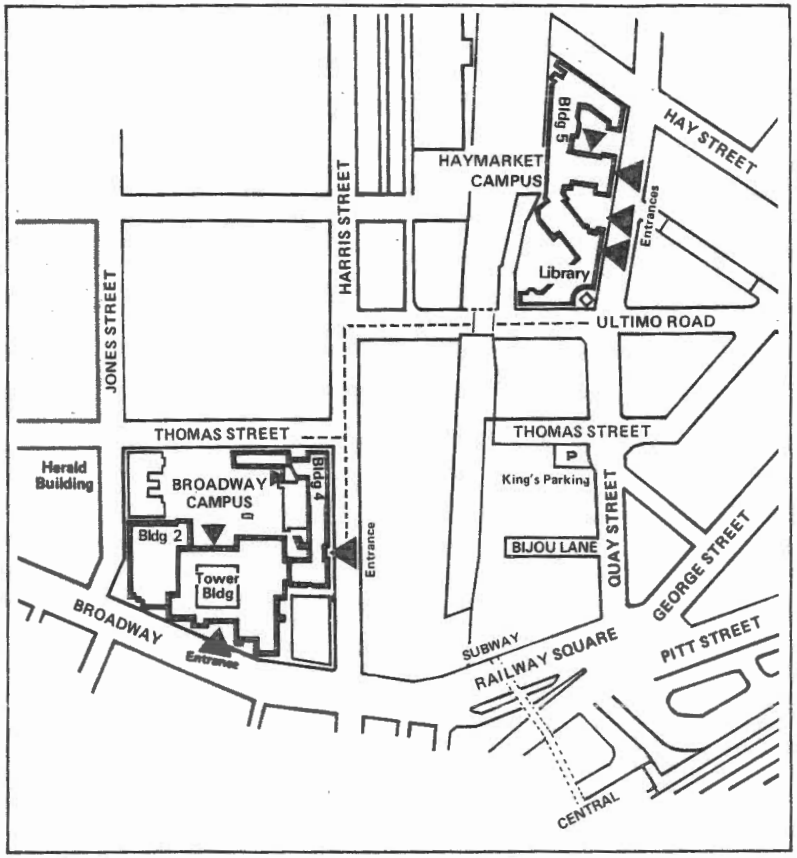
MISSION

The special mission of the University of Technology, Sydney is to provide higher education to equip graduates for professional practice. The UTS approach has been to relate academic study to practical needs and to offer courses through a variety of attendance patterns to encourage the combination of work and study. This style of cooperative education is appealing to students and highly regarded by professional associations.

UTS offers not only a degree but a profession, the option to combine work and study, the opportunity for working men and women to improve their qualifications, and a university education with a difference.

EQUAL OPPORTUNITY

It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of race, sex, marital status, physical disability, racial vilification or homosexuality.



FACULTY OF PHYSICAL SCIENCES
Office: Room 308, Building 4

BROADWAY CAMPUS
15-73 Broadway
Broadway
Telephone: (02) 20930

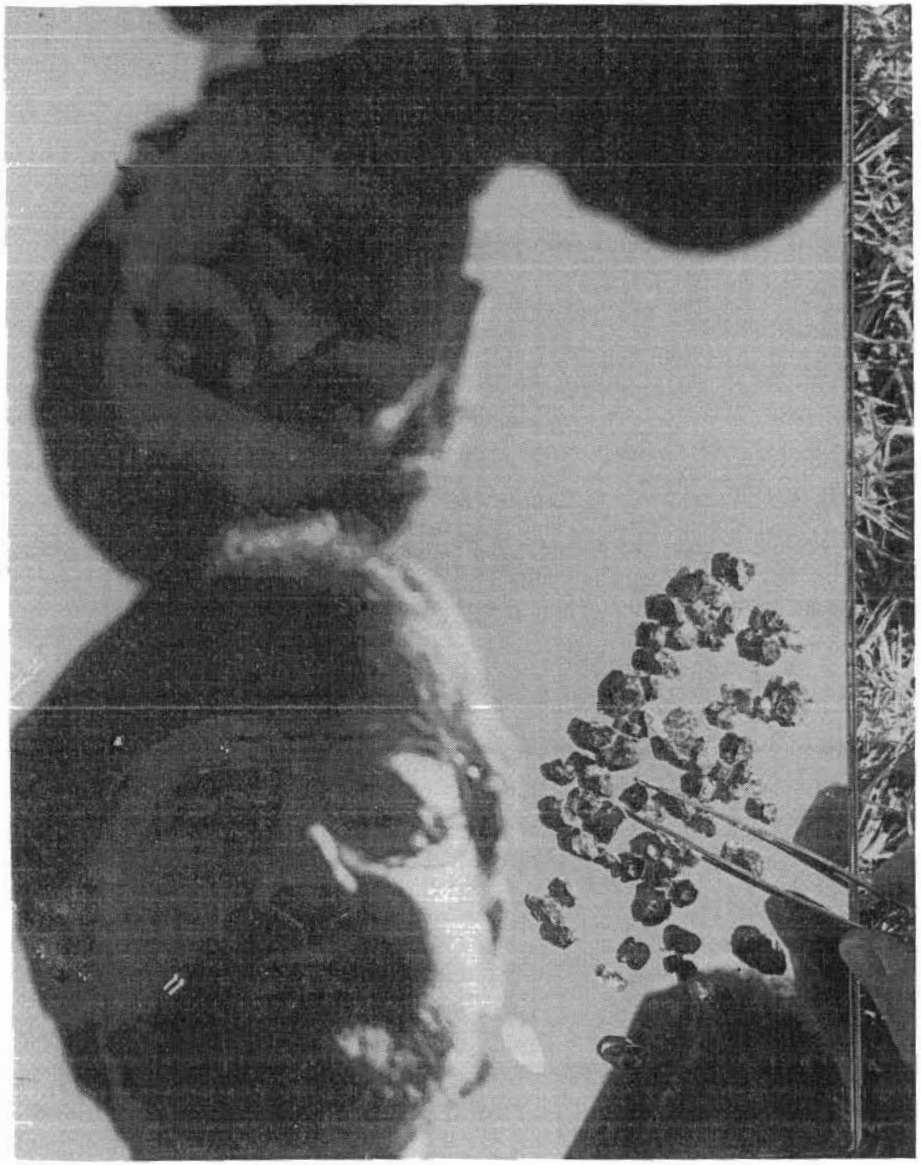
PO Box 123
Broadway NSW 2007

UTS
UNIVERSITY OF TECHNOLOGY SYDNEY

Faculty of Physical Sciences

1990 Handbook

Contents



INFORMATION DAY

Visit UTS on Monday 28 May, 1990
from 2.00pm - 7.00pm at the
Broadway Campus 15-73 Broadway.
Phone (02) 20930.

Select from an exciting new range of degree courses in

- Adult Education
- Architecture
- Biological and Biomedical Sciences
- Building
- Business
- Communication
- Computing
- Design
- Education
- Engineering
- Law
- Leisure Studies
- Library and Information Science
- Mathematics
- Nursing
- Physical Sciences
- and Accredited Short Courses

PRINCIPAL DATES FOR 1990

All courses at the University follow the semester pattern of attendance. The academic year is divided into two semesters, each containing twenty weeks.

January

3 Teaching commences for College of Law co-operatve course C190
15 Teaching commences for College of Law full-time course C901
29 Academic year commences
29-30 Enrolment of continuing students (not Kuring-gai)
31 Enrolment of new students (not Kuring-gai

February

1-2 Enrolment of new students (not Kuring-gai)
5-9 Enrolment of continuing students (not Kuring-gai)
10 Orientation Open Day
12 Classes commence for continuing students (not Kuring-gai), new Faculty of Business (Broadway) students and new School of Nursing (Gore Hill) students
12 Classes for all Faculty of Adult Education students commence
12-15 Enrolment of new and continuing students (Kuring-gai)
12-16 Orientation Week
13 Teaching ceases for College of Law co-operative course C190
13-15 Special Examinations (Kuring-gai)
19 Classes commence for other new students (all campuses) and for continuing Kuring-gai students
19 Teaching commences for College of Law co-operative course C289

March

2 Last day to add subjects (Kuring-gai)
9 Last day to add subjects (except Kuring-gai)
9 Last day to apply for advanced standing (ie subject exemption)
9 Last day to apply for transfer of course
9 Last day to pay HECS Up front charges
16 Last day for continuing students to withdraw without penalty from a course or a semester-unit (Kuring-gai)
16 Teaching ceases for College of Law co-operative course C289
19 Tutorial week commences (except Kuring-gai)
19 Classes suspended week (Kuring-gai except LTCS)
19 Field Experience week (School of Leisure, Tourism and Community Studies)
19 Project and Directed Activity week commences (Faculty of Adult Education)
30 Last day to change HECS Payments Option
31 Autumn HECS census date

April

2 Teaching commences for College of Law co-operative course C189
6 Last day for withdraw without academic penalty from a course or subject (except Kuring-gai)
6 Last day to approve leave of absence
9 Recess week for College of Law full-time course C901
13 Good Friday
13-20 Easter break (Faculty of Adult Education)
16 Easter Monday
17 Practicum (School of Teacher Education)
23 Practicum (School of Teacher Educaiton, School of Library and Information Studies)
23 Field Experience week (School of Leisure, Tourism and Community Studies)
23 Classes suspended week (Other Kuring-gai Schools)
25 Anzac Day
26 Graduation Ceremonies commence
27 Last day for first-year Kuring-gai students to withdraw without academic penalty from a course or semester-unit

30 Tutorial week commences (not Kuring-gai)
30 Practicum (School of Teacher Education, School of Library and Information Studies)
30 Field Experience week (School of Leisure, Tourism and Community Studies)
30 Classes suspended week (other Kuring-gai Schools)

May

1 Teaching ceases for College of Law co-operative course C189
7 Practicum (School of Teacher Education)
7 Project and Directed Activity week commences (Faculty of Adult Education)
25 Closing date for applications for Spring semester
28 Information Evening

June

4 Formal examinations commence for School of Nursing (Gore Hill)
4 Project and Directed Activity week commences (Faculty of Adult Education)
11 Queen's Birthday holiday
12 Formal examination period commences
18 Formal examinations commence for Architecture and Building, Engineering, and Kuring-gai
22 Teaching ceases for College of Law full-time course C901
22 Last day of teaching semester (Faculty of Adult Education)
25 Semester recess commences (Faculty of Adult Education)
29 End of formal examination period
29 End of Autumn Semester

July

2 Semester recess commences
2 Teaching commences for College of Law co-operative course C290
9 Teaching commences for College of Law full-time course C902
17-18 Special Examinations (Kuring-gai)
18 Project and Directed Activity week (Faculty of Adult Education)
18-20 Mid-year enrolment of students
23 Spring Semester commences
23 Classes commence for all Kuring-gai students and for continuing students on other campuses
25 Classes for all Faculty of Adult Education students commence
30 Classes commence for new students (except Kuring-gai)

August

3 Last day to add semester-units (Kuring-gai only)
9 Last day to apply for advanced standing (ie subject exemption)
9 Last day to apply for transfer of course
9 Last day to pay HECS Up front charges
9 Last day to add subjects (except Kuring-gai)
10 Teaching ceases for College of Law co-operative course C290
17 Last day to add subjects (except Kuring-gai)
17 Last day to withdraw from a course or semester-unit without penalty (Kuring-gai, except first-year students)
20 Teaching commences for College of Law co-operative course C190
27 Tutorial week commences (except Kuring-gai)
27 Practicum (School of Teacher Education, School of Library and Information Studies)
27 Field Experience week (School of Leisure, Tourism and Community Studies)
27 Project and Directed Activity week commences (Faculty of Adult Education)
27 Classes suspended week (other Kuring-gai Schools)
30 Last day to change HECS Payment Option
31 Spring HECS census date

September

3	Practicum (School of Teacher Education, School of Library and Information Studies)
3	Field Experience week (School of Leisure, Tourism and Community Studies)
3	Classes suspended week (other Kuring-gai Schools)
10	Practicum (School of Teacher Education)
14	Last day to approve leave of absence
14	Last day for withdrawal without academic penalty from a course or subject (except Kuring-gai)
14	Teaching ceases for College of Law co-operative course C190
17	Practicum (School of Teacher Education)
24	Non-teaching fortnight commences (Faculty of Adult Education)
26	Teaching commences for College of Law co-operative course C289
28	Applications close for admission in 1991

October

1	Labour Day holiday
1	Field Experience week (School of Leisure, Tourism and Community Studies)
1	Classes suspended week (other Kuring-gai Schools)
1	Recess week for College of Law full-time course C902
9	Tutorial week commences (except Kuring-gai)
24	Teaching ceases for College of Law co-operative course C289

November

12	Formal examinations commence for School of Nursing (Gore Hill)
12	Project and Directed Activity week commences (Faculty of Adult Education)
19	Formal examination period commences
26	Examinations commence for Architecture and Building, and Engineering
30	End of formal examination period (Kuring-gai only)
30	Last day of teaching semester (Faculty of Adult Education)

December

7	End of formal examination period (except Kuring-gai)
14	Teaching ceases for College of Law full-time course C902
24	End of academic year

Nursing Practical Experience for Kuring-gai students is ongoing throughout each semester. Details are in the *Clinical Experience Handbook* issued by the School of Nursing.

Kuring-gai Campus Practical Legal Training Courses.

First Half-Year Full-Time 901
January 15 - June 22
Recess: April 9 - April 16 (incl)

Second Half-Year Full-Time 902
July 9 - December 14
Recess: October 1 - October 5 (incl)

Co-Operative First Half-Year: Course C190
Session I: January 3 - February 13, 1990
Session II: August 20 - September 14, 1990
Session III: April 2 - April 30, 1991
Weekend Seminar - May 5 and 6, 1990

Co-Operative Second Half-Year: Course C290
Session I: July 2 - August 10, 1990
Session II: February 25 - March 22, 1991
Session III: October 8 - November 4, 1991
Weekend Seminar - November 10 and 11, 1990

1990 Academic Year

Autumn Semester
January 29 - June 29

Spring Semester
July 23 - December 24

1990 Public Holidays

Australia Day	January 26
Easter	April 13 - April 16
Anzac Day	April 25
Queen's Birthday	June 11
Labour Day	October 1

1990 TAFE and Public School Holidays

April 13 - April 22
July 2 - July 15
September 24 - October 5
December 17 - January 28

GENERAL INFORMATION

The Faculty Office is located in Building 4, Room 308, at Broadway.

The **UTS Information Service** is located in the foyer of the Tower Building at Broadway. It provides information and assistance to the public with all aspects of application for UTS courses. As the student centre it is the principal point of contact between students and the central administration. Through this centre students can obtain assistance with the broadest range of enquiries.

The **Student Health and Counselling Services** are located on the Broadway and Kuring-gai campuses, telephone 218 9145 (Broadway) or 413 8342 (Kuring-gai), and provide the following specialised services.

Student Counselling: The aim of this service is to assist students to perform to the best of their ability. Problems of a personal nature, study difficulties, selection of courses or anything else that is likely to affect a student's progress, may be discussed in confidence with the student counsellors.

Health Service: A free health service is provided for students of the University. A medical practitioner and a nursing sister staff the service and all consultations are considered strictly confidential.

Student Welfare Service: A Welfare Officer co-ordinates several distinct areas of student welfare including Accommodation, Student loans, Austudy applications; advocacy role (if needed) with academic and administrative problems. All interviews are confidential and suggestions for services required by students are welcome.

Students with Physical Disability: The Special Needs Co-ordinator is able to assist students with an increasing range of services. These include parking arrangements; amanuensis (note taker); hearing enhancement equipment; tape recorders; examination concessions (time and print size of paper). A seminar is held early in semester informing students with special needs of UTS policy.

A Learning Skills Counsellor is available to assist students with their study methods, particularly those students returning to study after some years absence.

The *International Students Counsellor* assists those students coming to UTS from overseas, with any difficulty they may have in successfully pursuing their course.

English classes: The University offers a variety of English classes particularly for overseas students. Interested students should contact the Student Services Unit in the first instance for further details.

Child Care: The Magic Pudding Child Care Centre provides full-time and part-time care for children of both students and staff. Care is available for children aged up to five years, Monday to Friday (8.00am - 10.00pm). Fees are calculated on a sliding scale based on family income. For further information please call 218 9507 or drop into the Centre at Broadway campus.

Financial Assistance is available to Australian residents under the AUSTUDY Assistance Scheme. The Australian Government provides means-tested living and other allowances to full-time and sandwich students undertaking approved tertiary and postsecondary courses. Further information is available from: The Director, Department of Employment, Education and Training, Plaza Building, 59 Goulburn Street, Sydney, NSW 2000. Telephone: (02) 218 8800. Information booklets and applicaton forms are also available from the Student Welfare Officer in the Student Services Unit at the University.

Fees and the Higher Education Contribution Scheme (HECS): Compulsory fees are payable to the University Union and Students' Association. The 1990 fees are $155 for new students and $137 for continuing students.

The Higher Education Contribution Scheme (HECS), introduced by the Commonwealth Government, collects a contribution from higher education students towards the cost of their education. Students (with the exception of some categories) are required to make a contribution of 20 per cent of their course costs. In 1990 this is about $1882 for a full-time course load. The contributions will only be required if and when the person has the capacity to pay.

Under HECS, an annual course charge of $1882 will apply for each year of equivalent full-time study undertaken. Relative charges will apply according to the actual proportion of equivalent full-time load being undertaken. If a student undertakes 75 per cent of a full-time laod then she or he will be charged about $1,412 (75 per cent of $1,882). The charge increases annually in line with tertiary education costs.

Student compulsory fees and HECS "upfront" charges are due and payable by a date determined by the Registrar and Secretary.

The Students' Association (SA) represents all students at the University. The Students' Council is the governing body of the SA. Elected by students, it is accountable to the student body. Each Faculty and the School of Design is represented on the Council along with a number of general members elected by all students.

The full-time paid President of the SA is directly elected by students. An Executive Committee assists the President in carrying out the directions of the Students' Council and the day to day management of the Association. The Vice-President is employed full-time to represent student education interests.

In general the SA plays a representative and advocacy role on behalf of students. It liaises closely with the University Union and the Student Services Unit. Additionally, it negotiates with, and/or lobbies government and non-government organisations on education and welfare issues in the interests of the students.

The Students' Association maintains close links with student bodies in other tertiary institutions and has a political role to play in maintaining educational standards and conditions for students both within the University and the tertiary sector as a whole.

The main office of the SA is located at the Broadway Campus on Level 3A of the Tower Building (telephone 218 9064). Opening hours - 9am to 6pm.

Equal Opportunity Co-ordinator

The Equal Opportunity Co-ordinator is available to assist any students who feel they have been discriminated against in their study. Whether the problem is sexual harassment or other unfair treatment because of race, sex, marital status, physical disability, racial vilification, homsexuality - you will be assured of a confidential hearing. You can contact her on 20930.

The **University Union** acts as the University's community centre and provides a focus for the social, cultural and recreational activities of the whole of the University community. All students are members of, and pay fees, to the Union; all University staff, whose fees are paid by way of an annual lump sum grant from the University to the Union, are also members; all graduates are eligible for life membership of the Union.

The Union fulfills its objectives by providing food services, licensed bars, lounge, meeting and function rooms, stationery shops, newsagency, sporting facilities (including squash courts, gymnasium, weights rooms and basketball/volleyball court), sports programmes and activities programmes which include dances, concerts, lunchtime speakers and entertainment, films and creative leisure courses. The Union also provides considerable financial and other assistance to affiliated clubs and societies. Miscellaneous services include free accident insurance, free legal advice, free diaries and other publications, lockers, telephones and TVs.

The Union also established the University's Careers and Appointments Service, which provides a gradaute placement service, casual employment and careers counselling.

The Union is controlled by a board of 15 persons, including eight students. Elections are usually held in September of each year and all interested students are encouraged to stand for a position on the board.

For further information, contact the Union Office on Level 6 of the Tower Building, phone 218 9403.

The **University Library** offers information from libraries on the Haymarket Campus, North Shore and Kuring-gai Campuses. The Faculty of Design has an Information Resource Centre (Library) at the Balmain campus. A wide variety of materials is available. Tours are given by library staff at the beginning of each semester as well as comprehensive sessions on the literature of various subjects.

The **Computing Services Division** provides a variety of facilities and services for undergraduate students. The main installation is on Level 9 of the Tower Building at Broadway with additional locations at Broadway and at the other campuses.

Scholarships: From time to time a number of companies, institutions and government authorities offer scholarships, cadetships, or employment to students about to commence courses at the University. Details are usually advertised in the press in the latter part of the year or early January. The UTS Information Service maintains a noticeboard devoted to such press clippings in the foyer of the Tower Building.

Prizes are awarded annually to students at UTS for excellence in study. These are made available through the generosity of private individuals and public organisations.

FURTHER INFORMATION

The information given above is a summary only. Further and more detailed information on each of the aspects covered may be obtained from the UTS Information Service or Faculty and School offices at the University.

An Information Evening or Open Day is normally held mid-year and prospective students are encouraged to attend and discuss their proposed courses and careers with members of academic staff. Information concerning the day may be obtained from the UTS Information Service.

STAFF

Professor of Chemical Technology and Dean of Physical Sciences Technology
R.J. Breakspere, PhD (Exeter), FRSC, CChem, ARACI
Sub-Dean
B.J. Franklin, BSc (Syd), MSc, PhD (NSW), MAIG, FGAA
Secretary to the Dean
M. Woessner
Administrative Officer
B.J. Kitto, BA (Macq)
Academic Administrative Co-ordinator
R.L.S. Woolcott, BSc, PhD (Syd), MAIP

School of Physical Sciences

Professor of Chemical Technology and Head of School
R.J. Breakspere, PhD (Exeter), FRSC, CChem, ARACI
Professor of Materials Technology
J. Unsworth, PhD, CChem, CPhys, FAIP, FPRI, SMIEEE
Professor of Physics
T.M. Sabine, DSc (Melb), FAIP
NSWIT Reader
G.B. Smith, BSc (UNE), PhD (Monash), MAIP
Associate Professor and Deputy Head of School
W. Stern, BSc, PhD (NSW), ASTC, CChem, FRACI
Data Entry Operator
D. Moriatas
Word Processor Operators
V. Searle
D.L. Francis
Technical Manager
B. Robens
Laboratory Cleaner
D. Blagojevic
Clerical Assistant/Data Entry Operator (P/T)
Vacant

Department of Applied Chemistry

Senior Lecturer and Head of Department
R.W. Jones, BSc, DipED (Melb), PhD (Cantab), CChem, ARACI
Senior Lecturers
R.A. Ashby, BSc, PhD (NSW), CChem, ARACI, MAIP
J.P. Byrne, BSc, PhD (Syd)
A.J. Cameron, MSc, PhD (Syd), CChem, ARACI, AMAusIMM
G.R. Draper, BSc, PhD (NSW), CChem, ARACI
D.A. Kairaitis, BSc (WA), MSc, PhD (UNE)
T.L. Mullins, BA, MSc (Hawaii), PhD (NSW), ACS, ARACI, CChem
G.P. Norton, BSc (Syd), MSc, PhD (NSW), CChem, ARACI
J.H. Sharp, BSc, PhD (NSW), CChem, ARACI
R.J. Sleet, MSc, PhD (Syd), CChem, ARACI
Lecturers
R. Armstrong, MSc, DipEd (Syd), DipEdTech (Plym), CChem, ARACI
A. Baker, BSc, PhD (NSW)
B.R. Crawford, MSc, PhD (NSW), ASTC
J.R. Kalman, BSc, PhD (Syd)
J.L. Hawking, BSc (NSW), DipEd (Syd), ME (UTS), FIICA
Senior Tutor
A. Wilson, BSc (St And), MEd (PNG), PhD (Ncle), MRSC
Research Scientist
H. Patney, BSc (Hons), MSc (Hons) (Punjab), PhD (India)
Scientific Officers
J. Keegan
H. Gotthard
Senior Technical Officers
T. Carlson
P. Carrodus
B. McQuillan
A. Barnes
J. Holmes
Technical Officers
S. Coneen
J.M. Ehret
D. Cohen
L. Klemes
M. Daraphet
M. Coulston
Vacant
L. Ambrose
Laboratory Attendant
J. Lah
Visual Aids Officer
J. Klemes
Laboratory Cleaners
H. Rogers
N. Djordjevic
B. Vracarevic
Laboratory Craftsman
J. Kerslake

Department of Applied Geology

Associate Professor and Head of Department
E.C. Leitch, MSc (Auck), PhD (UNE), FGS
Senior Lecturers
E. Frankel, BSc (Natal), PhD (Syd)
B.J. Franklin, BSc (Syd), MSc, PhD (NSW), MAIG, FGAA
B. Marshall, BSc (Lond), PhD (Brist), GradDipMgt (CIAE), ARCS, FGS, AMAIMM, MAIG
S.R. Sangameshwar, MSc (Mys), MSc, PhD (Sask), FGSI, AMAIMM, MAIG
Lecturer
C.G. Skilbeck, BSc, PhD (Syd)

Senior Tutor
J. Nicholson, MSc (NZ), AMAIMM
Tutor
J. Smith, BAppSc (NSWIT)
Tutor (Fractional-time)
S.J. McDonald, BSc (Syd)
Honorary Associates
K.G. Mosher, ED, OBE, BSc (Syd), MAIMM
F.L. Sutherland, MSc (Tas), PhD (J Cook)
Assistant Technical Manager
A. Buttenshaw
Scientific Officer
J. Bogi
Technical Officers
V. Taylor
A. Giles
L.M. Green
D. Colchester
Laboratory Attendant
S. Hoy

Department of Applied Physics

Associate Professor and Head of Department
A.R. Moon, BSc, PhD (Melb), FAIP
Senior Lecturers
G.R. Anstis, BSc (Monash), PhD (Adel)
D.G. Blair, BSc, PhD (Syd), MAIP, MASEG
R.W. Cheary, BSc, PhD (Aston)
P.F. Logan, MSc (Syd), PhD (ANU), GradDipEdStud (ACAE), MInstP
Lecturers
J.M. Bell, BSc (Syd), PhD (NSW), GAIP
S.W. Hogg, BSc (WA), MAppSc (NSWIT), MAIP
W. Kalceff, BSc (Syd), PhD (NSW), DipEd (STC), MAIP
K. McGuffie, BSc (Edin), PhD (Liverpool), FRMetS, MAGU
R.L.S. Woolcott, BSc, PhD (Syd), MAIP
Tutors
J.B. Franklin, BSc (ANU)
A. Thompson, BAppSc (NSWIT)
Honorary Associate
E.P.A. Sullivan, MSc, PhD (Syd), MAIP
Word Processor Operator/Typist
Vacant
Word Processor Operator (P/T)
H. Dalrymple
Secretary
E. Couttie
Science Officer
H.O. Sugo
Scientific Officer
M. Phillips
Senior Technical Officers
R. Graves
A. Rubel
A. Fischer-Cripps
A. Wong
M. Gertner
J. Campion
J. Hely
Technical Manager
M. Rosenbaum
Technical Officers
G. McCredie
V. Rao
M.G. London
D. Knezevic
A. Coelho
Apprentice
Vacant
Design and Manufacturing Co-ordinator
R. Peters
Technical Assistant
T. Broadhurst-Hill
Laboratory Craftspersons
J. Edington
Vacant
Laboratory Assistant
Vacant

Department of Materials Science

Senior Lecturer Head of Department
M. Wilson, BSc (Ncle), PhD (NSW), MIEAust
Associate Professor
R.F.G. MacMillan, MSc (Natal), PhD (BrCol), MIMMA
Senior Lecturers
B. Ben-Nissan, MSc (ITU), MSc, PhD, (NSW), MIM
A.S. Ray, MSc (Calc), PhD (NSW)
G.M. Renwick, BSc (St And), PhD (Monash), ARACI
M.G. Stevens, MSc, PhD (Syd), ARACI
Lecturer
G.L. Heness, MAppSc (NSWIT), MACS
Tutor (Fractional-time)
Vacant

FACULTY BOARD

Ex-Officio Members
Dean of the Faculty
R.J. Breakspere (Chair)
Professors, Associate Professors, Principal Lecturers and Heads of Department
R.W. Jones
E. Leitch
R.F.G. MacMillan
A.R. Moon
T.M. Sabine
W. Stern (Deputy Chair)
J. Unsworth
M. Wilson
Sub-Dean
B.J. Franklin

Deputy Head of School
W. Stern

Nominated Members
A. Wynack, Registrar and Secretary's Representative
R. Lim, School of Biological and Biomedical Sciences
Vacant, School of Humanities and Social Sciences
B. Bamber, School of Mathematical Sciences
T.A. Anderson, School of Civil Engineering
G. Ellit, School of Nursing
Vacant, University Library
K. Trigwell, Centre for Learning and Teaching

Faculty Staff Members
G.R. Anstis
R. Armstrong
A.T. Baker
J.M. Bell
D.G. Blair
B. Crawford
E. Frankel
J. Hawking
G. Heness
P.F. Logan
B. Marshall
J. Nicholson
G. Norton
G. Renwick
G.B. Smith
M.G. Stevens

Student Members
A. Van Bentum
D. Dimitriadis
A. Margarian
R. Wuhrer

COURSE ADVISORY COMMITTEES

APPLIED GEOLOGY

Ex-Officio Members
Dean of Physical Sciences and Head, School of Physical Sciences
R.J. Breakspere
Professors, School of Physical Sciences
T.M. Sabine
J. Unsworth
Registrar and Secretary's Representative
P. Allmond

Other Members
J.F. Gilfillan, John R. Gilfillan and Associates Pty Ltd
E.A. Bowen, Consultant and Geophysicist, Robertson Research (Aust) Pty Ltd
A.R. Collins, General Manager, Exploration Division, Pancontinental Mining Ltd Aust
K.R. Glasson, Foundation and Geological Services Pty Ltd
D.K. Hobday, Consultant, Baron Partners Ltd
R.W. Knox, BP Coal Development Pty Ltd
E.J. Malone, Consultant, Normandy Resources, Commercial Minerals Poseidon
T.F. McConachy, Principal Geologist, Eastern NSW, CRA Exploration Pty Ltd
M. McMahon, Consultant and Director, McMahon Associates Pty Ltd
N.L. Markham, Director, Geological Survey of NSW
I. Wallace, Manager, Technical Services, Boral Resoures (NSW) Pty Ltd
J.R. Williams, Manager Geotechnical Group, Department of Main Roads
All academic staff of the Department of Applied Geology

MATERIALS SCIENCE

Ex-Officio Members
Dean of Physical Sciences and Head, School of Physical Sciences
R.J. Breakspere
Professors, School of Physical Sciences
T.M. Sabine
J. Unsworth
Registrar and Secretary's Representative
Vacant

Other Members
J. Newton, General Manager, Amdel-Eastern Aust Group (Chair)
P. Harper, Product Division Manager, Polymer Division, ICI Australia
A.N. McKee, Manager Research, Rheem Australia Ltd
M.J. Murray, Division of Materials Science, CSIRO
K.D. Reeve, Leader, Ceramics Section, ANSTO
D. Taylor, Managing Director, Taylor Ceramic Engineering
All academic staff of the Materials Science Department

PHYSICS

Ex-Officio Members
Dean of Physical Sciences and Head, School of Physical Sciences
R.J. Breakspere
Professors, School of Physical Sciences
T.M. Sabine
J. Unsworth
Registrar and Secretary's Representative
Vacant

Other Members
B. Window, Principal Research Scientist, Division of Applied Physics, CSIRO (Chair)
N. Crothers, Manager, Technical Department, Australian Consumers Association
I. Fraser, ETP-Oxford Pty Ltd
P. Hariharan, Principal Research Scientist, Division of Applied Physics, CSIRO
D.R. Nicol, Chief of Technology Development Division, OTC (Aust)
G.K. White, Chief Research Scientist, Division of Applied Physics, CSIRO
All academic staff of the Physics Department

FACULTY OF PHYSICAL SCIENCES

The Faculty consists of one School, the School of Physical Sciences, which is located on the Broadway campus of the University. The educational interests of the Faculty span the broad areas of chemistry, geology, physics and materials science, particularly as they relate to the needs of the community and modern industry. In addition to the general laboratories and related facilities for the presentation of the general undergraduate programmes, the Faculty has a number of specialised laboratories used for advanced undergraduate work, for graduate extension courses and for postgraduate research.

Undergraduate courses offered in the Faculty lead to the degree of Bachelor of Applied Science.

Degree programmes in Applied Chemistry, Applied Geology, Applied Physics and Materials Science may be completed on a full-time, sandwich or part-time basis, extending over four to six years.

The degree courses in Applied Chemistry, Applied Geology, Applied Physics and Materials Science include a requirement of a minimum of one year of appropriate industrial experience which must be undertaken prior to or concurrent with the final stage of the course. Industrial experience may be gained on the basis of sandwich or part-time attendance at the University. An award with honours may be made to students who perform meritoriously and submit an acceptable project report in these degree courses.

In addition the Faculty provides service courses for students in Engineering, Applied Mathematics, Computing Sciences, Life Sciences, Nursing and Architecture.

Students may enrol in MAppSc and PhD programs by research and thesis.

Detailed information on the courses offered will be found on subsequent pages.

Some professional interests of the academic staff in the Faculty are given below. The University's telephone number is 20930 and these staff can be reached at the extensions shown.

	Ext.
Dr G.R. Anstis Electron Microscopy	9928
Dr R.A. Ashby Spectroscopy and Spectroanalysis	9419
Dr A.T. Baker Solid State Chemistry	9421
Dr J.M. Bell High Temperature Superconductors	9524
Dr B. Ben-Nissan Ceramics, Ceramic Composites	9571
Dr D.G. Blair Mathematical Physics, Geophysics	9944
Professor R.J. Breakspere Surface Science	9495
Dr J. Byrne Graphite Furnace AAS	9470
Dr A.J. Cameron Inorganic Chemistry	9931
Dr R.W. Cheary Materials Analysis	9517
Dr E. Frankel Sedimentology (Depositional Systems)	9647
Dr B. Franklin Igneous and Metamorphic Petrology	9570
Mr G.L. Heness Ceramics, Composites	9953
Dr R.W. Jones Applied Electrochemistry, Corrosion	9461
Dr D.A. Kairaitis Kinetics and Mechanisms of Reactions	9668
Dr W. Kalceff Neutron Scattering; Magnetic Materials; Computers; Education	9552
Dr J. Kalman Organic Chemistry	9411
Associate Professor E.C. Leitch Regional Geology, Tectonics	9457
Dr P.F. Logan Junior Physics; Energy Technology	9525
Associate Professor R.F.G. MacMillan Engineering Materials, Fire Cause Analysis	9460
Dr K. McGuffie Geophysics, Satellite Imagery	9493
Dr B. Marshall Structural Geology	9610
Associate Professor A.R. Moon Electron Microscopy Study of Materials	9468
Dr T. Mullins Marine Chemistry	9576
Mrs J. Nicholson Resource Management; Technical Writing	9473
Dr A. Ray Ceramics, Glass	9414
Dr G.M. Renwick Polymers; Organic Materials	9426
Professor T.M. Sabine	9418

Neutron Diffraction
Dr S. Sangameshwar 9463
Mineral Deposits: Geochemistry
Dr J.H. Sharp 9945
Analytical Chemistry
Dr C.G. Skilbeck 9476
Sedimentology, Petroleum Geology
Dr R. Sleet 9465
Chemical Education: Physical Chemistry
Dr G.B. Smith 9672
Materials & Solid State Physics; Thin Films; Electronic and Optoelectronic Devices; Solar Energy
Associate Professor W. Stern 9402
Analysis of Organic Chemicals
Dr M.G. Stevens 9529
Composites, Surface Science and Adhesion
Professor J. Unsworth 9472
Materials Technology, Polymer Electronics, Electroactive Composites and Power Insulation
Dr A. Wilson 9416
Science Education
Dr M. Wilson 9669
Engineering Materials - Processing and Fabrication, Mechanical Behaviour and Service Performance

Transfer Programme with Charles Sturt University
Under an agreement between The University of Technology, Sydney and the Charles Sturt University, it is possible for students to complete introductory subjects which will permit transference to UTS Physical Sciences courses at Stage 2 level. The subjects undertaken at Charles Sturt may be done by correspondence.

Further information on admission requirements and application procedures may be obtained from the Registrar, Charles Sturt University P.O. Box 588, Wagga Wagga, NSW 2650 or the Registrar and Secretary, The University of Technology, Sydney, P.O. Box 123, Broadway, NSW 2007.

Transfer Course with University of Western Sydney
An arrangement exists between the University and the University of Western Sydney, Nepean whereby the equivalent of one stage of the University's undergraduate Physical Sciences courses may be undertaken at the Kingswood Campus of the University of Western Sydney.

Enquiries may be made to the Secretary, the University of Western Sydney, P.O. Box 10, Kingswood, NSW 2750.

PhD Programme

The University of Technology, Sydney offers a Doctor of Philosophy (PhD) programme by research and thesis.

PhD programmes are offered in Physical Sciences as well as other areas of study.

For further information contact the Head of the relevant Department, the Dean of the Faculty or the Graduate Studies Office on 20930 ext. 9691.

Masters Degree by Thesis

Programmes leading to the award of Master of Applied Science are available on a full-time, part-time or external basis for graduates wishing to pursue a career in some field of applied science and seeking to extend and deepen their knowledge by undertaking an appropriate research investigation under professional supervision by academic staff of the University. Areas of study within the Faculty of Physical Sciences include the following:

Department of Applied Chemistry

Chemical research projects include the determination of molecular conformation in the solid state using diffraction methods; applications of fuel cells to environmental and medical analysis; computer assisted learning; mechanism of growth of kidney stones; analysis of high resolution band spectra of complex molecules; the nuclear magnetic spectroscopy of aromatic systems; a study of the distribution of trace metals in Sydney Harbour and the coastal waters of NSW; trace metal analysis of soils and vegetation; analytical application of chelating agents; mechanistic studies on the corrosion of stainless steel and cupro-nickel alloys; corrosion in structural steels; mass spectrometric analysis of trace organics; analysis of arson accelerants; as well as areas of chemical education such as a relative performance assessment of undergraduates.

Department of Applied Geology

Geological research projects include geochemical/mineralogical studies of economic metallic and non-metallic mineral deposits; field and laboratory studies involving petrology, tectonics, stratigraphy, structure and mineralisation on both detailed and regional scales; studies involving fluid inclusions, engineering geology, computer applications in geology, sedimentology, petroleum geology, coal geology, and marine geology.

Department of Applied Physics

A wide variety of research topics are being developed in physics. These include solar energy utilisation, including selective surfaces and photovoltaic convertors; the relationship between the structure and properties of solids using x-ray, electron and neutron diffraction methods; theoretical and experimental studies of the behaviour of superconducting materials; ceramics technology; physics education; geophysics.

Department of Materials Science

Materials Science research topics include techniques of metal joining (particularly welding); corrosion and corrosion protection; ceramic technology; polymer technology; adhesion technology; mineral extraction; flocculation studies; materials degradation and recycling; the deposition of oxide films by electrochemical methods; and materials science education.

Admission to the Course

A candidate may be registered as a Masters Degree Candidate subject to possessing a bachelors degree of the University of Technology, Sydney, an equivalent qualification, or such other evidence of general and professional qualifications as will satisfy the Academic Board that the applicant possesses the educational preparation and capacity to pursue graduate studies. If an applicant demonstrates that he/she is specially qualified in the relevant discipline at an advanced level, such as having satisfied the requirements for admission to a Bachelors degree with first or second class honours in the relevant discipline, he/she may be admitted with advanced standing and complete the requirements for a master's degree in less than the normal minimum four semesters on a full-time basis or six semesters on a part-time or external basis.

A candidate who has not reached the required stage of preparedness may be enrolled as a Masters Qualifying Student and be prescribed formal course work, or another suitable programme in order to prepare him/her for research studies.

The general rules governing admission, application, registration etc., are to be found in the rules section regarding graduate studies.

Bachelor of Applied Science (Chemistry)

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

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

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

Other patterns of attendance may also be permitted.

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

Part-time attendance involves 12 or 13 hours per week at the University; with this form of attendance a full stage may be completed in one year. It is normal practice for employers to release part-time students for at least one half-day per week for attendance at classes. Students commonly attend the University for one half-day and three evenings per week, or for two half-days and two evenings per week.

The award for successful completion of the course is Bachelor of Applied Science. The award of honours may be made to any student judged to have performed meritoriously in the course, and who has submitted a satisfactory report on an advanced chemistry project. The course has been designed to meet the academic requirements for entry to corporate membership of the Royal Australian Chemical Institute.

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

An Industrial Training Committee has been established within the Chemistry Department to provide guidance in the matter of appropriate vocational training. Students will be interviewed by this committee after completing Stage 2 of the course. Each student will then be assigned to a member of staff who will maintain regular contact during subsequent periods of study and employment.

SANDWICH PROGRAMME

STAGE 1

	Autumn Semester	*Hours/Week*
62414	Chemistry 1M F/T	6
63211	Physics 1 F/T	6
91388	Concepts in Biology F/T	6
	or	
62311	Geology 1 F/T	6
31870	Introduction to Microcomputers	2
33170	Basic Science Mathematics	3
	or	
33171	Science Mathematics 1 F/T (new)	4

STAGE 2

	Spring Semester	
62423	Organic Chemistry 1	6
62424	Chemistry 2M	6
63221	Physics 2 F/T	6
33171	Science Mathematics 1 F/T (new)	4
	or	
33172	Science Mathematics 2 F/T (new)	3
31871	Computing for Science	3

STAGE 3

	Autumn Semester	
62431	Structural Inorganic Chemistry	5
62433	Chemical Analysis 1	4
62436	Chemical Spectroscopy	5
63724	Introduction to Materials Science	4
60031	Treatment of Scientific Data	3
33172	Science Mathematics 2 (new)	3
	or	
33173	Science Mathematics 3 (new)	3
	Spring Semester	
62496	Industrial Training 1**	6

STAGE 4

	Autumn Semester	
62497	Industrial Training 2**	6
	Spring Semester	

62432 Organic Chemistry 2 5
62441 Physical Chemistry 1 6
62442 Electronics and Instrumentation 6
62443 Chemical Analysis 2 6
51368 Written and Oral Reporting 2

STAGE 5
Autumn Semester
21139 Business Organisation 2
51357 Oral Communication 2
62453 Chemical Analysis 3 6
62458 Chemical Technology (2 sem) 3
..... Elective* 6
62485 Advanced Chemistry Project (2 sem)† 5

STAGE 6
Spring Semester
62434 Industrial Chemistry, Safety and the Law 3
62456 Reaction Kinetics 3
62457 Surface Chemistry 3
62458 Chemical Technology (2 sem) 3
..... Elective* 6
62485 Advanced Chemistry Project (2 sem)† 5

PART-TIME PROGRAMME

STAGE 1
Academic Requirements
Autumn Semester *Hours/ Week*
62412 Chemistry 1 P/T (2 sem) 3
63212 Physics 1 P/T (2 sem) 3
91378 Concepts in Biology P/T (2 sem) 3
or
62312 Geology 1 P/T (2 sem) 3
33170 Basic Science Mathematics 3
or
33175 Science Mathematics 1 P/T (2 sem) (new) 2
Spring Semester
62412 Chemistry 1 P/T (2 sem) 3
63212 Physics 1 P/T (2 sem) 3
91378 Concepts in Biology P/T (2 sem) 3
or
62312 Geology 1 P/T (2 sem) 3
31870 Introduction to Microcomputers 2
33175 Science Mathematics 1 P/T (2 sem) (new) 2

STAGE 2
Academic Requirements
Autumn Semester
62422 Chemistry 2 P/T (2 sem) 3
63222 Physics 2 P/T (2 sem) 3
33171 Science Mathematics 1 (new) 4
or
33172 Science Mathematics 2 (new) 3
31871 Computing for Science 3
Spring Semester
62422 Chemistry 2 P/T (2 sem) 3
62423 Organic Chemistry 1 6
63222 Physics 2 P/T (2 sem) 3

STAGE 3
Academic Requirements
Autumn Semester
62433 Chemical Analysis 1 4
62436 Chemical Spectroscopy 5
33172 Science Mathematics 2 (new) 3
or
33173 Science Mathematics 3 (new) 3
Spring Semester
62431 Structural Inorganic Chemistry 5
60031 Treatment of Scientific Data 3
63724 Introduction to Materials Science 4
Industrial Requirements
62498 Industrial Training P/T** 3

STAGE 4
Academic Requirements
Autumn Semester
62432 Organic Chemistry 2 5
62441 Physical Chemistry 1 6
51368 Written and Oral Reporting 2
Spring Semester
62442 Electronics and Instrumentation 6
62443 Chemical Analysis 2 6
Industrial Requirements
62498 Industrial Training P/T** 3

STAGE 5
Academic Requirements
Autumn Semester
62453 Chemical Analysis 3 6
62458 Chemical Technology (2 sem) 3
51357 Oral Communication 2
Spring Semester
62434 Industrial Chemistry, Safety and the Law 3
62456 Reaction Kinetics 3
62457 Surface Chemistry 3
62458 Chemical Technology (2 sem) 3
Industrial Requirements
62498 Industrial Training P/T** 3

STAGE 6
Academic Requirements
Autumn Semester
21139 Business Organisation 2
..... Elective* 6
62485 Advanced Chemistry Project (2 sem)† 5
Spring Semester
..... Elective* 6
62485 Advanced Chemistry Project (2 sem)† 5
Industrial Requirements
62498 Industrial Training P/T** 3

***Electives**
62454 Applied Inorganic Chemistry (A) 6
62455 Applied Organic Chemistry 1 (S) 6
62462 Environmental Chemistry (A) 6
62465 Extractive Metallurgy (S) 6
62467 Applied Organic Chemistry 2 (A) 6
62468 Corrosion Science (S) 6

† Students wishing to be considered for a pass award must complete a minimum of 134 semester hours, including two approved electives. A project is not compulsory for students seeking a pass award, but students may undertake a project in lieu of one of their electives. Any chemistry project undertaken must be at least four-semester-hours duration. To be eligible for consideration for an honours award students must complete a minimum of 134 hours formal coursework together with an advanced chemistry project of 10 to 17 hours.

** Industrial experience is an integral part of this course. The minimum period of relevant employment required is the equivalent of one years full-time employment. The Industrial Training Committee of the Chemistry Department provides guidance on this occupational requirement. It is recommended that the Industrial Training component in the sandwich program, be undertaken after the completion of the third or fourth semester of academic work. It must be undertaken prior to commencement of the last semester of academic work.

Programme for Holders of the Chemistry Certificate

A special programme operates for students who have successfully completed the Chemistry Certificate of the Sydney Technical College and who are admitted into the Applied Chemistry degree course. The programme provides students with exemptions in a number of subjects and enables certificate holders to complete the Applied Chemistry degree program part time in five years. Students are admitted with advanced standing into Stage 2 of the course, and undertake the following programme:

STAGE 2
Academic Requirements
Autumn Semester *Hours/ Week*
63212 Physics 1 P/T (2 sem) 3
63724 Introduction to Materials Science 4
33170 Basic Science Mathematics 3
or
33175 Science Mathematics 1 P/T (new) (2 sem) 2
Spring Semester
63212 Physics 1 P/T (2 sem) 3
33175 Science Mathematics 1 P/T (new) (2 sem) 2
62431 Structural Inorganic Chemistry 5
31870 Introduction to Microcomputers 2

STAGE 3
Academic Requirements
Autumn Semester
63222 Physics 2 P/T (2 sem) 3
33171 Science Mathematics 1 F/T (new) 4
or
33172 Science Mathematics 2 (new) 3
31871 Computing for Science 3
Spring Semester
63222 Physics 2 P/T (2 sem) 3
33172 Science Mathematics 2 (new) 3
or
33173 Science Mathematics 3 (new) 3
62436 Chemical Spectroscopy 5
Industrial Requirements
62498 Industrial Training P/T 3

STAGES 4, 5 and 6
Identical to Applied Chemistry Degree Programme above, with 60031 Treatment of Scientific Data instead of Written and Oral Reporting
Exemptions Granted to Certificate Holders:
Chemistry 1M
Chemistry 2M
Organic Chemistry 1
Chemical Analysis 1
Written and Oral Reporting
Geology 1

Bachelor of Applied Science (Applied Geology)

This degree course is designed for students seeking careers as professional geologists. The basic award for successful completion of the course is Bachelor of Applied Science, but the award of honours may be made to any student who has performed meritoriously in formal course work, and has submitted a project report of high standard.

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

Industrial training is an essential part of the degree program, and is normally completed in two six-month periods one after completion of Stage 2 and one on completion of Stage 4. The Department of Appled Geology maintains close liaison with potential employers and assists students to obtain appropriate positions. The student may make his or her own arrangements, but the Head of Department must be satisfied as to the suitability of the employment.

The common course patterns are:
- four years of full-time enrolment, including two six-month periods of industrial training;
- six years of part-time* attendance, while concurrently employed full time in a relevant geological field;
- alternating periods of full-time study with similar periods of full-time relevant employment.

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

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

* Industrial training can be achieved by the student being concurrently in suitable employment. The matter should be discussed with the Head, Department of Applied Geology.

FULL-TIME PROGRAMME

In these programmes, each Stage corresponds to one semester spent in full-time attendance at the University.

STAGE 1

Autumn Semester		*Hours/Week*
62311	Geology 1 F/T	6
62411	Chemistry 1 F/T	6
63211	Physics 1 F/T	6
33170	Basic Science Mathematics	3
	or	
33171	Science Mathematics 1 F/T (new)	4
31870	Introduction to Microcomputers	2

STAGE 2

Spring Semester		
62322	Geological Mapping	4
62325	Lithology	2
62332	Geodynamics	3
62421	Chemistry 2 F/T	6
63221	Physics 2 F/T	6
33171	Science Mathematics 1 F/T (new)	4
	or	
33172	Science Mathematics 2 (new)	3

STAGE 3

Autumn Semester		
62396	Industrial Training	6
Spring Semester		
62330	Mineralogy and Petrology	8
62335	Sedimentary Geology	6
62336	Geochemistry	3
31871	Computing for Science	3
60031	Treatment of Scientific Data	3

STAGE 4

Autumn Semester		
62341	Technical Communication	4
62342	Structural Geology	6
62343	Economic Geology	4
62348	Resource Management	3
62355	Basin Analysis	3
62375	Exploration Geophysics	4
Spring Semester		
62397	Industrial Training 2	6

STAGE 5*

Autumn Semester		
62350	Engineering and Environmental Geology	6
62352	Advanced Petrology	4
62353	Fossil Fuels	4
62356	Exploration Geochemistry	3
62359	Project Seminar	3
62372	Advanced Structural Geology	4

STAGE 6*

Spring Semester		
62351	Exploration and Mining Geology	4
62360	Field Project	9
62364	Tectonics	3
62367	Remote Sensing	4
One of:		
62371	Advanced Fossil Fuels	4
62374	Mineral Deposits	4
62377	Advanced Engineering Geology	4

PART-TIME PROGRAMME

STAGE 1

Academic Requirements		
Autumn Semester		*Hours/Week*
62312	Geology 1 P/T (2 sem)	3
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
33170	Basic Science Mathematics	3
	or	
33175	Science Mathematics 1 P/T (2 sem) (new)	2
Spring Semester		
62312	Geology 1 P/T (2 sem)	3
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem) (new)	2
31870	Introduction to Microcomputers	2

STAGE 2

Academic Requirements		
Autumn Semester		
62332	Geodynamics	3
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
33171	Science Mathematics 1 F/T (new)	4
	or	
33172	Science Mathematics 2 (new)	3
Spring Semester		
62322	Geological Mapping	4
62325	Lithology	2
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3

STAGE 3

Academic Requirements		
Autumn Semester		
31871	Computing for Science	3
60031	Treatment of Scientific Data	3
62336	Geochemistry	3
Spring Semester		
62330	Mineralogy & Petrology	8

62335	Sedimentary Geology	6
Industrial Requirements		
62398	Industrial Training P/T	3

STAGE 4

Academic Requirements		
Autumn Semester		
62342	Structural Geology	6
62355	Basin Analysis	3
62375	Exploration Geophysics	4
Spring Semester		
62341	Technical Communication	4
62343	Economic Geology	4
62348	Resource Management	3
Industrial Requirements		
62398	Industrial Training P/T	3

STAGE 5*

Academic Requirements		
Autumn Semester		
62353	Fossil Fuels	4
62352	Advanced Petrology	4
62372	Advanced Structural Geology	4
Spring Semester		
62350	Engineering and Environmental Geology	6
62356	Exploration Geochemistry	3
62359	Project Seminar	3
Industrial Requirements		
62398	Industrial Training P/T	3

STAGE 6*

Academic Requirements		
Autumn Semester		
62351	Exploration and Mining Geology	4
62367	Remote Sensing	4
One of:		
62371	Advanced Fossil Fuels	4
62374	Mineral Deposits	4
62377	Advanced Engineering Geology	4
Spring Semester		
62360	Field Project	9
62364	Tectonics	3
Industrial Requirements		
62398	Industrial Training P/T	3

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

Bachelor of Applied Science (Applied Physics)

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

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

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

Attendance Patterns

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

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

Year 1
Stage 1 - (full time at the University)
Stage 2 - (full time at the University)
Year 2
Stage 3 - (full time at the University)
Stage 4 - (full time at the University)
Year 3
First Industrial Period of six months
Second Industrial Period of six months
Year 4
Stage 5 - (full time at the University)
Stage 6 - (full time at the University)

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

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

SANDWICH PROGRAMME

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

STAGE 1

Autumn Semester		*Hours/Week*
63211	Physics 1 F/T	6
62411	Chemistry 1 F/T	6
62311	Geology 1 F/T	6
	or	
91388	Concepts in Biology F/T	6

31870 Introduction to Microcomputers 2
33171 Science Mathematics 1 F/T (new) 4

STAGE 2
Spring Semester
63221 Physics 2 F/T 6
62421 Chemistry 2 F/T 6
63521 Materials Science 1 6
33172 Science Mathematics 2 (new) 3
33173 Science Mathematics 3 (new) 3

STAGE 3
Autumn Semester
31871 Computing for Science 3
33221 Engineering Mathematics 2A 3
51368 Written and Oral Reporting 2
60031 Treatment of Scientific Data 3
63196 Electrotechnology 2
63331 Physics 3 4
63332 Electronics 6

STAGE 4
Spring Semester
33330 Physical Mathematics 3
63153 Energy Technology 3
63333 Applied Physics 1 6
63341 Quantum Physics 1 3
63348 Applied Mechanics 3
63352 Digital Electronics 3
..... Elective 3
Autumn Semester
63396 Industrial Training 1 6
Spring Semester
63397 Industrial Training 2 6

STAGE 5
Autumn Semester
63354 Solid State Physics 4
63355 Experimental Methods 2 3
63357 Applied Techniques 6
63358 Field Theory 3
63361 Microprocessors in Instrumentation 3
63366 Nuclear Physics 2
..... Elective 3

STAGE 6
Spring Semester
63152 Materials Physics 3
63342 Principles of Instrumentation 3
63351 Quantum Physics 2 3
63365 Physical Optics 3
..... Elective 3
63849 Project 9

PART-TIME PROGRAMME
Each Stage corresponds to two semesters of part-time attendance at the University.

STAGE 1
Academic Requirements
Autumn Semester *Hours/ Week*
33175 Science Mathematics 1 P/T (2 sem) (new) 2
62412 Chemistry 1 P/T (2 sem) 3
63212 Physics 1 P/T (2 sem) 3
62312 Geology 1 P/T (2 sem) 3
or
91378 Concepts in Biology P/T (2 sem) 3
Spring Semester
31870 Introduction to Microcomputers 2
33175 Science Mathematics 1 P/T (2 sem) (new) 2
62412 Chemistry 1 P/T (2 sem) 3
63212 Physics 1 P/T (2 sem) 3
62312 Geology 1 P/T (2 sem) 3
or
91378 Concepts in Biology P/T (2 sem) 3

STAGE 2
Academic Requirements
Autumn Semester
33172 Science Mathematics 2 (new) 3
51368 Written and Oral Reporting 2
62422 Chemistry 2 P/T (2 sem) 3
63222 Physics 2 P/T (2 sem) 3
Spring Semester
31871 Computing for Science 3
33173 Science Mathematics 3 (new) 3
62422 Chemistry 2 P/T (2 sem) 3
63222 Physics 2 P/T (2 sem) 3

STAGE 3
Academic Requirements
Autumn Semester
33221 Engineering Mathematics 2A 3
60031 Treatment of Scientific Data 3
63196 Electrotechnology 2
63331 Physics 3 4
Spring Semester
63332 Electronics 6
63521 Materials Science 1 6
Industrial Requirements
63398 Industrial Training P/T 3

STAGE 4
Academic Requirements
Autumn Semester
63153 Energy Technology 3
63333 Applied Physics 1 6
..... Elective 3
Spring Semester
33330 Physical Mathematics 3
63341 Quantum Physics 1 3
63348 Applied Mechanics 3
63352 Digital Electronics 3
Industrial Requirements
63398 Industrial Training P/T 3

STAGE 5
Academic Requirements
Autumn Semester
63355 Experimental Methods 2 3
63357 Applied Techniques 6
63361 Microprocessors in Instrumentation 3
Spring Semester
63342 Principles of Instrumentation 3

63366 Nuclear Physics 2
63859 Project P/T (2 sem) 6
Industrial Requirements
63398 Industrial Training P/T 3

STAGE 6
Academic Requirements
Autumn Semester
63354 Solid State Physics 4
63358 Field Theory 3
63859 Project P/T (2 sem) 3
..... Elective 3
Spring Semester
63152 Materials Physics 3
63351 Quantum Physics 2 3
63365 Physical Optics 3
..... Elective 3
Industrial Requirements
63398 Industrial Training P/T 3

Bachelor of Applied Science (Materials Science)

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

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

Attendance Patterns
The course consists of six Stages which may be completed as follows:

1. *For Students Studying Full Time*
Three years of study are integrated with a 12-month period of employment in suitable industries.
2 .For Students Studying Part Time
Six years of part-time study whilst employed in a relevant industry.
3. A Combination of Full-Time and Part-Time Study
Students have the flexibility of choice and may complete portions of their course on a full-time or part-time basis.

All students enrolled in the Materials Science degree course are required to undertake one calendar year of full-time, or the part-time equivalent, industrial training of an approved nature. This industrial training is an integral and compulsory part of the degree programme. A programme of this type is called a Co-operative Education Programme or a Sandwich Programme.

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

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

SANDWICH PROGRAMME
Each Stage corresponds to one semester of full-time attendance at the University.

STAGE 1
Autumn Semester *Hours/ Week*
62311 Geology 1 F/T 6
or
91388 Concepts in Biology F/T 6
62411 Chemistry 1 F/T* 6
63211 Physics 1 F/T* 6
31870 Introduction to Microcomputers 2
33170 Basic Science Mathematics 3
or
33171 Science Mathematics 1 F/T (new) 4

STAGE 2
Spring Semester
62421 Chemistry 2 F/T 6
63221 Physics 2 F/T 6
62191 Introductory Organic Chemistry 3
63534 Introduction to Crystallography 2
63724 Introduction to Materials Science 4
33171 Science Mathematics 1 F/T (new) 3
or
33172 Science Mathematics 2 (new) 3

STAGE 3
Autumn Semester
31799 Computing 1 4
33141 Statistics 1 3
62192 Thermodynamics 3
63531 Materials Science 2 5
63532 Organic Materials 1 3
63533 Mechanical Properties of Materials 6

STAGE 4
Spring Semester
51368 Written and Oral Reporting* 2
63333 Applied Physics 1 6
63541 Physical Metallurgy 1 4
63542 Organic Materials 2 4
63544 Physical Metallurgy 2 4
63546 Ceramics 1 4

Autumn Semester
63596 Industrial Training 1 6
Spring Semester
63597 Industrial Training 2 6

STAGE 5
Autumn Semester
21139 Business Organisation* 2
5. . . . Social Science Elective/Elective* 2
63551 Physical Metallurgy 3 4
63556 Ceramics 2 4
63562 Organic Materials 3 4
63566 Ceramics 3 4
63858 Project (2 sem) 4

STAGE 6
Spring Semester
62193 Corrosion Technology 4
62465 Extractive Metallurgy 6
63553 Materials Degradation 2
63563 Surface Properties of Materials 4
63567 Design and Materials Selection 2
63568 Advanced Materials 2
63858 Project (2 sem) 4

*Subject normally available both Autumn and Spring Semester.

PART-TIME PROGRAMME
Each Stage corresponds to two semesters of part-time attendance at the University.

STAGE 1
Academic Requirements
Autumn Semester *Hours/ Week*
62312 Geology 1 P/T (2 sem) 3
or
91378 Concepts in Biology P/T (2 sem) 3
62412 Chemistry 1 P/T (2 sem) 3
63212 Physics 1 P/T (2 sem) 3
33170 Basic Science Mathematics 3
or
33175 Science Mathematics 1 P/T (2 sem) (new) 2
Spring Semester
62312 Geology 1 P/T (2 sem) 3
or
91378 Concepts in Biology P/T (2 sem) 3
62412 Chemistry 1 P/T (2 sem) 3
63212 Physics 1 P/T (2 sem) 3
31870 Introduction to Microcomputers 2
33175 Science Mathematics 1 P/T (2 sem) (new) 2

STAGE 2
Academic Requirements
Autumn Semester
62422 Chemistry 2 P/T (2 sem) 3
63222 Physics 2 P/T (2 sem) 3
63724 Introductory to Materials Science 4
33175 Science Mathematics 1 P/T (2 sem) (new) 2
or
33172 Science Mathematics 2 (new) 3
Spring Semester
62191 Introductory Organic Chemistry 3
62422 Chemistry 2 P/T (2 sem) 3
63222 Physics 2 P/T (2 sem) 3
63534 Introduction to Crystallography 2
33175 Science Mathematics 1 P/T (2 sem) (new) 2

STAGE 3
Academic Requirements
Autumn Semester
62192 Thermodynamics 3
63531 Materials Science 2 5
63532 Organic Materials 3
Spring Semester
31799 Computing 1 4
63541 Physical Metallurgy 1 4
63546 Ceramics 1 4
Industrial Requirements
63598 Industrial Training P/T 3

STAGE 4
Academic Requirements
Autumn Semester
33141 Statistics 1 3
51368 Written and Oral Reporting* 2
63533 Mechanical Properties of Materials 6
Spring Semester
63333 Applied Physics 1 6
63542 Organic Materials 2 4
63544 Physical Metallurgy 2 4
Industrial Requirements
63598 Industrial Training P/T 3

STAGE 5
Academic Requirements
Autumn Semester
63551 Physical Metallurgy 3 4
63556 Ceramics 2 4
21139 Business Organisation 2
5. . . . Social Science Elective 2
Spring Semester
62193 Corrosion Technology 4
62465 Extractive Metallurgy 6
63553 Materials Degradation 2
Industrial Requirements
63598 Industrial Training P/T 3

STAGE 6
Academic Requirements
Autumn Semester
63562 Organic Materials 3 4
63566 Ceramics 3 4
63858 Project (2 sem)* 4
Spring Semester
63563 Surface Properties of Materials 4
63567 Design and Materials Selection 2
63568 Advanced Materials 2
63858 Project (2 sem)* 4
Industrial Requirements
63598 Industrial Training P/T 3

*Subject normally available both Autumn and Spring Semester.

Extension Courses

The following extension courses may be offered by the School.
1. Applied Clay Mineralogy
2. Environmental and Pollution Studies

Courses will be of 48 hours duration in 12 sessions of four hours each.

The courses are aimed at people of graduate or equivalent level in formal education, but non-graduates with appropriate experience, interest and work situation may be admitted to a particular course.

No formal awards are to be offered for these courses, but statements are issued to students who successfully complete a particular extension course.

1. Applied Clay Mineralogy
The course will be of 12 weeks duration and will require four hours attendance per week. The course is designed for chemists, geologists and other scientific staff engaged in the supply or utilisation of clay and similar material in industry. It will consist of background lectures, field and laboratory work and will presuppose only a fundamental knowledge of geology. Topics to be covered include the composition, crystal structure and behaviour of clay minerals; the principal methods of identification and analysis; the processes of clay mineral formation and the geology of some typical deposits; and the requirements of clays for various industrial purposes.

2. Environmental and Pollution Studies
The course will be of 14 weeks duration and will require four hours attendance per week. It will consist of lectures, laboratory work and field work covering the chemistry of polluted and unpolluted systems. The aim is to provide the student with an understanding of the sources and problems of pollution, embracing the atmospheric, river and coastal systems.

Methods of surveys for the location and duration of polluting systems, controls, and correction measures will be discussed. Gaseous, liquid and solid waste systems will also be discussed. Special emphasis will be placed on analytical techniques in the field. At the conclusion of the course the student should have a good working knowledge of the theoretical aspects of existing problems, and be cognisant of the practical techniques of sampling, analysis and controls.

SYNOPSIS

60031 TREATMENT OF SCIENTIFIC DATA
Three semester hours
Prerequisites: 33171 or 33175 Science Mathematics 1 (new), 31870 Introduction to Microcomputers

Errors: error calculations, error propagation. Presentation of data and graphical analysis. Population and frequency distributions. Sampling techniques. Least-squares. Applications of concepts to the physical sciences.

62171 ENGINEERING CHEMISTRY (MECHANICAL)
Six semester hours (3 s/hrs lectures, 1 s/hr tutorial, 2 s/hrs practical)

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

62176 BASIC CHEMISTRY
One and one half semester hours

This subject introduces the language and basic concepts of chemistry. Topics include: language and nomenclature; atomic structure, periodic table and chemical bonding; mole concept; stoichiometry and chemical equation; energy and equilibrium; relevance of chemistry.

62181 PHYSICAL SCIENCE 1A
Three semester hours

This course is designed to develop the student's knowledge of basic physical and chemical concepts. It is an introduction to the fundamental principles required for the understanding of the scientific basis of physiological processes, pathophysiological changes and nursing practice. It covers basic physical concepts, basic chemical concepts, atomic structure, bonding, fluids at rest, fluids in motion and electricity.

62182 PHYSICAL SCIENCE 1B
Three semester hours
Prerequisite: 62181 Physical Science 1A

This course follows on from Physical Science 1A and is designed to develop the student's knowledge of basic physical and chemical concepts. It covers temperature and heat, heat transfer and the ideal gas, motion and the kinetic theory of gases, organic chemistry, chemical reactions and heat, chemical kinetics and equilibria, chemistry of blood, and poisons.

62186 ENGINEERING CHEMISTRY (Civil)
Four semester hours

At the completion of the subject students should understand the basic structure of various types of matter and their units of measurement, bonding in the various states of matter and how bonding affects their characteristics, and basic types of reactions in the liquid state. Topics include: atoms and molecules; concentration units; chemical and phase equilibria; bonding; acids and bases; states of matter; electrochemistry; organic chemistry.

62191 INTRODUCTORY ORGANIC CHEMISTRY
Three semester hours (lectures and practical)
Prerequisite: 62411 Chemistry 1 F/T or 62412 Chemistry 1 P/T
Corequisite: 62421 Chemistry 2 F/T or 62422 Chemistry 2 P/T

Structures, bonding and nomenclature of organic compounds. Functional groups. Preparation, properties and reactions of: aliphatic hydrocarbons, alkyl halides, alcohols, ethers, amines, aldehydes, ketones, nitriles, acids and derivatives, benzene and derivatives.

Qualitative analysis: IR and UV spectroscopy, chromatography. Structural and geometric isomerism. Examples of chain and condensation polymerisations. Consumption of plastics and natural polymers. Structures of some common polymers. Natural gas, oil and petroleum. The raw materials for plastics. Organic chemicals from wood and coal. Soaps, detergents, dyes etc.

62192 THERMODYNAMICS
Three semester hours - Lectures and practical
Prerequisites: 63521 Materials Science 1, 33163 Science Mathematics 2 (Physical Science) or 33213 Ordinary Differential Equations, 62422 Chemistry 2 P/T or 62421 Chemistry 2 F/T

First Law of Thermodynamics, internal energy and enthalpy changes in chemical and physical reactions. Entropy and the Second and Third Laws of Thermodynamics. Free Energy and chemical equilibria. Phase equilibria. The thermodynamic properties of ideal and non-ideal solutions.

62193 CORROSION TECHNOLOGY
Four semester hours (2 s/hrs lectures, 2 s/hrs practical)
Prerequisite: 63544 Physical Metallurgy 2

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

62311 GEOLOGY 1 F/T
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)

The dynamic Earth: Earth materials; Earth structure and the evolution of the continents and oceans. Geological history. Geological structure of Australia. Resource and environmental geology.

62312 GEOLOGY 1 P/T
Three semester hours for two semesters

Equivalent to 62311.

62322 GEOLOGICAL MAPPING
Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)
Prerequisite: 62311 or 62312 Geology 1

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

62324 CLAY MINERALOGY
Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Geology and mineralogy of non-metallic mineral deposits; quality parameters and testing procedures for industrial use; special techniques for clay evaluation.

62325 LITHOLOGY
Two semester hours (1 s/hr lecture, 1 s/hr practical)
Prerequisite: 62311 or 62312 Geology 1

Crystal symmetry and habit. Crystal growth types. Chemical classification of minerals; Ore mineral associations. Field classification and hand specimen description of igneous, sedimentary, metamorphic and volcanic rocks. Includes origin and types of deposits. Practical includes hand specimen examination of common minerals and rocks.

62330 MINERALOGY AND PETROLOGY
Eight semester hours (3 s/hrs lectures, 5 s/hrs practical)
Prerequisite: 62325 Lithology

Crystal symmetry and Miller Indices. Optical theory. Use of the polarizing microscope. Optical properties, chemistry and paragenesis of rock-forming minerals.

Crystallisation paths of igneous minerals; occurrence, mineralogy and texture of igneous rocks; nature of magma and its cooling behaviour; magmatic differentiation; sources of magma — nature of crust and upper mantle; igneous rock associations. Types of metamorphism and textures of metamorphic rocks; chemical equilibria and metamorphic mineral reactions; concept of metamorphic zones and facies; metamorphic rock association. Microscopic and megascopic description of rock types. Five-day field camp with 62335 Sedimentary Geology.

62332 GEODYNAMICS
Three semester hours (1½ s/hrs lectures, 1½ s/hrs practical)
Prerequisite: 62311 or 62312 Geology 1

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

62335 SEDIMENTARY GEOLOGY
Six semester hours (3 s/hrs lectures, 3 s/hrs practical)
Pre or Corequisite: 62330 Mineralogy & Petrology

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

62336 GEOCHEMISTRY
Three semester hours (1½ s/hrs lectures, 1½ s/hrs practical)
Corequisite: 62330 Mineralogy & Petrology

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

62341 TECHNICAL COMMUNICATION
Four semester hours (2 s/hrs lectures, 2 s/hrs tutorial)
Prerequisites: 62330 Mineralogy & Petrology, 62335 Sedimentary Geology

The nature of technical communication, geological report writing and presentation. Visual communication; charts, graphs, line drawings, maps, statistics. Legal problems of technical communication; contracts, copyright. House style, standard abbreviations and terminology. Editing, preparation and submission of technical manuscripts for publication and/or printing. Oral presentation of technical reports, participation in symposia. Journal and library research.

62342 STRUCTURAL GEOLOGY
Six semester hours (2½ s/hrs lectures, 3½ s/hrs practical)
Prerequisites: 62330 Mineralogy & Petrology, 62335 Sedimentary Geology

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

62343 ECONOMIC GEOLOGY
Four semester hours
Prerequisites: 62330 Mineralogy & Petrology, 62335 Sedimentary Geology

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

62348 RESOURCE MANAGEMENT
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisite: 62325 Lithology

Determination of reserves and resources on a global scale. Definition of reserve categories in use in Australia. The structure and financing of mining companies including financial evaluation techniques using discounted cash

flows. Stock exchange operation. Metal marketing and cartels. The New South Wales Mining Law; comparison with law in other States. Government policies with respect to the mining industry and the effects of political decisions on mining operations. Ethics in the mining industry and the geological profession.

62350 ENGINEERING AND ENVIRONMENTAL GEOLOGY

Six semester hours (lecture and practical plus four day field excursion)

Pre or Corequisites: 62342 Structural Geology, 62375 Exploration Geophysics, 62348 Resource Management

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

62351 EXPLORATION AND MINING GEOLOGY

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Prerequisites: 62342 Structural Geology, 62343 Economic Geology

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

62352 ADVANCED PETROLOGY

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Pre or Corequisite: 62372 Advanced Structural Geology

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

62353 FOSSIL FUELS

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Pre or Corequisites: 62335 Sedimentary Geology, 62355 Basin Analysis

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

62355 BASIN ANALYSIS

Three semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Pre or Corequisites: 62342 Structural Geology, 62375 Exploration Geophysics

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

62356 EXPLORATION GEOCHEMISTRY

Three semester hours (1 s/hr lecture, 2 s/hrs practical)

Pre or Corequisites: 62342 Structural Geology , 62343 Economic Geology

Introduction to geochemical exploration. Stream, soil, rock, plant sampling. Testing methods. Sampling theory. Sample security. Geochemical maps.

62357 ENGINEERING GEOLOGY

Three semester hours

Prerequisites: 62338 Environmental Geology, 62342 Structural Geology

The role of geology in civil engineering; mechanical properties of soil and rock materials; soil material and rock mass classification; hydrogeology and groundwater studies; slope stability analysis and control; geological requirements of construction materials; applications of geomorphology and terrain analysis in engineering geology; site investigations of civil engineering projects.

62359 PROJECT SEMINAR

Three semester hours

In preparation for the Field Project (62360), students are assigned seminar topics which include a literature search on an area of interest, background reading on relevant theoretical topics, and practical or field exercises designed to develop skills applicable to the particular Field Project proposed.

62360 FIELD PROJECT

Nine semester hours

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

62364 TECTONICS

Three semester hours (1½ s/hrs lectures, 1½ s/hrs practical)

Prerequisites: 62322 Geodynamics, 62352 Advanced Petrology

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

62367 REMOTE SENSING

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Pre or Corequisites: 62342 Structural Geology, 62343 Economic Geology

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

62371 ADVANCED FOSSIL FUELS

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Prerequisite: 62353 Fossil Fuels

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

62372 ADVANCED STRUCTURAL GEOLOGY

Four semester hours

Prerequisite: 62343 Economic Geology

Pre or Corequisite: 62352 Advanced Petrology

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

62374 MINERAL DEPOSITS

Four semester hours

Prerequisites: 62342 Structural Geology, 62343 Economic Geology

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

62375 EXPLORATION GEOPHYSICS

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Prerequisites: 63223 Geodynamics, 31799 Computing 1

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

62377 ADVANCED ENGINEERING GEOLOGY

Four semester hours (1½ s/hrs lectures, 2½ s/hrs practical)

Prerequisite: 62350 Engineering & Environmental Geology

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

62378 MINERAL SCIENCE PROJECT

Five semester hours

This project is a field and/or laboratory study on a topic selected by the Head of School. It should include literature review pertinent to the topic, appropriate methods of scientific investigations and where possible relate to the needs of and facilities available to the individual student.

62379 MINERAL SCIENCE PROJECT - Report and Seminar

Two semester hours

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

62381 ENGINEERING GEOLOGY (for engineers)

Two semester hours

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

62390 THESIS (Applied Geology) F/T

62391 THESIS (Applied Geology) P/T & EXT

62396 INDUSTRIAL TRAINING 1 (Applied Geology)

Prerequisite: 62322 Geological Mapping, 62325 Lithology

The first period of at least six months full-time relevant industrial employment is necessary to satisfy this subject.

The employment must have the approval of the Head, Department of Applied Geology.

62397 INDUSTRIAL TRAINING 2 (Applied Geology)
Prerequisite: Stage 4, Applied Geology Course.

62398 INDUSTRIAL TRAINING P/T (Applied Geology)

62411 CHEMISTRY 1 F/T

62412 CHEMISTRY 1 P/T
Six semester hours (62412 extends over 2 semesters at 3 s/hrs/week, 2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisite: HSC Science (any course) or equivalent

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

62414 CHEMISTRY 1M F/T
Six semester hours
Assumed knowledge: Core of HSC Chemistry 2U course or equivalent

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

62416 CHEMISTRY 1 F/T (Life Sciences)

See 62417.

62417 CHEMISTRY 1 P/T (Life Sciences)
Six semester hours (62417 extends over 2 semesters at 3 s/hrs/week; 2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisite: HSC Science (any course) or equivalent

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

62421 CHEMISTRY 2 F/T

62422 CHEMISTRY 2 P/T
Six semester hours (62422 extends over 2 semesters at 3 s/hrs/week, 2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisite: 62411 Chemistry 1 F/T or 62412 Chemistry 1 P/T

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

62423 ORGANIC CHEMISTRY 1
Six semester hours (3 s/hrs lectures/tutorial, 3 s/hrs practical)

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

62424 CHEMISTRY 2M F/T
Six semester hours
Prerequisite: 62414 Chemistry 1M F/T or equivalent

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

62426 CHEMISTRY 2 (Life Sciences)
Six semester hours (3 s/hrs lectures, 3 s/hrs practical)
Prerequisite: 62416 Chemistry 1 F/T Life Sciences or 62417 Chemistry 1 P/T Life Sciences

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

62431 STRUCTURAL INORGANIC CHEMISTRY
Five semester hours (2 s/hrs lectures, 3 s/hrs practical)
Prerequisite: 62421 Chemistry 2 F/T or 62422 Chemistry 2 P/T or 62424 Chemistry 2M

Chemical bonding and molecular structure. Introduction to transition metal chemistry. Co-ordination complexes and co- ordinate bonds. Introduction to basic concepts in solid state structural chemistry.

62432 ORGANIC CHEMISTRY 2
Five semester hours (2 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: 62423 Organic Chemistry 1, 62436 Chemical Spectroscopy plus all Stage 1 subjects

Structural determinations. Aromatic syntheses. Polynuclear aromatic hydrocarbons. Carbanion reactions. Carbohydrates. Hetrocyclic chemistry.

62433 CHEMICAL ANALYSIS 1
Four semester hours (1 s/hr lecture, 3 s/hrs practical)
Prerequisite: 62421 Chemistry 2 F/T or 62424 Chemistry 2M

An introduction to the theory and practice of qualitative and gravimetric analysis in organic chemistry. Classical methods of qualitative separation, identifying reactions of metal ions. Spot tests. Gravimetric separation methods. Theory of errors. Sampling methods.

62434 INDUSTRIAL CHEMISTRY, SAFETY AND THE LAW
Three semester hours (3 s/hrs lectures)
Corequisite: 62441 Physical Chemistry 1
Prerequisite: Work Experience

Principles of the processes used in industry. Efficiency of production, consumption of raw materials and energy; industrial fuels and water. Materials used.

62435 TREATMENT OF CHEMICAL DATA
Two semester hours (2 s/hrs lectures/tutorials)
Prerequisites: 33163 Science Mathematics 2 (Physical Sciences), 33141 Statistics 1 (Physical Sciences)

Method of measurement and chemical data collection; sources of experimental errors, statistical and non-statistical treatment of errors; graphical and numerical methods of data presentation and interpretation; use of dimensions in unit conversion, equation checking and equation formulation; representation of physical chemical data by mathematical relationships; computer applications.

62436 CHEMICAL SPECTROSCOPY
Five semester hours (2 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: 62421 Chemistry 2 F/T or 62424 Chemistry 2M and 62423 Organic Chemistry 1

This subject is an introduction to the theory and applications of spectroscopy, including electronic, infrared, n.m.r. and mass spectroscopy.

62441 PHYSICAL CHEMISTRY 1
Six semester hours (2 s/hrs lectures, 1/hr tutorial, 3 s/hrs practical)
Prerequisites: 33163 Science Maths 2, or 33172 Science Mathematics 2 (new), and 62436 Chemical Spectroscopy

This subject provides a firm foundation in the principles and applications of thermodynamics, and a comprehensive course in basic electrochemistry treated substantially from the kinetic viewpoint.

62442 ELECTRONICS AND INSTRUMENTATION
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisites: 63221 Physics 2, Stage 2 Chemistry subjects and all Stage 1 subjects

Electronics: components, relays, meters, transistors, integrated circuits. Digital electronics, counting circuits, pulse circuits, light detection devices.

Instruments: measuring instruments, op-amp polarographs, spectrometers.

62443 CHEMICAL ANALYSIS 2
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisites: 62433 Chemical Analysis 1, 62431 Structural Inorganic Chemistry and all Stage 1 subjects

A lecture series with associated practical work on separation techniques and volumetric procedures used in analytical chemistry.

62453 CHEMICAL ANALYSIS 3
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisites: 62443 Chemical Analysis 2, 62441 Physical Chemistry 1 and all Stages 1 and 2 subjects

Spectroanalytial chemistry. X-ray fluorescence analysis. Electroanalytical chemistry. Radiochemistry.

62454 APPLIED INORGANIC CHEMISTRY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisite: All Stages 1, 2 and 3 subjects

Ligands and their industrial applications. Crystal field theory and mineralogical applications. Biological applications of co-ordination chemistry. Concepts in solid state structural chemistry. Technological applications of inorganic solids.

62455 APPLIED ORGANIC CHEMISTRY 1
Six semester hours (3 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: All Stages 1, 2 and 3 subjects and 62432 Organic Chemistry 2

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

62456 REACTION KINETICS
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisites: 62441 Physical Chemistry 1, 62435 Treatment of Chemical Data or 60031 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects

Kinetics: Rate laws, reaction mechanism, rate theory.

62457 SURFACE CHEMISTRY
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisites: 62441 Physical Chemistry 1, 62435 Treatment of Chemical Data or 60031 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects

Interfacial phenomena, surface active agents, catalysis, rheology.

62458 CHEMICAL TECHNOLOGY (2 sem)
Six semester hours (3 s/hrs for two semesters)
Prerequisites: All Stage 3 Chemistry subjects and all Stages 1 and 2 subjects

Practical and theoretical treatment of automatic control. Development of differential equations for the process. Control problems solved using the analogue computer. Unit operations of fluid flow, and heat transfer treatment.

62462 ENVIRONMENTAL CHEMISTRY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisites: All Stages 1, 2 and 3 subjects

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

62465 EXTRACTIVE METALLURGY
Six semester hours (3 s/hrs lectures, 3s/hrs practical)
Prerequisites: 62441 Physical Chemistry 1 plus all Stages 1, 2 and 3 subjects

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

62467 APPLIED ORGANIC CHEMISTRY 2
Six semester hours (3 s/hrs lectures, 3 s/hrs practical)
Prerequisites: 62432 Organic Chemistry 2 and all Stages 1, 2 and 3 subjects

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

62468 CORROSION SCIENCE
Six semester hours
Prerequisites: 62441 Physical Chemistry 1 and all Stages 1, 2 and 3 subjects

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

62472 - CHEMISTRY PROJECT
62480 Four to eighteen semester hours
Prerequisites: All Stages 1-4 subjects

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

62490 THESIS (Applied Chemistry) F/T

62491 THESIS (Applied Chemistry) P/T & EXT

62496 INDUSTRIAL TRAINING 1 (Applied Chemistry)
First six months full time.

62497 INDUSTRIAL TRAINING 2 (Applied Chemistry)
Second six months full time.

62498 INDUSTRIAL TRAINING P/T (Applied Chemistry)

62955 READING/LITERATURE ASSIGNMENT (Higher Degree)

62966 PROJECT (Higher Degree)

63111 PHYSICS 1 (Life Sciences)
Six semester hours

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

63113 ENGINEERING PHYSICS 1 (Electrical)
Six semester hours

This is a foundation Physics course for Electrical Engineering students. It covers the fundamentals of dynamics and statics, fluid mechanics, atomic and nuclear physics, thermal physics and wave motion including sound and light.

63116 PHYSICS FOR ELECTRONICS
Six semester hours (2½ s/hrs lectures, 1 s/hr tutorial, 2½ s/hrs practical)

This is a foundation course for the sub-major in Electronics. It covers basic mechanics, wave motion and optics; electrostatics, electromagnetism and circuit analysis. An option, recommended in special cases only, is to replace the wave motion and optics with further mechanics including rotational motion.

63117 ENGINEERING PHYSICS (Mechanical)
Three semester hours

This is a foundation Physics course for Mechanical Engineering students. It covers the fundamentals of thermal physics, wave motion including sound and light, and electricity and magnetism.

63127 ELECTRICAL ENGINEERING 1 (Mechanical)

Three semester hours
Prerequisites: 63117 Engineering Physics (Mechanical), 33121 Engineering Mathematics 1

This subject covers the basic theory of electricity and magnetism and provides an introduction to the theoretical and practical aspects of electrical machines. The syllabus includes DC circuits, transients, AC circuits, magnetic fields, electromagnetic induction, magnetic materials, magnetic circuits, DC machines, multiphase circuits, transformers, induction motors and synchronous machines.

63131 ENGINEERING PHYSICS (Civil)
Six semester hours
Corequisite: 43511 Statics

This course provides an understanding of fundamental concepts in dynamics, electromagnetism, optics and thermal properties of matter. Students are introduced to the basic techniques of measurement.

63152 MATERIALS PHYSICS
Three semester hours (1¼ s/hrs lectures, 1¾ s/hrs practical)
Prerequisite: 63196 Electrotechnology

Dieletric properties: atomic theory, polarising ability, relaxation, ferroelectrics, piezoelectronics, breakdown. Magnetic properties: moments in atoms, ions, metals, ferrites and garnets, ferromagnetism, B-H loop, anisotropy, domains. Superconductivity: characteristics, flux trapping, type I and II applications.

63153 ENERGY TECHNOLOGY
Three semester hours (1 s/hr lecture, 1 s/hr seminar/tutorial, 1 s/hr practical)
Prerequisite: 63331 Physics 3 or equivalent

The physics of modern energy technology: energy sources, conversion, transportation, storage; new hydrocarbon fuel technology; electricity generation from nuclear fission, nuclear fusion, solar, wind and geothermal power; other energy utilisation systems. The subject includes an excursion to the AAEC Research Establishment at Lucas Heights.

63154 ELECTRICAL POWER GENERATION
Three semester hours
Prerequisite: 63113 Engineering Physics 1 (Electrical)

This is a basic course on energy and power for electrical engineering students. It covers the laws of thermodynamics; T-S diagrams; different thermodynamic cycles including the Otto, Diesel and steam engines; refrigeration cycles, thermal generation technology; nuclear reactors; nuclear fusion; M.H.D.; solar energy; alternative energy including wind, hydro, waves, tidal and geothermal; the distribution and storage of energy including pumped storage and batteries; the efficient use of energy; pollution; the economics, politics and planning of energy production and use.

63155 COMMUNICATION PHYSICS

Three semester hours

Basic aspects of electromagnetic wave propagation and attenuation in specific media. Real boundary problems, distributed source and multiwavelength effects; involving interference, diffraction, reflection, and image formation and processing. Waveguides and optical fibres. Sources and detectors of radiation. Electro-optic, acousto-optic and integrated optoelectronics.

63172 ELECTRICITY AND MAGNETISM
Three semester hours
Prerequisite: 63211 Physics 1

Introduction to electrostatics, electromagnetism and circuit analysis.

63173 PHYSICAL PROPERTIES
Three semester hours
Prerequisite: 63211 Physics 1

Properties of matter, geometric and physical optics and gravitation.

63175 THERMODYNAMICS
Two semester hours
Temperature scales. The First Law of Thermodynamics and various thermodynamic processes for solids, liquids and gases. The Second Law, entropy, and applications to heat engines. Thermodynamic functions and Maxwell's relations. Applications, e.g. specific heats, Joule-Kelvin effect, changes of phase.

63176 VACUUM TECHNOLOGY
Three semester hours
This course is an introduction to the practical aspects of scientific measurements and industrial processes requiring either low pressure or low temperature, including: properties of substances under these conditions; ultra-high vacuum techniques; leak testing; thin films; handling of liquified gases.

63185 INTRODUCTION TO QUANTUM PHYSICS
Two semester hours

Brief historical introduction, the Schroedinger equation. Time independent solutions for harmonic oscillator, infinite square well, hydrogen atom. Angular momentum. Interpretation of solutions.

63189 PHYSICS OF THE SOLID STATE
Three semester hours
Selection of topics from the subject 63354.

63190 ELECTRON MICROSCOPY
Two semester hours
Electron optics. Transmission E.M. and Scanning E.M.: image formation and contrast mechanisms. Microprobe analysis.

63194 ATOMIC PHYSICS
Two semester hours
Prerequisite: 63221 Physics 2 or 63172 Electricity and Magnetism

Discovery of electron and isotopes, basic nature of the atom, work of Rutherford, Bohr theory. Concepts of quantisation including work of Planck and Einstein. Special relativity. Nature of X-rays. Wave nature of matter, introduction to wave mechanics. Basic properties of nucleus, radioactivity, particle detectors, nuclear energy and interactions. Elementary particles.

63196 ELECTROTECHNOLOGY
Two semester hours
Prerequisites: 63221 Physics 2, 33163 Science Mathematics 2, 33164 Science Mathematics 3

Application of electrostatics, magnetic effects of currents and electromagnetic induction; alternating current circuits using complex impedance; electrical measurements; magnetic materials; transformers.

63197 ELECTROMAGNETIC FIELDS
Two semester hours
Corequisites: 63196 Electrotechnology, 33319 Advanced Calculus, 33213 Ordinary Differential Equations

Basic electromagnetic theory; Maxwell's equations; plane wave solutions in vacuum, dielectrics and conductors; boundary-conditions; reflection with normal incidence.

63211 PHYSICS 1 (F/T)
Six semester hours (3½ s/hrs lecture/tutorials, 2½ s/hrs practical)
Corequisites: 33170 Basic Science Mathematics or 33171 Science Mathematics 1 F/T (new) or 33175 Science Mathematics 1 P/T (2 sem) (new)

Introduction to the fundamental laws of mechanics, thermal physics, wave motion and optics.

63212 PHYSICS 1 P/T
Three semester hours for two semesters

Equivalent to 63211

63221 PHYSICS 2 F/T
Six semester hours (2½ s/hrs lectures, 1 s/hr tutorial, 2½ s/hrs practical)
Prerequisite: 63211 or 63212 Physics 1
Corerequisite: 33171 or 33175 Science Mathematics 1 (new)

Introduction to electrostatics, electromagnetism and circuit analysis, properties of matter and optics. For Chemistry and Geology students: atomic and nuclear physics instead of gravitation and additional optics.

63222 PHYSICS 2 P/T
Three semester hours for two semesters

Equivalent to 63221

63293 APPROVED EXTERNAL SUBJECT
Three semester hours

63296 APPROVED EXTERNAL SUBJECT
Six semester hours

63331 PHYSICS 3
Four semester hours (3½ s/hrs lectures/tutorials, ½ s/hr practical)

Prerequisites: 63221 Physics 2 or 63172 Electricity and Magnetism; 33163 Science Mathematics 2

Thermodynamics: temperature scales. The First Law of Thermodynamics and various thermodynamic processes for solids, liquids and gases. The Second Law, entropy, and applications to heat engines. Thermodynamic functions and Maxwell's relations. Applications, e.g. specific heats, Joule-Kelvin effect, changes of phase.

Atomic physics: discovery of electron and isotopes, basic nature of the atom, work of Rutherford. Bohr theory. Concepts of quantisation including work of Planck and Einstein. Special relativity. Nature of X-rays. Wave nature of matter, introduction to wave mechanics. Basic properties of nucleus, radioactivity, particle detectors, nuclear energy and interactions. Elementary particles.

63332 ELECTRONICS
Six semester hours (2 s/hrs lectures/tutorials, 4 s/hrs practical)
Prerequisites: 63221 Physics 2 or 63172 Electricity and Magnetism or 63116 Physics for Electronics; 33163 Science Mathematics 2

Direct current circuits, alternating current circuits, semiconductor theory, bipolar transistor, field effect transistor, amplifiers including operational amplifiers, feedback (positive and negative), power supplies, introduction to digital electronics.

Emphasis is placed upon practical work. Experiments cover all topics included in the lecture course.

63333 APPLIED PHYSICS 1
Six semester hours (1½ s/hrs lectures, 4½ s/hrs practical/tutorial)
Prerequisites: 63221 Physics 2, 33163 Science Mathematics 2

Vacuum physics: introduction to the production, measurement and application of vacuum pressures. Pumps for rough, medium and high vacua. Gauges used for measuring. Production and measurement of ultrahigh vacua. Leak detection. Applications, e.g. vacuum coating. Optical instruments and photography: extension of lens and mirror theory to include defects and aberrations. Applications to cameras and other instruments. Densitometry. Workshop practice, including use of tools, basic machines, welding. Engineering drawing, emphasising plane drawing of items for construction in a workshop.

63335 EXPERIMENTAL METHODS 1
Three semester hours
Prerequisite: 63221 Physics 2
Corequisite: 33163 Science Mathematics 2

Analysis of the experimental process: planning an experiment, equipment design and selection, commissioning, experimental execution, data analysis, presentation of results. Statistical methods. Basis of experimental design. Temperature measurement. Excursion to National Measurement Laboratory.

63341 QUANTUM PHYSICS 1
Three semester hours (lecture/tutorials)
Prerequisite: 63331 Physics 3 or 63194 Atomic Physics
Corequisite: 33221 Engineering Mathematics 2A

Brief historical introduction, the Schroedinger equation. Time-independent solutions for harmonic oscillator, infinite and finite square wells, hydrogen atom, potential steps and barriers. Angular momentum. Orthonormality, interpretation of solutions.

63342 PRINCIPLES OF INSTRUMENTATION
Three semester hours (1 s/hr lecture/tutorial, 2 s/hrs practical)
Prerequisites: 63332 Electronics; 63352 Digital Electronics or 31888 Logic Design 1
Corequisite: 33330 Physical Mathematics
Characteristics of measurement; the role of electronics in instrumentation; signal conditioning; performance characteristics of instruments; noise and its reduction; analysis of signals and instruments.

63344 APPLIED MECHANICS 2
Two semester hours (lecture/tutorials)
Prerequisite: 63334 Applied Mechanics 1
Corequisites: 33319 Advanced Calculus, 33213 Ordinary Differential Equations

Problem-solving techniques in statics and dynamics; free and forced vibrations, including systems with more than one degree of freedom, dynamics of non-rigid systems, Lagrange's equations, Hamilton's equations.

63348 APPLIED MECHANICS
Three semester hours
Prerequisites: 63221 Physics 2, 33221 Engineering Mathematics 2A

The aim of this course is to develop techniques and skills in problem solving in applied dynamics. Particle kinematics, kinetics in various co-ordinate systems, relative motion, systems of particles, rigid bodies, and Lagrangian and Hamiltonian mechanics are covered.

63351 QUANTUM PHYSICS 2
Three semester hours (lecture/tutorials)
Prerequisite: 63341 Quantum Physics 1
Corequisite: 33330 Physical Mathematics
Quantum mechanics: time-independent perturbation theory, variational principle, applications. Rotational and vibrational spectra of molecules. Multi-electron atoms, Hartree approximation. Interpretation of quantum theory.

Statistical mechanics and transport phenomena: probability calculations. Isolated systems, fixed-temperature systems, resulting distributions, partition function. Application to paramagnetic solid, ideal gases and other systems. Maxwell velocity distribution. Electrochemical potential. Fermi and Bose distribution functions. Irreversible thermodynamics of linear processes.

63352 DIGITAL ELECTRONICS
Three semester hours (1 s/hr lecture/tutorial, 2 s/hrs practical)

Prerequisite: 63332 Electronics

Logic gates, boolean algebra, decoding and multiplexing, decision circuits, signal conditioning, digital data storage, counting techniques, A to D and D to A conversions.

63354 SOLID STATE PHYSICS
Four semester hours (2 s/hrs lectures, 2 s/hrs practical)
Prerequisite: 63341 Quantum Physics 1

Electronics in solids: free electrons, chemical bonds, LCAO, band theory, insulators; metals and semiconductors; electrical and optical properties of semiconductors. Lattice vibrations: phonons, specific heat, thermal conductivity and expansion. Magnetism: para- dia- and ferromagnetism; Curie and Curie-Weiss law; resonance.

63355 EXPERIMENTAL METHODS 2
Three semester hours
Prerequisites: 63335 Experimental Methods 1, 63332 Electronics

Least squares fitting procedures and analysis, numerical noise reduction techniques, transducers and sensors; data processing. Measurement of pressure, flow vibration, noise, heat flux, position, angle, surface morphology. Infrared and optical detectors, photon noise.

63357 APPLIED TECHNIQUES
Six semester hours (2 s/hrs lecture/tutorials, 4 s/hrs practical)
Prerequisite: 63521 Materials Science 1
Corequisites: 63331 Physics 3, 63333 Applied Physics 1

X-ray generation, absorption and scattering; space group theory; crystal diffraction theory; application to structure analysis; defects and deformations in crystal, accurate cell dimensions. Quantitative XRF and XRD. Electron microscopy: electron optics, transmission e.m. and scanning e.m.; image formation and contrast mechanisms. Electron diffraction. X-ray microprobe analysis.

63358 FIELD THEORY
Three semester hours
Prerequisites: 33330 Physical Mathematics, 63196 Electrotechnology

Solution of electrostatic and magnetostatic problems using Laplace and Poisson equations. Fields in rectangular trough, around a split cylinder. Dielectric sphere in a field. Separation of variables in rectangular, cylindrical and spherical coordinates. Maxwell's equations in integral and differential form. Derivation. Power flow. Poynting vector. Boundary conditions on E, B, D, H. Wave equation in free space. Plane wave solutions. Skin effect. Reflection of interfaces. Vector magnetic potential and current distribution. Electric dipole radiation. Waveguides. TE and TM modes.

63361 MICROPROCESSORS IN INSTRUMENTATION
Three semester hours
Prerequisites: 31799 Computing 1, 63332 Electronics; 63352 Digital Electronics or 31888 Logic Design 1

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

63365 PHYSICAL OPTICS
Three semester hours
Prerequisite: 63347 Electromagnetism or 63197 Electromagnetic Fields or 63358 Field Theory
Corequisite: 63333 Applied Physics 1

Classical physical optics: dispersion, Fresnel equations; polarisation; interference and interferometry; diffraction, the use of Fourier transforms in diffraction; spatial filtering; laser cavities and amplification; coherence, holography, fibre optics.

63366 NUCLEAR PHYSICS
Two semester hours (1¼ s/hrs lectures, 1¼ s/hr practical)
Prerequisites: 63153 Energy Technology, 63331 Physics 3

Basic properties of nuclei, nuclear decay, nuclear electronics, passage of energetic particles through matter, nuclear models, nuclear reactions, nuclear forces and fields, fundamental particles.

63381 COMPUTATIONAL ANALYSIS OF PHYSICAL DATA
Three semester hours
Prerequisites: 42549 Numerical Analysis, 63355 Experimental Methods 2
Corequisite: 33330 Physical Mathematics

This subject covers analysis of data from a wide range of physical systems with particular emphasis on the physical aspects and the practical implementation in computer software.

Survey of physics areas using computational analysis, computing aspects, fitting of data to model predictions, case studies, spectral analysis, image digitisation and analysis.

63382 COMPUTER MODELLING OF PHYSICAL SYSTEMS
Three semester hours
Prerequisites: 33330 Physical Mathematics, 63335 Experimental Methods 1, 42549 Numerical Analysis

This subject involves the modelling of a range of physical systems, with emphasis placed on developing the student's skill in practical implementation on a computer, including packages.
Simulation of electrical network behaviour, including Fourier and Laplace transform methods. Monte Carlo methods, including spin lattices, diffusion, multiple scattering. Modelling in mechanics, including particle trajectories, design of magnetic lens, energy eigenfunctions. Modelling of waves and fields, fluid flow, partial differential equations.

63390 THESIS (Applied Physics) F/T

63391 THESIS (Applied Physics) P/T & EXT

63396 INDUSTRIAL TRAINING 1 (Applied Physics)

First six months full time.

63397 INDUSTRIAL TRAINING 2 (Applied Physics)
Second six months full time.

63398 INDUSTRIAL TRAINING P/T (Applied Physics)

63521 MATERIALS SCIENCE 1
Six semester hours
Prerequisites: 62411 Chemistry 1, 63211 Physics 1; 33111 Calculus & Analytic Geometry or 33160 Science Mathematics 1

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

Introduction to crystallography, crystal systems, symmetry, Miller indices, the stereographic projection, x-rays, diffraction methods, interpretation of powder photographs, the determination of crystal structures, intensities of x-ray reflections and intensity calculations.

63531 MATERIALS SCIENCE 2
Five semester hours
Prerequisites: 63521 Materials Science 1, 33163 Science Mathematics 2 or 33213 Ordinary Differential Equations, 63221 Physics 2, 62421 Chemistry 2

Introduction to quantum mechanics and quantum numbers appled to atomic structure. Bond theory or solids. Electrical properties - conductivity, semi-conduction and p-n junctions, superconductivity, dielectric properties. Thermal properties - heat capacity, thermal conductivity and thermoelectric power. Magnetic properties - atomic magnetism, magnetization curves and hysteresis, domain theory, magnetic materials.

63532 ORGANIC MATERIALS 1
Three semester hours
Prerequisites: 63521 Materials Science 1, 62191 Introductory Organic Chemistry
Corequisite: 63531 Materials Science 2

The preparation, properties and applications of common commercial plastics. Qualitative analysis of polymers. Number and weight average molecular weights. Bonding, structures and morphology of polymers. Structure/property relationships. Thermal properties of polymers and copolymers. The structures and properties of natural polymers (rubber, wood, cellulose, rosin, wool). Synthetic elastomers and copolymers.

63533 MECHANICAL PROPERTIES OF MATERIALS
Six semester hours
Prerequisite: 63521 Materials Science 1
Corerequisite: 33163 or 33172 Science Materials 2

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

63534 INTRODUCTION TO CRYSTALLOGRAPHY
Two semester hours

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

63541 PHYSICAL METALLURGY 1
Four semester hours
Prerequisites: 63521 Materials Science 1, 63531 Materials Science 2, 62192 Thermodynamics

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

63542 ORGANIC MATERIALS 2
Four semester hours
Prerequisite: 63532 Organic Materials 1

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

63543 MATERIALS SCIENCE 3
Three semester hours
Prerequisite: 63531 Materials Science 2

Magnetic Properties: fundamental, diamagnetism, paramagnetism and ferromagnetism, magnetisation and hysteresis, domain theory, magnetic materials, anisotropy, magnetostriction, soft and hard magnets and their application.

Optical Properties: light and related phenomena - polarisation, reflection, refraction, isotropic - anistropic media, sources of colour - absorption and transmission, dispersion. Raman spectroscopy. Application - X-rays, luminescence - fluorescence and phosphorescence, lasers. Introduction to electron optics.

Resonance: NMR - principles, experimental methods, diffusion in solids, deformation in metals, ESR - principles, experimental methods - applications in metals, ionic crystals, semiconductors and ferromagnetics.

63544 PHYSICAL METALLURGY 2
Four semester hours
Prerequisite: 63533 Mechanical Properties of Materials
Corequisite: 63541 Physical Metallurgy 1

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

63546 CERAMICS 1
Four semester hours
Prerequisites: 63521 Materials Science 1 or 63724 Introduction to Materials Science

Construction and interpretation of binary and ternary phase diagrams and their applications. Structure and classification of ceramic materials with special emphasis on clay minerals. Phase transformations in silica and alumina silicate systems.

Raw materials, pressing, extrusion and slip casting of clay products. Clay, heavy clay and whiteware manufacturing methodologies, cation exchange and properties of clay based ceramics.

Structure and chemistry of cements and concretes
Introduction to refractories and ceramic microstructures.

Industrial excursions.

63551 PHYSICAL METALLURGY 3
Four semester hours
Prerequisites: 63541 Physical Metallurgy 1, 63533 Mechanical Properties of Materials

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

Industrial excursions and technical inspections.

63553 MATERIALS DEGRADATION
Two semester hours
Prerequisites: 63546 Ceramic Materials 1, 63542 Organic Materials 2, 63556 Ceramics 2

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

63556 CERAMICS 2
Four semester hours
Prerequisites: 63546 Ceramics 1, 62192 Thermodynamics

Structure and composition of glasses. Phase transformations and nucleation in glass systems and their applications in glass ceramics and glazes.

Chemical and physical strengthening of glasses and glass ceramics. Glass fibres and their applications in optical communication.

Raw materials used in glass manufacture. Properties and manufacture of commercial glasses.

Industrial excursions.

63562 ORGANIC MATERIALS 3
Four semester hours
Prerequisite: 63532 Organic Materials 1

The mechanical properties and testing of polymers. Viscolelasticity and creep. Polymer rheology, processing and fabrication. The chemical, physical and engineering properties of rubber and elastomers. Optical properties of polymers, birefringence and photoelasticity. Textiles, fibres and new polymers. Other organic materials (fuels, oil, paper). Paint, coatings, adhesives.

Industrial excursions.

63563 SURFACE PROPERTIES OF MATERIALS
Four semester hours
Prerequisites: 62192 Thermodynamics, 63542 Organic Materials 2, 63544 Physical Metallurgy 2, 63546 Ceramics 1

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

63566 CERAMICS 3
Four semester hours
Prerequisites: 63531 Materials Science 2, 63533 Mechanical Properties of Materials, 63546 Ceramics 1

Structural imperfections and defect mechanisms. Kroger-Vink notations, diffusion in ceramics and solid state electrolytes. Solid reactions, sintering theories, densification and grain growth. Advanced production methods. Solid solutions and molecular engineering in ceramics with oxides, nitrides and carbides.

Mechanical properties and designing with brittle materials. Reliability and probability analysis in ceramics.

Thermal, magnetic and electrical ceramic properties and production methodologies.

Toughening mechanisms and introduction to Ceramic Composites.

Industrial excursions.

63567 DESIGN AND MATERIALS SELECTION
Two semester hours
Prerequisites: 63544 Physical Metallurgy 2, 63546 Ceramics 1, 63542 Organic Materials 2

This subject is an examination of the decision-making processes which an engineer or technologist employs to originate, evolve and proportion a device, a machine component or structural system. Material selection and specification, a critical factor in this process, is examined in regard to material characteristics, inservice performance,

aesthetic and economic factors, and other matters that must be considered in the design process. Various case histories are studied.

63568 ADVANCED MATERIALS
Two semester hours
Prerequisites: 63544 Physical Metallurgy 2, 63551 Physical Metallurgy 3, 63542 Organic Materials 2, 63562 Organic Materials 3, 63556 Ceramics 2, 63566 Ceramics 3
Corequisite: 63563 Surface Properties of Materials

Mechanical properties, fracture mechanics and failure analysis of polymer, metallic and ceramic matrix composites. Properties of fibres, weaves, fabrics and pregs, their manufacturing and processing requirements. Properties of advanced materials and composites and their selection.

Advanced polymers, co-polymers and polymeric matrix composites. Design and properties of high temperature metal alloys and metal matrix composites, manufacturing methodologies and behaviour. Toughening of mechanisms in ceramic matrix composites and manufacturing with advanced ceramics.

63590 THESIS (Materials Science) F/T

63591 THESIS (Materials Science) P/T & EXT

63596 INDUSTRIAL TRAINING 1 (Materials Science)

63597 INDUSTRIAL TRAINING 2 (Materials Science)

63598 INDUSTRIAL TRAINING P/T (Materials Science)

63704 MATERIALS ENGINEERING 1
Three semester hours
Prerequisites: 42611 Mechanics 1, 62171 Engineering Chemistry

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

63724 INTRODUCTION TO MATERIALS SCIENCE
Four semester hours
Prerequisites: 62411 Chemistry 1, 63211 Physics 2
Corequisites: 62421 Chemistry 2, 63221 Physics 2, 33171 Science Mathematics 1 (new)

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

63734 MATERIALS TECHNOLOGY
Three semester hours
Prerequisite: 63113 Engineering Physics 1 (Elec)

The objectives of the subject are to develop the student's familiarity with commonly used electrical engineering materials to the extent that he or she could classify them in order of hardness, strength, thermal and electrical conductivity, density, dielectric constant and permeability.

Materials covered include ferrous and non-ferrous metals, plastics and ceramics. The subject includes the topics of measurement of material properties, joining techniques, forming and surface finishing techniques. General production techniques and the selection methods are covered but the emphasis is placed on the properties and selection of metals ceramics, polymers and composites in electronic devices and instruments.

63842-63847 PROJECT
Two to seven semester hours

63848 PROJECT F/T
Eight semester hours

63849 PROJECT F/T
Nine semester hours

63858 PROJECT P/T
Eight semester hours (4 s/hrs over 2 semesters)

63859 PROJECT P/T
Nine semester hours (4½ s/hrs over 2 semesters)

63901 ADVANCED SOLID STATE PHYSICS
Two semester hours

63903 DIFFRACTION THEORY
Three semester hours

63905 ADVANCED ELECTRON MICROSCOPY
Three semester hours

63907 ADVANCED MODERN TECHNOLOGY
Two semester hours

63909 ADVANCED SCIENTIFIC INSTRUMENTATION
Two semester hours

63911 ADVANCED MATERIALS PHYSICS
Two semester hours

63955 READING/LITERATURE ASSIGNMENT (Higher Degree)

63966 PROJECT (Higher Degree)

SUBJECTS OFFERED TO STUDENTS OF FACULTY OF PHYSICAL SCIENCES BY THE FACULTY OF HUMANITIES AND SOCIAL SCIENCES

51357 ORAL COMMUNICATION
(2hr subject for Physical Sciences)

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

51368 WRITTEN AND ORAL REPORTING
(2hr subject for Physical Sciences)

This course in the principles and practice of effective written and oral reporting is designed to help students in researching, organising, writing and presenting material appropriate to technical and commercial contexts. Topics covered include adaptation of material and communication techniques to selected channels of communication, e.g. letters, memoranda, reports, articles and graphs, tables and diagrams; short talks on technical subjects; visual aids.