

PLEASE RETURN TO:  
**FACULTY OF ENGINEERING**  
PUBLICATIONS OFFICE  
THE UNIVERSITY OF NEW SOUTH WALES  
**1974 HANDBOOK**  
ROOM 304, THE ENGINEERING  
P.O. BOX 1, KENSINGTON 2033



THE UNIVERSITY OF NEW SOUTH WALES

80 CENTS



PLEASE RETURN TO:  
ENGINEERING DEPT  
THE UNIVERSITY OF NEW SOUTH WALES  
KENSINGTON, N.S.W. 2033  
PROF. R. A. KIRKWOOD, C.E.

---

**FACULTY OF ENGINEERING**  
**1974 HANDBOOK**  
**EIGHTY CENTS**

---



**THE UNIVERSITY OF NEW SOUTH WALES**  
**P.O. Box 1, Kensington, N.S.W. 2033**  
**Phone: 663 0351**

*The University of New South Wales Library has catalogued this work as follows:*

UNIVERSITY OF NEW SOUTH WALES —

378.94405

Faculty of Engineering

NEW

Handbook. Annual. Kensington.

University of New South Wales —  
*Faculty of Engineering — Periodicals.*



## FOREWORD

This handbook is primarily for undergraduate students in the Faculty of Engineering and aims to provide information concerning the requirements for admission, enrolment and re-enrolment, conditions for the award of the different Bachelor degrees in the Faculty and the subject matter of the courses offered, including text and reference books. *It is important that each student in the Faculty becomes well acquainted with the information presented here.* In addition to this Handbook, pamphlets and brochures issued in conjunction with the enrolment period and Orientation Week are available. These should be consulted, together with the University Calendar, for further information on problems associated with courses.

At the same time, it is appreciated that a student's choice in regard to course and other matters remains to be discussed with members of the academic staff. Some students will not make their final choice of degree course until well into their first year: others do not need to make their decision before the start of third year. Students should consult the Heads of Schools about this; where the Heads cannot be available, they have nominated colleagues to deal with enquiries.

We hope to do much more than merely impart a body of knowledge to our undergraduates. Appropriate attitudes and skills for professional engineers operating into the twenty-first century must also be developed. Good opportunities exist for this in *Faculty Hour*, a voluntary series of lectures and discussions on topics touching on the interaction of the engineer and society. This takes place at noon on Mondays in the Electrical Engineering Theatre LG1. All third and fourth year students, and some others also, will find their timetables free of formal classes at noon on Mondays. Students are urged to use Faculty Hour to broaden their approach to their studies.

P. T. FINK,  
Dean,  
Faculty of Engineering

## TABLE OF CONTENTS

---

	Page
CALENDAR OF DATES .. .. .	A5
STAFF .. .. .	A9
<b>THE FACULTY:</b>	
School of Civil Engineering .. .. .	A19
School of Electrical Engineering .. .. .	A19
School of Mechanical and Industrial Engineering ..	A20
School of Surveying .. .. .	A21
School of Highway Engineering .. .. .	A21
School of Nuclear Engineering .. .. .	A21
School of Transportation and Traffic .. .. .	A22
<b>REQUIREMENTS FOR ADMISSION:</b>	
Matriculation Requirements .. .. .	A24
<b>ADMISSIONS AND ENROLMENT PROCEDURE:</b>	
Admissions Procedure .. .. .	A30
Faculty of Engineering Enquiry Centre .. .. .	A30
Admissions Office .. .. .	A30
Enrolment Procedure .. .. .	A31
University Union Card .. .. .	A37
<b>FEES:</b>	
Student Fees .. .. .	A41
Special Examination Fees .. .. .	A42
Late Fees .. .. .	A42
Withdrawal from Course .. .. .	A43
<b>RULES RELATING TO STUDENTS:</b>	
General Conduct .. .. .	A44
Attendance .. .. .	A44

	Page
Course Transfers .. .. .	A45
Admission With Advanced Standing .. .. .	A45
Changes in Course Programmes .. .. .	A46
Student Records .. .. .	A46
Resumption of Courses .. .. .	A47
Annual Examinations .. .. .	A47
Examination Results .. .. .	A49
Deferred Examinations .. .. .	A50
Application for Admission to Degree or Diploma ..	A51
Restriction Upon Students Re-enrolling .. .. .	A51
Re-admission after Exclusion .. .. .	A54
Ownership of Students' Work .. .. .	A55
Change of Address .. .. .	A55
Notices .. .. .	A55
Lost Property .. .. .	A55
Parking .. .. .	A56
Application of Rules .. .. .	A56
STUDENT SERVICES:	
The Library .. .. .	A57
The University Union .. .. .	A57
Student Accommodation .. .. .	A58
Student Amenities Unit .. .. .	A59
Student Employment Unit .. .. .	A60
Chaplaincy Service .. .. .	A60
Student Health Unit .. .. .	A61
Student Counselling and Research Unit .. .. .	A61
Financial Assistance to Students .. .. .	A61
Financial Assistance to Aboriginal Students .. ..	A63
Co-operative Bookshop .. .. .	A63
Location of Laboratories .. .. .	A63
STUDENT ACTIVITIES:	
The Students' Union .. .. .	A64
The Sports Association .. .. .	A64
Physical Education and Recreation Centre .. ..	A65
Student Clubs and Societies .. .. .	A65
The University Regiment .. .. .	A65
The N.S.W. University Squadron .. .. .	A65
Royal Australian Navy .. .. .	A65

	Page
<b>UNDERGRADUATE SCHOLARSHIPS AND PRIZES:</b>	
Scholarships .. .. .	A66
Prizes .. .. .	A70
<b>UNDERGRADUATE COURSES:</b>	
Common First Year .. .. .	A73
Progression .. .. .	A73
Full-time Courses .. .. .	A74
General Studies Programme .. .. .	A74
Industrial Training Requirements .. .. .	A75
Part-time Courses .. .. .	A75
Faculty of Applied Science .. .. .	A76
<b>GRADUATE SCHOOL OF ENGINEERING:</b>	
Higher Degrees .. .. .	A79
Graduate Courses .. .. .	A79
<b>OUTLINES OF UNDERGRADUATE COURSES:</b>	
School of Civil Engineering .. .. .	A81
Civil Engineering Courses .. .. .	A82
School of Electrical Engineering .. .. .	A86
Electrical Engineering Courses .. .. .	A87
Combined Full-time/Part-time Courses .. .. .	A91
Substitution of Subjects .. .. .	A91
Double Degree of BSc BE .. .. .	A92
Double Degree of BA BE .. .. .	A92
School of Mechanical and Industrial Engineering .. .. .	A95
Mechanical Engineering, Aeronautical Engineering and Naval Architecture Courses .. .. .	A97
Department of Industrial Engineering .. .. .	A104
School of Surveying .. .. .	A108
<b>DESCRIPTION OF SUBJECTS: TEXT AND REFERENCE BOOKS:</b>	
School of Mechanical and Industrial Engineering .. .. .	B1
School of Electrical Engineering .. .. .	B18
School of Civil Engineering .. .. .	B30
Department of Industrial Engineering .. .. .	B49
School of Surveying .. .. .	B53
Non-Engineering Subjects .. .. .	B61

# CALENDAR OF DATES FOR 1974

**Session 1:** March 4 to May 19

**May Recess:** May 20 to May 26

**May 27 to June 16**

**Midyear Recess:** June 17 to July 21

**Session 2:** July 22 to August 25

**August Recess:** August 26 to September 1

**September 2 to November 3**

**Study Recess:** November 4 to November 10

---

## JANUARY

Tuesday 1	New Year's Day—Public Holiday
Friday 11	Last day for application for review of results of annual examinations Last day for application for admission under "show cause" rules
Monday 14	Timetable for deferred examinations available
Tuesday 15	Last day for acceptance of applications from students graduating in 1974 for admission to University degrees and diplomas
Friday 18	Last day for application for deferred examinations Last day for acceptance of applications to enrol by new students and students repeating first year
Monday 28	Australia Day—Public Holiday
Tuesday 29	Deferred examinations begin

## FEBRUARY

Friday 8	Last day for students to appeal against exclusion under the re-enrolment rules
Saturday 9	Deferred examinations end
Monday 18	Enrolment period begins for new students and students repeating first year
Monday 25	Enrolment period begins for students re-enrolling (second and later years) Deferred examination results available

**MARCH**

Friday 1	Last day for application for review of deferred examination results Last day for students with deferred examinations to appeal against exclusion under the re-enrolment rules
Monday 4	<b>Session 1 begins</b>
Friday 15	Last day for acceptance of enrolments by new students (late fee payable)
Friday 22	Faculty of Engineering meeting, 2 p.m. Last day for application for review of results of deferred examinations
Friday 29	Last day for changes in course programmes Last day for acceptance of enrolments by students re-enrolling (late fee payable)

**APRIL**

Thursday 4	Last day for discontinuation without failure of subjects which extend over the first session only
Friday 12 to Monday 15	Easter
Thursday 25	Anzac Day—Public Holiday

**MAY**

Tuesday 7	Provisional timetable for June/July examinations published
Tuesday 14	Last day for acceptance of corrected enrolment details forms
Monday 20	May Recess begins
Sunday 26	Last day for students to advise of examination timetable clashes May Recess ends Last date for discontinuation without failure of subjects which extend over the academic year

**JUNE**

Tuesday 4	Timetable for June/July examinations published
Friday 14	Faculty of Engineering meeting, 2 p.m.
Sunday 16	<b>Session 1 ends</b>
Monday 17	Queen's Birthday—Public Holiday Midyear Recess begins
Tuesday 18	Midyear examinations begin
Sunday 30	Last date for acceptance of applications for re-admission after exclusion under rules governing re-enrolment

**JULY**

Tuesday 2	Midyear examinations end
Sunday 21	Midyear Recess ends
Monday 22	Session 2 begins

**AUGUST**

Thursday 1	Foundation Day
Friday 16	Faculty of Engineering meeting, 2 p.m.
Thursday 22	Last day for discontinuation without failure of subjects which extend over the second session only
Monday 26	August Recess begins Holiday for non-academic staff

**SEPTEMBER**

Sunday 1	August Recess ends
Tuesday 10	Provisional timetable for annual examinations published
Monday 16	Last day for return of corrected enrolment details forms
Monday 23	Last day for students to advise of examination timetable clashes
Monday 30	Last date for applications from students graduating in 1975 for admission to University degrees and diplomas

**OCTOBER**

Monday 7	Eight Hour Day—Public Holiday
Friday 18	Faculty of Engineering meeting, 2 p.m.
Tuesday 29	Timetable for annual examinations published

**NOVEMBER**

Monday 4	Study Recess begins
Sunday 10	Session 2 ends
Monday 11	Annual examinations begin

**DECEMBER**

Tuesday 3	Annual examinations end
Wednesday 25	Christmas Day—Public Holiday
Thursday 26	Boxing Day—Public Holiday

## 1975

**Session 1:** March 3 to May 11

**May Recess:** May 12 to May 18

May 19 to June 15

**Midyear Recess:** June 16 to July 20

**Session 2:** July 21 to August 24

**August Recess:** August 25 to August 31

September 1 to November 2

**Study Recess:** November 3 to November 9

## JANUARY

Wednesday 1	New Year's Day—Public Holiday
Friday 10	Last day for application for review of results of annual examinations
Monday 13	Timetable for deferred examinations published
Friday 17	Last day for application for deferred examinations Last day for acceptance of applications to enrol by new students and students repeating first year
Monday 27	Australia Day—Public Holiday
Tuesday 28	Deferred examinations begin

## FEBRUARY

Saturday 8	Deferred examinations end
Monday 17	Enrolment period begins for new students and students repeating first year
Friday 21	Results of deferred examinations available
Monday 24	Enrolment period begins for students re-enrolling (second and later years)

## THE ACADEMIC YEAR

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

Session 1 commences on the first Monday of March.



# FACULTY OF ENGINEERING

---

**DEAN** — Professor P. T. Fink

**CHAIRMAN**—Professor T. K. Hogan

**ADMINISTRATIVE ASSISTANT**—Mrs. Patricia R. Kinard, BA Maryland

## SCHOOL OF CIVIL ENGINEERING

*Professor of Civil Engineering, Head of School and of Department of Water Engineering*

H. R. Vallentine, BE Syd., MS Iowa, ASTC, FIEAust, MASCE

*Professor of Civil Engineering and Head of Department of Civil Engineering Materials*

I. K. Lee, BCE MEngSc PhD Melb., MIEA, MASCE

*Professor of Civil Engineering*

A. S. Hall, BSc(Eng) Lond., DIC, FIEAust, MACI

*Professor of Civil Engineering and Head of Department of Engineering Construction and Management*

R. W. Woodhead, BE Syd., ME N.S.W., ASCE, ASEE, AIC

*Visiting Professor of Civil Engineering*

J. N. Antill, BE Syd., ME N.S.W., FIEAust, AMAusIMM

*Professor of Engineering (on secondment)*

T. K. Hogan, BE W.Aust., FIEAust, MAusIMM

*Visiting Fellow*

A. E. McMullen, MSc PhD Alberta

*Administrative Officer*

J. G. Lloyd, MA Pitt.

---

*Honorary Associate*

O. G. Ingles, BA MSc Tas., CEng, FRIC, AMInstF

---

## Department of Water Engineering

(Including Hydraulics, Hydrology, Public Health Engineering, Water Resources Engineering, and the Water Research Laboratory)

*Associate Professors*

B. W. Gould, BE Tas., ME N.S.W., MIEAust

D. H. Pilgrim, BE PhD N.S.W., MIEAust

K. K. Watson, BE Syd., ME PhD N.S.W., MIEAust

*Senior Lecturers*

- C. R. Dudgeon, ME *N.S.W.*, MIEAust
- T. R. Fietz, ME *N.S.W.*, MIEAust
- D. N. Foster, BE *Syd.*, MIEAust
- D. T. Howell, BE *Syd.*, ME *N.S.W.*, MIEAust, MAIAS
- J. R. Learmonth, BE *Syd.*, ME *N.S.W.*
- C. J. Wiesner, BSc *Adel.*, FRMetS

*Lecturers*

- A. J. Askew, BSc *Birm.*, MSc(Engin) *Qu.*, PhD *N.S.W.*, MASCE, MIEAust, MEIC
- P. J. Bliss, BE *N.S.W.*, MSc *Lond.*, DIC, ASTC, MIEAust
- I. Cordery, ME PhD *N.S.W.*, MIEAust
- B. S. Jenkins, BE *N.S.W.*, ASTC, MIEAust
- R. E. Loewenthal, BSc(Eng) *Rand.*, MSc *Cape T.*
- D. L. Wilkinson, BE *Syd.*, PhD *N.S.W.*

*Tutor*

- J. Seeto, BE *N.S.W.*

*Teaching Fellow*

- M. J. Boyd, BSc(Tech) MEngSc *N.S.W.*

*Professional Officers*

- D. G. Doran, BE DipCompSc *Qld.*
- F. A. J. Stein, ED, BE *N.S.W.*, GradIEAust, AMASCE
- J. K. Tuck, BE *N.S.W.*

**Department of Civil Engineering Materials**

(Including Soil Mechanics, Rock Mechanics, Concrete Technology, and Plastics and Timber)

*Associate Professors*

- A. F. S. Nettleton, BSc BE *Syd.*, ME *N.S.W.*, DIC, MIEAust
- G. B. Welch, BE *Syd.*, ME *N.S.W.*, CEng, MICE, FIEAust

*Senior Lecturers*

- A. G. Douglas, ME *N.S.W.*, PhD *Mich. State.*, MIEAust
- E. M. Kitchen, BE *Syd.*, MIEAust
- B. J. F. Patten, BE *Syd.*, PhD *N.S.W.*, DIC, MIEAust
- S. Valliappan, BE *Annam*, MS *Northeastern*, PhD *Wales*, MASCE, AMIE(INDIA)

*Lecturers*

- D. J. Cook, BE *W.Aust.*, MSc PhD *Calg.*, MIEAust, AMASCE, APIA
- D. R. Morgan, BSc(Eng) *Rand.*, MSc *Calg.*
- H. Taylor, BSc(Eng) *Birm.*, DipNA & AC *Syd.*

*Professional Officers*

- D. E. Hattersley, MSc N.S.W., ASTC  
H. N. Lunsmann, BE N.S.W., ASTC, GradIEAust

**Department of Structural Engineering***Associate Professors*

- H. J. Brettie, BE Syd., PhD N.S.W., DIC, ASTC, FIEAust  
R. A. Frisch-Fay, DiplEng Bud., ME N.S.W., MIEAust  
A. P. Kabaila, MEngSc PhD N.S.W., FRMTC, MIEAust, MASCE  
R. W. Traill-Nash, BE W.Aust., PhD Brist., MIEAust, AFRAeS  
R. F. Warner, ME N.S.W., PhD Lehigh, MIEAust

*Senior Lecturers*

- P. S. Balint, DiplEng Bud., ME N.S.W., MIEAust  
L. S. Edwards, BCE Melb., BEc Syd., MSc Lond., DIC, ARMTC, MIEAust  
K. A. Faulkes, ME N.S.W., Ms Ill., MIEAust  
J. L. Jenkins, BE Syd., ME N.S.W., DIC, ASTC, MIEAust

*Lecturers*

- D. J. Fraser, MEngSc N.S.W., ASTC  
A. C. Heaney, BE MEngSc Melb., PhD Wat., MIEAust, MASCE, AMICE  
P. W. Kneen, BE Melb., PhD Wat.  
G. C. Lacey, BCE MEngSc Melb., PhD Texas, MIEAust  
R. Lawther, BE PhD N.S.W.  
S. F. Pawsey, BSc BE Syd., MSc PhD Calif.  
V. A. Pulmano, BSCE Uni. of Philippines, MEng A.I.T.Bangkok, PhD Northwestern, AMASCE  
B. V. Rangan, BE Madr., PhD I.I.S.B'lore., MASCE, MACI  
J. J. Somerville, BE N.S.W., ASTC

*Teaching Fellows*

- K. D. Below, BE Qld.  
R. Care, BE N.S.W.  
Y. K. Chan, ME Auck.  
S. French, BE N.S.W.  
J. V. Kopp, BE N.S.W.

*Professional Officer*

- C. G. Bowen-Thomas, BE Syd.

**Department of Engineering Construction and Management**

(including Systems Engineering, Engineering Economy, Project Planning and Management)

*Senior Lecturer*

- L. V. O'Neill, BE Syd., MIEAust

*Lecturer*

- V. J. Summersby, MEngSc N.S.W., ASTC, MIEAust

**SCHOOL OF ELECTRICAL ENGINEERING***Professor of Electrical Engineering — Communications and Head of School*

A. E. Karbowiak, DSc(Eng) Lond., CEng, FIREE, MIEE

*Professor of Computer Science*

M. W. Allen, BE Adel., PhD Syd., CEng, FIREE, MIEE, MIEEE

*Professor of Electrical Engineering — Systems and Control*

N. W. Rees, BSc PhD Wales

*Professor of Electrical Engineering*

R. E. Vowels, ME Adel., SMIEEE, CEng, FIEAust, MIEE

*Visiting Professor — Solid State Electronics*

L. W. Davies, BSc Syd., DPhil Oxon., FInstP, FAIP, FIREE

*Tyree Professor of Electrical Engineering*

F. J. Evans, BSc BE Syd., CEng, FIEE, FIEAust

*Executive Assistant to Head of School*

C. A. Stapleton, BSc BE Syd., CEng, MIEAust, MIEE, MIEEE

*Senior Administrative Officer*

H. G. Phillips

*Administrative Assistant*

S. Mo, B.A. N.S.W., MA Syd.

**Department of Communications***Associate Professor*

W. H. Holmes, BSc BE MEngSc Syd., PhD Camb., MIEEE, MIREE

**Senior Lecturers**

E. H. Fooks, BSc PhD Lond., CEng, MIEE, MIEEE

G. J. Parker, BSc BE Syd., ME N.S.W., MIEAust, MIREE

T. B. Vu, BE PhD Adel.

**Lecturers**

P. T. Bason, ME N.S.W., MIEAust, MIEEE

W. J. Dewar, MSc Qu.

T. L. Hooper, BSc Syd., MSc N.S.W., CEng, MIEE, MIEEE, MIREE

H. L. Humphries, BSc BE BEc Syd., MIEAust, MIREE

C. J. E. Phillips, BSc BE PhD Syd., AMIREE

R. Radzyner, BE Melb., MEngSc N.S.W.

R. A. Zakarevicius, BSc BE MEngSc PhD Syd., MIEAust, MIEEE  
MIREE**Professional Officers**

D. Cohen, MSc Syd.

K. Poronnik, BE N.S.W., ASTC, MIREE

**Department of Computer Science****Senior Lecturers**

A. Dunworth, BSc PhD Manc., SMIEEE, FIREE, MIEAust, GradInstP

J. Lions, BSc Syd., PhD Camb.

G. B. McMahon, BSc Syd., PhD N.S.W.

**Lecturers**

L. C. Hill, BE N.S.W., MIEAust  
P. C. Maxwell, MSc Auck., PhD A.N.U.  
K. A. Robinson, BSc BE Syd.  
Mrs. I. Pamela Sallaway, BSc Br.Col., MMath PhD Wat.

**Professional Officer**

K. W. Titmuss, BSc(Tech) N.S.W.

**Department of Electric Power Engineering****Associate Professors**

G. C. Dewsnap, MEE Melb., CEng, FIEE, MIEAust  
G. W. Donaldson, BE Qld., BSc MA Oxon., CEng, MIEE, MIEAust, SMIEE  
R. M. Huey, BSc BE Syd., FIEAust, FIREE, SMIEE  
G. J. Johnson, MSc Syd., CEng, MIEE, AInstP, SMIEE, AAIP

**Senior Lecturers**

H. Harrison, BSc BE Syd., ME N.S.W., MIEAust  
I. F. Morrison, BSc BE PhD Syd., MIEAust, MIEE

**Lecturers**

D. B. Goudie, BSc BE PhD Syd., MIEE, AMIEE  
H. R. Outhred, BSc BE Syd., AMIEE  
H. Yee, BSc BE PhD Syd.

**Professional Officers**

H. T. Bazoché, DiplIng T.U. Braunschweig  
J. R. Kinard, BA Fla.S.U., MS Mass., MIEE, MOSA

**Department of Solid-State Electronics****Senior Lecturers**

H. S. Blanks, BSc ME Syd., PhD N.S.W., CEng, MIQA  
R. Vaughan, BSc BE PhD Syd.

**Lecturer**

Mrs. Manjula B. Waldron, BSc Delhi, BE I.I.S.B'lore., MS PhD Stan., MIEE

**Professional Officer**

R. Michael, BSc BE MEngSc Syd.

**Department of Systems and Control Engineering****Associate Professors**

J. B. Hiller, BE PhD N.S.W., FIREE, MIEE  
K. E. Tait, BE(Hons) BSc N.Z., PhD N.S.W., MIEAust

**Senior Lecturers**

R. F. Brown, BE Liv., PhD N.S.W., CEng, MIEE  
C. A. Stapleton, BSc BE Syd., CEng, MIEE, MIEE, MIEAust

**Lecturers**

F. Lewin, BSc BE Syd.  
D. H. Mee, BSc BE Syd., PhD Lond., DIC, MIREE  
O. Pawloff, DiplIng Berl., MIEAust, MIREE

*Professional Officers*

K. J. Flynn, BE MEngSc N.S.W., ASTC  
 K. W. Ford, ASTC  
 P. A. Newton, B.Sc N.S.W.  
 J. H. Sieuwerts, BE N.S.W., ASTC

*Tutors (School)*

Dorothy M. Lesmana, BSc BE N.S.W.  
 A. J. Peebles, BSc BE N.S.W.  
 G. N. Westley, BEng Liv.

*Teaching Fellows (School)*

G. O. Ferry, BE N.S.W.  
 C. M. Gysland, BS Wash.  
 G. R. Hellestrand, BSc N.S.W.  
 N. Q. Le, BE MEngSc N.S.W.  
 W. Nippita, BSc BE Syd.  
 J. Sandor, BE Syd.  
 A. Sunarcia, BE N.S.W.  
 Q. H. Vu, ME N.S.W.

## SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

*Nuffield Professor of Mechanical Engineering, Head of School and of  
Department of Fluid Mechanics/Thermodynamics*

R. A. A. Bryant, ME N.S.W., ASTC, CEng, FIMechE, FIEAust,  
AFRAeS

*Professor of Mechanical Engineering*

P. T. Fink, BE Syd., CEng, FIMechE, FRAeS, MAIAA, MRINA

*Sir James Kirby Professor of Production Engineering*

P. L. B. Oxley, BSc PhD Leeds, CEng, FIEAust, FIProdE, MIMechE

*Professor of Operations Research, Head of Department of Industrial  
Engineering*

G. Bennett, BA Syd., PhD N.S.W., ASTC, CEng, FIProdE

*Professor of Mechanical Engineering, Head of Department of Applied  
Mechanics*

N. L. Svensson, MMechE PhD Melb., CEng, MIMechE, MIEAust

*Professor of Mechanical Engineering, Head of Department of Agricultural  
Engineering*

A. H. Willis, DSc(Eng) Lond., CEng, FIMechE, MIEAust,  
MemASAE, WhSc

*Executive Assistant to Head of School*

J. Y. Harrison, BE Syd., PhD N.S.W., MIEAust

*Senior Administrative Officer*

G. Dusan, BEc Syd.

**Department of Applied Mechanics***Associate Professor*

R. G. Robertson, MA *Oxon.*, ME *N.S.W.*, CEng, MIMechE, AFRAeS

*Senior Lecturers*

J. A. B. Cartmel, MSc *Cran.I.T.*, PhD *N.S.W.*, CEng, FIMechE, FIEAust, MASME, MIEEE, MAIAA  
 J. Y. Harrison, BE *Syd.*, PhD *N.S.W.*, MIEAust  
 E. C. Hind, ME *N.S.W.*, ASTC, MIEAust  
 C. Samonov, DiplIng Dr techn *T.H. Vienna*, VDI, MIEAust

*Lecturers*

J. E. Baker, MSc *Syd.*, BE MEngSc *N.S.W.*, AFIMA  
 R. A. V. Byron, BE *Syd.*, CEng, AFRAeS, MAIAA  
 A. E. Churches, BE PhD *N.S.W.*, ASTC  
 G. Crawford, BE BSc *N.S.W.*  
 R. A. Dennis, MSc *Nott.*  
 H. E. Enahoro, BSc MScTech *Manc.*, PhD *Sheff.*, CEng, FIMechE  
 E. J. Hahn, BE BSc PhD *N.S.W.*, MASME  
 D. J. S. Mudge, BSc *Lond.*, CEng, MIMechE, MIEAust, WhSc  
 B. Osman, BE *Adel.*, FSASM, MIEAust  
 H. L. Stark, BSc PhD *Strath.*  
 K. J. Waldron, BE MEngSc *Syd.*, PhD *Stan.*, MIEAust

*Senior Tutor*

K. Kjørrefjord, BSc *Durh.*, CEng, AMRINA

**Department of Fluid Mechanics and Thermodynamics**

(Including Aeronautical Engineering and Naval Architecture)

*Associate Professors*

R. D. Archer, BSc *Melb.*, BE *Syd.*, MS PhD *Minn.*, FBIS, MIEAust, MAIAA, AFRAeS  
 G. de Vahl Davis, BE *Syd.*, PhD *Camb.*, CEng, FIMechE, FIEAust, MASME

*Senior Lecturers*

R. E. Corbett, DIC, ASTC, CEng, MIMechE, MIEAust  
 M. R. Davis, BSc(Eng) PhD *Ston.*  
 J. N. Hool, BE *Syd.*, DPhil *Oxon.*, ASTC, CEng, FIMechE, MIEAust  
 O. F. Hughes, SB SM(NavArch) *M.I.T.*, PhD *N.S.W.*, MIEAust, MRINA, MSNAME  
 R. T. B. McKenzie, MS ME *Purdue*, ARSCT(Glas.), CEng, FIMechE  
 C. M. Sapsford, BSc(Eng) *Lond.*, ME *N.S.W.*, CEng, FIMechE, MIEAust  
 R. J. Tuft, ASTC, FRINA, MIEAust, MRINA

*Lecturers*

L. J. Doctors, BE MEngSc *Syd.*, PhD *Mich.*, AMCASI, AMSNAME, MIEAust  
 B. E. Milton, BE PhD *N.S.W.*, BSc *Birm.*, MIEAust  
 G. L. Morrison, BE PhD *Melb.*  
 J. O. Muiznieks, DiplIng *Latvia*, DrIngAer *Rome*  
 J. A. Reizes, ME *N.S.W.*, MIEAust

**Department of Agricultural Engineering****Senior Lecturer**

H. G. Bowditch, ME *N.S.W.*, ASTC, MIEAust, MIAgrE, MemASAE

**Department of Industrial Engineering**

(Including Operations Research and Production Engineering)

**Associate Professor**

J. Taylor, BSc *Nott.*, CEng, FIMechE

**Senior Lecturers**

J. F. C. Close, BSc BE *Syd.*, ME *N.S.W.*, MIEE, SMAIIE, MIEAust

M. G. Stevenson, BSc(Tech) PhD *N.S.W.*, ASTC, CEng, MIEAust, MIProdE

R. A. Williams, BE PhD *N.S.W.*, ASTC, CEng, MIProdE, AMIEAust

**Lecturers**

L. E. Farmer, BE MEngSc PhD *N.S.W.*

D. Goodridge, DiplIngChim *L'Aurore, Shanghai*, DipIndEng *N.S.W.*

T. R. Jefferson, MSc *Tor.*, PhD *Northwestern*

R. N. Roth, BE PhD *N.S.W.*

C. H. Scott, BSc *Qld.*, PhD *N.S.W.*

G. Smith, BE MEngSc *N.S.W.*, ASTC, MIEAust

**Honorary Associate (School)**

C. A. Gladman, BSc(Eng) *Lond.*, ACGI, CEng, FIProdE, MIMechE, MIED

**Professional Officers (School)**

E. A. Carter, BE MEngSc *N.S.W.*, ASTC

W. Dollar, ASTC

T. W. Forristal, BMath *Wat.*

M. H. Fraser, BSc(Tech) *N.S.W.*

R. B. Frost, BE *N.S.W.*

J. Y. M. Fung, BE MEngSc *Syd.*, GradIEAust

W. F. Hastings, BSc(Tech) *N.S.W.*

B. C. Motson, BE *N.S.W.*, ASTC, MIEAust

P. H. Sivyver, BE *N.S.W.*, MIEAust

C. B. Smith, BE MEngSc *N.S.W.*, ASTC, GradIEAust, MAIRAH

G. D. White, BSc(Eng) *N.S.W.*

**Teaching Fellows (School)**

T. S. Lee, BE *N.S.W.*

R. H. Marshall, MSME *Mich.*

L. G. Nhan, BE *N.S.W.*

M. D. Rabinowitz, BSc. *Technion, Haifa*

Simandiri, BTech. *Bandung Inst. Tech., Indonesia*

C. K. Tan, BE *Monash*

C. K. Wong, BSc *N.T.U.*, MSc *N.S.W.*



## SCHOOL OF SURVEYING

*Professor of Surveying and Head of School*

P. V. Angus-Leppan, BSc(Eng) Rand, PhD DipTP Natal, FISAust, MILS(Natal), MAIC

*Associate Professors*

G. G. Bennett, MSurv Melb., PhD N.S.W., LS (N.S.W.), FISAust

R. S. Mather, BSc Ceylon, PhD N.S.W., MISAust

*Senior Lecturers*

J. S. Allman, BSurv PhD N.S.W., MAIC, MISAust

J. G. Freislich, BSc(Eng) Rand, FISAust, AMINS(SA)

J. C. Trinder, BSurv PhD N.S.W., MSc T.H. Delft, LS(N.S.W.), MISAust

*Lecturers*

L. Berlin, BSc(L.S.) Cape T., BSc T.H. Delft

G. J. F. Holden, ARICS, Dip.Photo. Lond., FRGS, MISAust

A. H. W. Kearsley, BSurv MSurvSc N.S.W., MAIC, MISAust

A. J. Robinson, BSurv N.S.W., LS(N.S.W.), MISAust, AMAIC

A. Stolz, BSurv N.S.W., LS(N.S.W.)

A. P. H. Werner, DiplIng Bonn, FISAust

*Special Project Officer*

R. J. Keith, ME N.S.W., ASTC

*Senior Tutors*

M. Maughan, BSc Lond., ARICS

S. U. Nasca, DottScGeol Florence, Dip/Top&Cart (Istituto Geografico Militare), MGAS, AMAIMM

*Teaching Fellow*

G. Unadhay, BSc Philippines

*Professional Officer*

C. E. Wardrop, BSc N.S.W.

*Administrative Assistant*

J. V. Fonseca, BA Lond.

## SCHOOL OF HIGHWAY ENGINEERING

*Professor of Highway Engineering and Head of School*

D. F. Orchard, BSc PhD Lond., DIC, ACGI, FIEAust, FCIT, MICE, MIMunE, MISTrucE

*Senior Lecturers*

W. H. Cogill, MSc Cape T. and Camb., PhD N.S.W., FIEAust, MICE

G. C. Y. Hu, BSc Kwangtung Kuomin, Canton, MSc PhD Birm., DipTP Lond., MIMunE, MIEAust, MASCE, AMTPI

R. A. Jones, BE W.Aust., ME Auck., MSc Lond., DIC, MSINZ, MIEAust

T. ten Brummelaar, BE MEngSc N.S.W.

*Lecturers*

B. S. Shackel, BE *Sheff.*, MEngSc N.S.W., MIEAust, MASCE  
 W. O. Yandell, ME PhD N.S.W., MIEAust

*Professional Officers*

C. E. Quinlan, GradDip N.S.W., ASTC, MIEAust  
 A. W. Raczkowski, MgrInz T.U. *Warsaw*

**SCHOOL OF NUCLEAR ENGINEERING***Professor of Nuclear Engineering and Head of School*

J. J. Thompson, BE PhD *Syd.*

*Associate Professor*

Z. J. Holy, DiplIng *Prague*, MSc *Birm.*, MEngSc PhD N.S.W., MIEAust

*Senior Lecturer*

P. R. Barrett, MSc PhD *Birm.*, MInstP

*Lecturers*

O. O. C. A. Bils, DiplIng *Berl.*, PhD N.S.W.  
 L. G. Kemeny, BE *Syd.*, MIEAust

*Professional Officer*

P. Y. P. Chen, BSc MEngSc ME N.S.W., ASTC

**SCHOOL OF TRANSPORTATION AND TRAFFIC***Professor of Traffic Engineering and Head of School*

W. R. Blunden, BSc BE *Syd.*, FCIT(Lond.), MITE(U.S.A.), MIEAust,  
 MStatSocAust, MAustSocOpRes

*Senior Lecturers*

D. J. Buckley, BE *Syd.*, MEngSc PhD N.S.W., MIEAust, MORSA,  
 MStatSocAust  
 R. D. Munro, BSc *W.Aust.*, BA *Melb.*  
 J. I. Tindall, BE *Qld.*, BCom ME N.S.W.  
 H. J. A. Turner, BSc *Lond.*, ME N.S.W., MIEE, ARCS

*Senior Project Scientist*

A. J. Fisher, BSc *Lond.*

*Professional Officers*

R. R. Hall, BSc *A.N.U.*  
 C. J. Wingrove, BSc N.S.W.

## THE FACULTY

---

### SCHOOL OF CIVIL ENGINEERING

The School of Civil Engineering consists of four departments, Water Engineering, Civil Engineering Materials, Structural Engineering, and Engineering Construction and Management. The School conducts both part-time and full-time undergraduate courses in Civil Engineering. In addition, all departments conduct graduate courses and carry out graduate research programmes in many fields.

The Department of Water Engineering encompasses the fields of Hydraulics, Hydrology, Water Resources and Public Health Engineering. The Public Health Engineering Laboratory is located at Kensington. The Hydrology research centre is also at Kensington, but a substantial amount of investigation is carried out in the field. The Water Research Laboratory is located at Manly Vale and is the centre for instruction and research in hydraulics.

The Department of Civil Engineering Materials includes the fields of Soil Mechanics, Rock Mechanics, Concrete Technology, Plastics and Timber. The Materials Laboratories are located at Kensington.

The Department of Structural Engineering covers the fields of Structures, Stress Analysis and Solid Mechanics. The Model Structures, Experimental Stress Analysis and Solid Mechanics Laboratories are at Kensington. The Heavy Structures Laboratory is at King Street, Randwick.

The Department of Engineering Construction and Management is responsible for the fields of Civil Engineering Systems, Engineering Economy, Project Planning and Management.

### SCHOOL OF ELECTRICAL ENGINEERING

The School of Electrical Engineering comprises five departments — Communications, Computer Science, Electric Power Engineering, Solid State Electronics and Systems and Control Engineering.

Each department carries out research in its own field and offers lecture and laboratory courses at the undergraduate and postgraduate levels. Subjects of common interest are provided by the School as a whole.

Special laboratories are equipped for work in the areas of Integrated Circuit Design, Microwaves, Computer Control, Machines and Acoustics. A Measurements Laboratory provides a calibrating service under certificate from the National Association of Testing Authorities.

### SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

Full-time undergraduate courses leading to the degree of Bachelor of Engineering are offered in Mechanical, Industrial, and Aeronautical Engineering, and in Naval Architecture. Part-time courses leading to the degree of Bachelor of Science (Engineering) are offered in the same four fields. Either degree may be taken out by a combination of full-time/part-time study, subject to approval by the Head of School.

The first two years of the full-time degree, and the first four stages of the part-time degree are common to all courses within the School. Thus a final decision on the discipline to be followed need not be made until the end of Year 2 for full-time and Stage 4 for part-time students.

Formal postgraduate courses of study are available, with a wide choice of subjects, leading to the degree of Master of Engineering Science. There are special Master of Engineering Science courses in Refrigeration and Air Conditioning, and in Industrial Engineering. The Department of Industrial Engineering within the School offers a course leading to a Graduate Diploma.

Graduates with a good first degree may register for the higher degrees of Master of Engineering and Doctor of Philosophy. Current research fields are as follows—Aerodynamics, Agricultural Engineering, Applied Plasticity, Automatic Control, Bio-mechanics, Dynamics, Gas Dynamics, Heat Transfer, Fluid Mechanics, Metal Cutting, Naval Hydrodynamics, Refrigeration and Air Conditioning, and Two-phase Flow.

Undergraduates who are interested in working for a research degree should consult the Head of School towards the end of their final year. Advice will be given to all students during their third year so that each can select the best possible combination of final year elective subjects.

## SCHOOL OF SURVEYING

The School of Surveying offers a Bachelor of Surveying degree taken over four years of full-time study or seven years of part-time study. Subject to the approval of the Head of School, combinations of full and part-time study are also permissible. The graduate courses offered are Master of Surveying Science, a two year part-time or one year full-time course; and the research degrees Master of Surveying and PhD.

The School is located in the Civil Engineering Building. Facilities include four Photogrammetry laboratories with plotting instruments of various types, an observing platform for Positional Astronomy and a comprehensive range of field equipment for Surveying and Geodesy. Computing facilities include programmable calculators and a library of programmes for use on the University's IBM 360/50 computer.

Current research is in the fields of physical geodesy, photogrammetry, geometrical geodesy, error theory, gyrotheodolite theory, computer applications and land systems studies.

## SCHOOL OF HIGHWAY ENGINEERING

Postgraduate courses are offered, leading to the degree of Master of Engineering Science and to a Postgraduate Diploma, in which road location and geometrics, properties of road materials, construction techniques, bridge design and traffic engineering are studied.

The School has well-equipped laboratories for studying the properties of soils, road aggregates, bitumen and cement concrete, and active studies on these subjects are in progress. Members of the School use a 1620 IBM computer as part of their course, and studies are being made of its utilization in all phases of highway engineering. They also have access to a 360/50 computer.

## SCHOOL OF NUCLEAR ENGINEERING

The School of Nuclear Engineering in the University of New South Wales was established in 1961. The School presently operates at the postgraduate level in the Faculty of Engineering. A fourth year undergraduate course in Nuclear Power Technology is provided as an elective for other Schools.

In addition to the supervision of programmes of advanced study and research for candidates for the research degrees of

Master of Engineering and Doctor of Philosophy, the School offers a formal graduate course leading to the degree of Master of Engineering Science. This formal course aims specifically at the education of engineers for the detailed understanding, analysis and assessment of nuclear reactors and nuclear power systems. Particular attention is given to the mathematical, numerical and computational techniques which are relevant to nuclear engineering.

Special research interests in the School include the general field of fluctuation phenomena and noise in nuclear reactors, the coupled thermomechanical, fluid dynamics and nuclear aspects of reactor fuel elements and coolant channels, and the subject of reactor utilization and reactor strategy.

The School is presently situated in the Electrical Engineering building at Kensington. Library, workshop, digital and analogue computing facilities are available. Special digital and analogue equipment for the analysis and recording of random signals has been acquired for experimental noise research. Through the Australian Institute of Nuclear Science and Engineering, the special facilities of the Australian Atomic Energy Commission's Research Establishment at Lucas Heights can be made available for research purposes. Close personal contact is maintained between members of the School and the Engineering Research Division at Lucas Heights.

## SCHOOL OF TRANSPORTATION AND TRAFFIC

The School of Transportation and Traffic is located at Randwick, and is associated with the School of Highway Engineering.

The establishment of the School followed the endowment of a Chair by the Australian Automobile Association, which had long been concerned with the need for a centre for training traffic engineers and specialists. The School is assisting this object by conducting courses in traffic and transport planning and control, and offering opportunities for research into the technical problems created by the tremendous growth in the use of the motor vehicle on the street and highway system, and also into its impact on other forms of transport and on land use activity.

The research activities of the School cover a wide range of transport and traffic phenomena, viz.: traffic flow theory — queueing, traffic stream structure, saturation flow, transportation planning — land use and transport interaction, system parameters,

synthetic models for growth, distribution and assignment of desire lines; public enterprise economics; and human factors and road safety. Research in these fields can be undertaken for the ME, MSc, and PhD degrees. Formal courses, one year full-time and two years part-time, leading to the degree of Master of Engineering Science are also offered in Transport and Traffic. A part-time Transport Graduate course offered over six terms leads to a Graduate Diploma.

In addition to the academic research activities the School has an Applied Research Division which undertakes project research for national bodies and institutions. It has an active programme relating to freeway lighting, traffic flow and capacity of urban roads and arterials and traffic instruments.

## REQUIREMENTS FOR ADMISSION

---

A person who seeks to become a candidate for any degree of Bachelor of the University must first have qualified for matriculation and have satisfied the requirements for admission to the particular Faculty, Course or Subject chosen.

In addition to complying with these conditions candidates must be selected before being permitted to enrol in a course. In 1974 it will be necessary for the University to limit the number of students enrolling in all undergraduate courses.

### *Special Assistance for Aboriginal Students*

The University may admit suitably qualified persons of Aboriginal descent outside of any quota restrictions.

Upon receipt of an application under this provision, the University will assess the applicant's potential to cope with University studies, and will make Student Counsellors available to discuss the choice of a course and subsequent career opportunities.

All enquiries relating to this scheme should be directed to the Registrar.

### *Matriculated Student*

A candidate who has satisfied the conditions for matriculation and for admission to a course of study shall be classed as a "matriculated student" of the University, after enrolment.

A person who has satisfactorily met the conditions for admission may be provided with a statement to that effect on the payment of the prescribed fee.

## MATRICULATION REQUIREMENTS

### Section A

#### GENERAL MATRICULATION AND ADMISSION REQUIREMENTS

1. A candidate may qualify for matriculation by attaining in recognised matriculation subjects at one New South Wales Higher School Certificate Examination or at one University of Sydney Matriculation Examination a level of performance determined by the Professorial Board from time to time.



2. The level of performance required to qualify for matriculation shall be
  - (a) passes in at least five recognised matriculation subjects, one of which shall be English and three of which shall be at Level 2 or higher; and
  - (b) the attainment of an aggregate of marks, as specified by the Professorial Board, in not more than five recognised matriculation subjects, such marks being co-ordinated in a manner approved by the Board.
3. The following subjects, and such other subjects as may be approved by the Professorial Board from time to time, shall be recognised matriculation subjects:—

English	Greek	Chinese
Mathematics	Latin	Japanese
Science	French	Hebrew
Agriculture	German	Dutch
Modern History	Italian	Art
Ancient History	Bahasa Indonesia	Music
Geography	Spanish	Industrial Arts
Economics	Russian	

4. A candidate who has qualified to matriculate in accordance with the provisions of Clauses 1, 2 and 3 may be admitted to a particular Faculty, course or subject provided that:—
  - (a) his qualification includes a pass at the level indicated in the subject or subjects specified in Schedule A as Faculty, course or subject prerequisites; or
  - (b) the requirements regarding these particular Faculty, course or subject prerequisites, as specified in Schedule A, have been met at a separate Higher School Certificate or University of Sydney Matriculation Examination.
5. Notwithstanding any of the provisions of Clauses 1 to 4, the Professorial Board may grant matriculation status to any candidate at the Higher School Certificate or University of Sydney Matriculation Examination who has reached an acceptable standard and may admit him to any Faculty, course or subject.

#### NOTE

1. For the purposes of clause 2(a), Mathematics and Science **BOTH PASSED** at first level or second level full course shall together count as three subjects.
2. For the purposes of clause 2(b), Mathematics and Science, **TAKEN** either singly or together at first level or second level full course shall each count as one and one half subjects.

**Schedule A**

FACULTY OR COURSE	FACULTY OR COURSE PREREQUISITES
Applied Science (excl. Applied Geography and Wool and Pastoral Sciences courses) Biological Sciences Engineering Industrial Arts Course Medicine Military Studies (Engineering course and Applied Science course) Science Bachelor of Science (Education)	(a) Science at Level 2S or higher AND (b) either Mathematics at Level 2F or higher OR Mathematics at Level 2S, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board.
Architecture Applied Geography (Biogeography and Pedology specializations) Wool and Pastoral Sciences courses	(a) Science at Level 2S or higher AND (b) Mathematics at Level 2S or higher
Applied Geography (Economic Geography specialization)	Either Mathematics at Level 2F or higher OR Mathematics at Level 2S, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board.

FACULTY OR COURSE	FACULTY OR COURSE PREREQUISITES
Arts	English at Level 2 or higher
Commerce	(a) Mathematics at Level 2S or higher AND (b) either English at Level 2 or higher OR English at Level 3, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board.
Law Combined Jurisprudence/Law Combined Arts/Law Combined Commerce/Law	Nil Nil As for Arts As for Commerce
Military Studies (Arts course)	English at Level 2 or higher OR English at Level 3, provided that the candidate's performance in this subject and his general level of attainment are at standards acceptable to the Professorial Board, and provided that a candidate so qualified shall not enrol in a course of English Literature.
Social Work course	English at Level 2 or higher OR English at Level 3, provided that the candidate's performance in the subject and his general level of attainment are at standards acceptable to the Professorial Board, and provided that a candidate so qualified shall not enrol in English I.

SUBJECT	SUBJECT PREREQUISITES
1.011—Higher Physics I 1.001—Physics I	As for Faculty of Science
2.001—Chemistry I 17.011—Human Biology 25.001—Geology I 25.111—Geoscience I	Science at Level 2S or higher
10.011—Higher Mathematics I	Mathematics at Level 2F or higher
10.001—Mathematics I	Either Mathematics at Level 2F or higher OR Mathematics at Level 2S, provided that the candidate's performance in the subject and his general level of attainment are at standards acceptable to the Professorial Board.
10.021—Mathematics IT	Mathematics at Level 2S or higher
15.102—Economics II	As for Faculty of Commerce
50.111—English IA 51.111—History I 51.121—History IB	English at Level 2 or higher
56.111—French I	French at Level 2 or higher
59.111—Russian I	Russian at Level 2 or higher
64.111—German I	German at Level 2 or higher
65.111—Spanish I	Spanish at Level 2 or higher
59.001—Russian IZ 64.001—German IZ 65.001—Spanish IZ	A foreign language, other than that in which enrolment is sought, at Level 2 or higher.

**Section B****SUPPLEMENTARY PROVISIONS FOR MATRICULATION**

Notwithstanding the provisions of Section A above, candidates may be accepted as "matriculated students" of the University under the conditions which are listed in the University Calendar.

# ADMISSIONS AND ENROLMENT PROCEDURE

---

## ADMISSIONS PROCEDURE

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

Persons seeking entry to first year courses in one or more of the three Universities in the Sydney Metropolitan Area (Macquarie University, the University of New South Wales and the University of Sydney) are required to lodge a single application form with the Metropolitan Universities Admissions Centre, Third Floor, 13-15 Wentworth Avenue, Sydney (near Liverpool Street). Postal address: Box 7049, G.P.O., Sydney, 2001. Telephone: 26-6301. On the application form provision is made for applicants to indicate preferences for courses available in any of the three Universities. Students are notified individually of the result of their applications and provided with information regarding the procedures to be followed in accepting the offer of a place at this University and completing their enrolment at the Enrolment Bureau, Unisearch House, 221 Anzac Parade, Kensington.

## FACULTY OF ENGINEERING ENQUIRY CENTRE

The Faculty Enquiry Centre is situated in the undercroft of the School of Electrical Engineering Building, Kensington (the corner of Engineering and Library Roads). Members of Academic Staff will be available to advise students about careers in the various fields of engineering and about undertaking a course in engineering in this University. The Centre will be open from 10.00 a.m. to 4.00 p.m. (closed 1.00 p.m. to 2.00 p.m.) from Wednesday, 9th to Friday 11th January, and Monday, 14th to Friday, 18th January, 1974. Telephone: 663 0351 extn. 3438. Prospective students are advised to take advantage of this facility.

## ADMISSIONS OFFICE

The Admissions Office which is located in the Chancellery on the upper campus provides intending students (both local and overseas) with information regarding courses, admission requirements, scholarships and enrolment. Office hours are from 9.00 a.m.

to 1.00 p.m. and 2.00 p.m. to 5.00 p.m. Monday to Friday and an evening service is provided during the enrolment period.

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

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

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

### ENROLMENT PROCEDURE FOR UNDERGRADUATE COURSES

In 1974 it will be necessary for the University to limit entry into each Faculty and Board of Studies, in particular in the Schools of Civil Engineering and Surveying.

The enrolment procedure for the different classes of undergraduate students is as follows:

#### First Enrolments

(a) New South Wales residents already qualified for admission and persons who are applying for enrolment on the basis of qualifications gained or about to be gained outside New South Wales must lodge an application for enrolment with the Metropolitan Universities Admissions Centre, 13-15 Wentworth Avenue, Sydney (P.O. Box 7049 G.P.O., Sydney) by 26th October, 1973.

(b) New South Wales residents qualifying for admission by the 1973 New South Wales Higher School Certificate Examination or the 1974 Sydney University Matriculation Examination and those who have attended a University in New South Wales in 1973 must apply for enrolment to the Metropolitan Universities Admissions Centre, 13-15 Wentworth Avenue, Sydney (P.O. Box 7049 G.P.O., Sydney) by 18th January, 1974.

### **Completion of Enrolment**

Students whose applications for enrolment are accepted will be required to complete their enrolment at a specified appointment time before the start of Session 1. Fees must be paid on the day of the appointment. However, in special circumstances and provided class places are still available, students may be allowed to complete their enrolment after the prescribed week subject to the payment of a late fee.

Application forms for enrolment and details of the application procedures may be obtained on application to the Registrar, P.O. Box 1, Kensington 2033.

### **Failure in First Year**

First year students who failed more than half their programme at the 1973 Annual Examinations and who were not granted any deferred examinations will NOT follow the above procedure. They are required to 'show cause' why they should be allowed to continue in the course, and should await instructions in writing from the Registrar as to the procedure.

### **Later Year Enrolments**

All students enrolling other than for the first time and not included above should enrol through the appropriate School and bring with them their notification of examination results for the previous year. This enrolment must be effected before or during the week before the commencement of Session 1 in accordance with the special arrangements made by the individual Schools.

### **Preliminary Enrolment**

*Courses in Aeronautical, Industrial, Mechanical Engineering and Naval Architecture*

Students in the above courses should have received a form requesting them to nominate their choice (choices) of general studies electives, and technical electives where applicable.

If any student has not received the above form he should obtain it from the School's general office, complete it and return



it to the general office before the end of lectures in the second session.

*Courses in Civil Engineering, Electrical Engineering and Surveying*

*Enrolment Timetable*

**SCHOOL OF CIVIL ENGINEERING**

**a. Full-time Courses**

1. *Students progressing into a complete year as shown in this Handbook*

Year 2	Friday 22nd February
Surnames A to M	9.00 a.m. to 11.00 a.m.
Surnames N to Z	11.00 a.m. to 1.00 p.m.
Year 3	Thursday 21st February
Surnames A to M	9.00 a.m. to 11.00 a.m.
Surnames N to Z	11.00 a.m. to 1.00 p.m.
Year 4	Wednesday 20th February
Surnames A to M	9.00 a.m. to 11.00 a.m.
Surnames N to Z	11.00 a.m. to 1.00 p.m.

2. *Students with "broken" programmes NOT progressing into a complete year, as shown in this Handbook*

Year 2	Friday 1st March
Surnames A to M	9.30 a.m. to 11.00 a.m.
Surnames N to Z	11.00 a.m. to 12.30 p.m.
Year 3	Wednesday 27th February
Surnames A to M	9.30 a.m. to 11.00 a.m.
Surnames N to Z	11.00 a.m. to 12.30 p.m.
Year 4	Tuesday 26th February
Surnames A to M	9.30 a.m. to 11.00 a.m.
Surnames N to Z	11.00 a.m. to 12.30 p.m.

**b. Part-time Courses**

1. *Students progressing into a complete stage as shown in this Handbook*

Stages 2, 3, and 4	Thursday 21st February 6.00 p.m. to 8.00 p.m.
Stages 5 and 6	Friday 22nd February 6.00 p.m. to 8.00 p.m.

2. *Students with "broken" programmes NOT progressing into a complete stage as shown in this Handbook*

Stages 2, 3, and 4

Wednesday 27th February

2.00 p.m. to 4.30 p.m.

6.00 p.m. to 8.00 p.m.

Stages 5 and 6

Thursday 28th February

2.00 p.m. to 4.30 p.m.

6.00 p.m. to 8.00 p.m.

c. **New Students with Advanced Standing**

Full-time

Friday 1st March

9.30 a.m. to 12.30 p.m.

Part-time

Wednesday 27th February

6.00 p.m. to 8.00 p.m.

*Enrolment Centre*

1. Students progressing into a complete stage or year as shown in this Handbook

Room 109

School of Civil Engineering

2. Students with "broken" programmes NOT progressing into a complete stage or year as shown in this Handbook

Unisearch House

221 Anzac Parade

(across from Main Campus)

3. New Students with Advanced Standing

Unisearch House

221 Anzac Parade

(across from Main Campus)

**SCHOOL OF ELECTRICAL ENGINEERING**

a. **Full-time Courses**

Year 1 repeats and Year 2 students

Thursday 28th February

2.00 p.m. to 4.30 p.m.

Year 3

Tuesday, 26th February

2.00 p.m. to 4.30 p.m.

Year 4

Monday 25th February

9.30 a.m. to 12.30 p.m.

b. **Part-time Courses**

Students re-enrolling at all stages

Wednesday 27th February

6.00 p.m. to 8.00 p.m.

## c. New Students with Advanced Standing

Friday 1st March  
9.30 a.m. to 12.30 p.m.

*Enrolment Centre*

Re-enrolling students

Unisearch House  
221 Anzac Parade  
(across from Main Campus)

New students with advanced  
standing

Room G1  
Electrical Engineering Building

**SCHOOL OF MECHANICAL AND INDUSTRIAL  
ENGINEERING**

Unless otherwise indicated students enrolling in the courses offered by the School are required to attend Room 106 in the School's Building in accordance with the following timetable:

## a. Full-time Courses

Year 2 and Year 1 repeats

Monday 25th February  
2.00 p.m. to 6.00 p.m.

Year 3

Tuesday 26th February  
9.00 a.m. to 12 noon

Year 4

Monday 25th February  
9.00 a.m. to 12 noon

## b. Part-time Courses

Stages 2, 3 and Stage 1  
repeats

Monday 25th February  
2.00 p.m. to 6.00 p.m.

Stages 4, 5 and 6

Tuesday 26th February  
2.00 p.m. to 5.00 p.m.  
6.00 p.m. to 8.30 p.m.

## c. New Students with Advanced Standing

Friday 1st March  
2.00 p.m. to 5.00 p.m.

*Enrolment Centre*

Room 106

School of Mechanical and Industrial Engineering Building

## SCHOOL OF SURVEYING

## a. Full-time Courses

Year 2	Monday 25th February 9.30 a.m. to 12.30 p.m.
--------	---

Year 3	Tuesday 26th February 9.30 a.m. to 12.30 p.m.
--------	--

Year 4	Friday 1st March 9.30 a.m. to 12.30 p.m.
--------	---

## b. Part-time Courses

Students re-enrolling at all Stages	Wednesday 27th February 2.00 p.m. to 6.00 p.m.
-------------------------------------	---

## c. New Students with Advanced Standing

Full-time	Tuesday 26th February 9.30 a.m. to 12.30 p.m.
-----------	--

Part-time	Wednesday 27th February 2.00 p.m. to 6.00 p.m.
-----------	---

*Enrolment Centre*

## Full-time

Unisearch House, 221 Anzac Parade  
(across from Main Campus)

## Part-time

Room 701

Civil Engineering Building

**Miscellaneous Subjects (students not proceeding to a degree or diploma)**

Students may be accepted for enrolment in miscellaneous subjects provided the University considers that the subject/s will be of benefit to the student and there is accommodation available. Only in exceptional circumstances will subjects taken in this way count towards a degree or diploma.

Students seeking to enrol in miscellaneous subjects should obtain a letter of approval from the Head of the appropriate School or his representative permitting them to enrol in the subject concerned. The letter should be given to the enrolling officer at the time of enrolment. **Where a student is under exclusion he may not be enrolled in any miscellaneous subjects unless given approval by the Professorial Board.**

Unless otherwise instructed, students who have obtained written permission to enrol should attend the Unisearch House enrolment centre on

Friday 1st March

2.00 p.m. to 6.00 p.m.

Students unable to enrol at the above time may enrol by attending the Admissions Office, Chancellery, at the times shown below, with a written permission to enrol from the Head of School.

Week commencing 4th March:      Monday to Friday  
9.30 a.m. to 1.00 p.m.  
2.00 p.m. to 4.30 p.m.  
5.30 p.m. to 8.00 p.m.

Week commencing 11th March:      Monday to Friday  
9.30 a.m. to 1.00 p.m.  
2.00 p.m. to 4.30 p.m.  
Wednesday and Friday  
5.30 p.m. to 8.00 p.m.

Students who have completed the final examinations but have a thesis still outstanding are required to enrol for the period necessary to complete the thesis and to pay the requisite fees.

Course details must be completed during the prescribed Enrolment Week. For details of fee requirements, including late fee provisions, see under Fees.

**Final Dates for Completion of Enrolment.** No enrolments will be accepted from **new students** after the end of the second week of Session 1 (15th March, 1974) except with the express approval of the Registrar and the Head of the School concerned; no **later year enrolments** will be accepted after 31st March without the express approval of the Registrar which will be given in exceptional circumstances only.

### UNIVERSITY UNION CARD

All students other than miscellaneous students are issued with a University Union membership card. This card must be carried during attendance at the University and shown on request.

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

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

A student who loses a Union card must notify the University Union as soon as possible.

New students will be issued with University Union cards at the University Union Enquiry Desk as soon as practicable after payment of fees. In the meantime, fees receipt form should be carried during attendance at the University and shown on request. A period of at least three weeks should be allowed to elapse after payment of fees before making application for the card. Cards will not be posted under any circumstances.

## FEES

---

### *Payment of Fees*

As from 1st January, 1974, no fees for tuition will be payable. Other fees and charges will still be payable. These include those charges raised to finance the expenses incurred in operating student activities such as the University Union, the Students' Union, the Sports Association and the Physical Education and Recreation Centre. Late fees are also charged where a student fails to observe required procedures by the appropriate time. Charges may also be payable, sometimes in the form of a deposit, for the hiring of kits of equipment which are lent to students for their personal use during attendance in certain subjects. Accommodation charges and costs of subsistence on excursions, field work, etc., and for hospital residence (medical students) are payable in appropriate circumstances. In order to become a student member of the University in any particular course of study it is necessary to meet the entrance requirements for the course and to enrol formally in it. To effect enrolment it is necessary to present a duly completed and authorised enrolment form to the University cashier together with, where payable, either the appropriate fees, or an authority authorising those fees to be charged to some other person or institution.

### *Completion of Enrolment*

All students are required to attend the appropriate enrolment centre during the prescribed enrolment period\* for authorisation of course programme. Failure to do so will incur a late fee of \$10.

First year students (including students repeating first year) must complete enrolment (including fee payment) before they are issued with class timetables or permitted to attend classes. A first year student who has been offered a place in a course to which entry is restricted and who fails to complete enrolment at the appointed time may lose the place allocated.

Fees should be paid during the prescribed enrolment period but will be accepted during the first two weeks of Session 1. (For

---

\* The enrolment periods for Sydney students are prescribed annually in the leaflets on enrolment procedures.

late fees see below.) **No student is regarded as having completed an enrolment until fees have been paid.** Fees will not be accepted (i.e. enrolment cannot be completed) from new students in year-long courses after the end of the second week of Session 1 (i.e. 15th March, 1974), and after 31st March from students who are re-enrolling, except with the express approval of the Registrar, which will be given in exceptional circumstances only.

Students enrolling for the first time in any year at the commencement of Session 2 are required to pay all fees due within the first two weeks of that Session. Students Activities fees due will be one-half of the annual fees.

These arrangements also apply to medical students and although the structure of the academic year in the later years of the course in Medicine differs from that followed in other courses, medical students are required to observe the same dates for payment as apply to students in other courses.

### *Assisted Students*

Scholarship holders or sponsored students who have not received an enrolment voucher or appropriate letter of authority from their sponsor at the time when they are enrolling should complete their enrolment paying their own fees. A refund of fees will be made when the enrolment voucher or letter of authority is subsequently lodged with the Cashier.

### *Extension of Time*

Any student who is unable to pay fees by the due date may apply in writing to the Deputy Registrar (Student Services) for an extension of time. Such application must state year or stage, whether full-time or part-time; and the course in which enrolment is sought, describe clearly and fully why payment cannot be made and what extension is required, and must be lodged before the date on which a late fee becomes payable. Normally the maximum extension of time for the payment of fees is one month for fees due in Session 1 and for one month from the date on which a late fee becomes payable in Session 2.

Where an extension of time is granted to a first year student in Session 1, such student may only attend classes on the written authority of the Registrar, but such authority will not normally be given in relation to any course where enrolments are restricted.



*Failure to Pay Fees or Other Debts*

Any student who fails to pay prescribed fees or charges or is otherwise indebted to the University and who fails to make a satisfactory settlement of his indebtedness upon receipt of due notice ceases to be entitled to the use of University facilities. Such a student is not permitted to register for a further session, to attend classes or examinations, or to be granted any official credentials.

No student is eligible to attend the annual examinations in any subject where any portion of his fees for the year is outstanding after the end of the fourth week of Session 2 (16th August, 1974).

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

**STUDENT FEES\***

**All undergraduate students and students taking miscellaneous subjects (with the exception of External students) will be required to pay —**

University Union†	\$20 — entrance fee
Student Activities Fees:	
University Union†	\$30 — annual subscription
Sports Association†	\$4 — annual subscription
Students' Union†	\$7 — annual subscription
Miscellaneous	\$17 — annual fee

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

**Depending on the subject being taken, students may also be required to pay —**

Pathology Instrument Kit — \$10 (refundable on return in satisfactory condition).

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

† Life members of these bodies are exempt from the appropriate fee or fees.

**SPECIAL EXAMINATION FEES**

Examinations conducted under special circumstances — \$11 for each subject.

Review of examination result — \$11 for each subject.

**LATE FEES****Session 1—First Enrolments**

Fees paid at the late enrolment session and before the commencement of Session 1 .. .. .	\$10
Fees paid during the 1st and 2nd weeks of Session 1	\$20
Fees paid after the commencement of the 3rd week of Session 1 with the express approval of the Registrar and Head of the School concerned	\$40

**Session 1—Re-Enrolments**

Failure to attend enrolment centre during enrolment week .. .. .	\$10
Fees paid after the commencement of the 3rd week of Session 1 to 31st March .. .. .	\$20
Fees paid after 31st March where accepted with the express approval of the Registrar .. ..	\$40

**Session 2—All Enrolments**

Fees paid in 3rd and 4th weeks of Session 2 ..	\$20
Fees paid thereafter .. .. .	\$40

## WITHDRAWAL FROM COURSE

1. Students withdrawing from a course are required to notify the Registrar in writing.
2. Where notice of withdrawal from a course is received by the Registrar before the first day of Session 1 a refund of all fees paid will be made.
3. On notice of withdrawal:
  - (a) a partial refund of the University Union Entrance Fee will be made on the following basis: any person who has paid the entrance fee in any year and who withdraws from membership of the University Union after the commencement of Session 1 in the same year, or who does not renew his membership in the immediately succeeding year may on written application to the Warden receive a refund of half the entrance fee paid.
  - (b) A partial refund of other Student Activities Fees will be made on the following basis:
    - University Union—\$7.50 in respect of each half session.
    - University of New South Wales Students' Union—where notice is given prior to the end of the fifth week of Session 1, \$3.50; thereafter no refund.
    - University of New South Wales Sports Association—where notice is given prior to the 5th week a full refund is made; thereafter no refund.
    - Miscellaneous Student Activities Fee — \$4.25 in respect of each half session.
4. Where initial enrolment is made at commencement of Session 2 in any year and the student subsequently withdraws, a refund of fees based on the above rules may be made.

**Cashier's Hours**

The cashier's office is open for the payment of fees from 9.30 a.m. to 1.00 p.m., and from 2.00 p.m. to 4.30 p.m. Monday to Friday. It is open for additional periods during the first four weeks of Session 1. Students are advised to consult noticeboards for details.

# RULES RELATING TO STUDENTS

---

## GENERAL CONDUCT

Acceptance as a member of the University implies an undertaking on the part of the student to observe the regulations, by-laws and other requirements of the University, in accordance with the declaration signed at the time of the enrolment.

In addition, students are expected to conduct themselves at all times in a seemly fashion. Smoking is not permitted during lectures, in examination rooms or in the University Library. Gambling is also forbidden.

Members of the academic staff of the University, senior administrative officers, and other persons authorised for the purpose, have authority, and it is their duty, to check and report on disorderly or improper conduct or any breach of regulations occurring in the University.

## ATTENDANCE AT CLASSES

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

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

Applications to the Registrar for exemption from re-attendance at classes, either for lectures or practical work, may only be granted on the recommendation of the Head of the appropriate School. The granting of an exemption from attendance does not carry with it exemption from payment of fees.

Where a student has failed a subject at the annual examinations in any year and re-enrols in the same course in the following year, he must include in his programme of studies for that year the subject in which he has failed. This requirement will not be applicable if the subject is not offered the following year; is not a compulsory component of a particular course; or if there is

some other cause, which is acceptable to the Professorial Board, for not immediately repeating the failed subject.

Where a student has attended less than eighty per cent of the possible classes, he may be refused permission to sit for the examination in that subject.

### COURSE TRANSFERS

Students wishing to transfer from one course to another must apply on an application form obtainable from the Admissions Office, Chancellery, by Friday, 18th January. As the number of places in each course is limited, failure to apply by 18th January, 1974, will probably result in the application for transfer being unsuccessful.

Students whose applications to transfer are successful are required to comply with the enrolment procedures for the year/stage of the new course in which they expect to enrol. Unless otherwise instructed they must present the letter granting approval of the transfer to the enrolling officer.

Students who have not received advice regarding their application to transfer before the date on which they are required to enrol should check with the Admissions Office.

Students should also advise the Enrolling Officer of the School in which they are enrolled of their intention to transfer.

### ADMISSION WITH ADVANCED STANDING

Any person who makes application to register as a candidate for any degree or other award granted by the University may be admitted to the course of study leading to such degree or award with such standing on the basis of previous attainments as may be determined by the Professorial Board.

Students should consult the University Calendar for complete details regarding "Admission with Advanced Standing".

## CHANGES IN COURSE PROGRAMMES AND WITHDRAWAL FROM SUBJECTS

Students seeking approval to substitute one subject for another (including change of session), add one or more subjects to their programme or discontinue part or all of their programme must make application to the Registrar through the Head of the School responsible for the course on forms available from School offices. The Registrar will inform students of the decision. Application to enrol in additional subjects must be submitted by 31st March.

Approval of withdrawal from subjects is not automatic, each application being determined after considering the circumstances advanced as justifying withdrawal.

It is emphasized that:

1. withdrawal from a subject, tuition in which extends over the academic year, at any time after the May recess;
2. withdrawal from a subject, tuition in which extends over only one session, at any time after one month from the commencement of the subject; or
3. failure to sit for the examinations in any subject in which the student has enrolled,

shall be regarded as failure to satisfy the examiners in the subject, unless written approval to withdraw without failure has been obtained from the Registrar.

If a student applies after the following date to withdraw from a subject he will most likely be awarded a failure in the subject:

Subject taken over Session 1 only — 4th April 1974

Subject taken over Session 2 only — 22nd August 1974

Subject taken over both sessions — 26th May 1974

## STUDENT RECORDS

All students will receive enrolment details forms by 30th April and 2nd September. It is not necessary to return the forms unless any information recorded thereon is incorrect. Amended forms must be returned to the Examinations and Student Records Section by 14th May and 16th September respectively. Amendments notified after the closing date will not be accepted unless exceptional circumstances exist and approval is obtained from the Registrar. Amended forms returned to the Registrar will be acknowledged in writing within fourteen days.

## RESUMPTION OF COURSES

Students wishing to resume their studies after an absence of twelve months or more are required to apply to the Admissions Office for permission to re-enrol by 18th January, 1974. Students re-enrolling in this way will normally be required to satisfy conditions pertaining to the course at the time of re-enrolment. This condition applies also to students who have been re-admitted to a course after exclusion under the rules restricting students re-enrolling.

## ANNUAL EXAMINATIONS

Formal examinations in most Faculties are held in June-July and November-December. Provisional timetables including the dates and times of examinations are posted on the central notice boards in the Wallace Wurth Medical School, Biological Sciences Building, the Chancellery, Central Lecture Theatre Block, Dalton (Chemistry) School, Main Building (Mining and Physics), outside the Science Theatre and in the Western Grounds Area on 7th May and 10th September. Students must advise the Examinations Unit (Chancellery) of clash of examinations by 20th May and 23rd September. Final timetables will be displayed, and individual copies available for students on 4th June and 29th October.

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

A student suffering from a physical disability which puts him at a disadvantage in written examinations should apply to the Registrar in writing, as early as possible, for special provisions to be made for him to take examinations. The request should be supported by medical or other evidence.

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

- (a) Candidates are required to obey any instruction given by an examination supervisor for the proper conduct of the examination.
- (b) Candidates are required to be in their places in the examination room not less than ten minutes before the time for commencement.
- (c) No bag, writing paper, blotting paper, manuscript or book, other than a specified aid, is to be brought into the examination room.

- (d) No candidate shall be admitted to an examination after thirty minutes from the time of commencement of the examination.
- (e) No candidate shall be permitted to leave the examination room before the expiry of thirty minutes from the time the examination commences.
- (f) No candidate shall be re-admitted to the examination room after he has left it unless during the full period of his absence he has been under approved supervision.
- (g) A candidate shall not by any improper means obtain, or endeavour to obtain, assistance in his work, give, or endeavour to give, assistance to any other candidate, or commit any breach of good order.
- (h) Smoking is not permitted during the course of examinations.
- (i) All answers must be in English unless otherwise directed. Foreign students who have the written approval of the Officer-in-Charge of Examinations may use standard translation dictionaries.
- (j) A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination, to immediate expulsion from the examination room and to such further penalty as may be determined in accordance with the By-Laws.

A student who through serious illness or other cause outside his control is unable to attend an examination is required to bring the circumstances (supported by a medical certificate or other evidence) to the notice of the Registrar not later than seven days after the date of the examination, and may be required to submit to medical examination. A student who attempts an examination yet claims that his performance is prejudiced by sickness on the day of the examination, must notify the Registrar or Examination Supervisor, before, during or immediately after the examination and may be required to submit to medical examination.

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



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

Final examination results are posted to the term addresses of students and it is therefore essential that any change of address be advised to the Examination and Student Records Section. Results are also posted on School notice boards and in the foyer of the Library. No examination results will be given by telephone.

Examination results may be reviewed for a fee of \$11 a subject, which is refundable in the event of an error being discovered. Such a review will consist primarily in ensuring that all questions attempted by candidates have been marked and that the total of all marks awarded are correct. Applications for review must be submitted on the appropriate form to the Examinations and Student Records Section, together with the necessary fee by the date indicated on the notification of results.

## EXAMINATION RESULTS

### *Graded Passes*

Passes will be graded as follows:

High Distinction (indicates a quite superior performance).

Distinction (indicates a superior performance).

Credit (indicates a good but not superior performance).

Pass (indicates the achievement of an acceptable minimum level of competence in relation to the course objectives).

### *Pass Conceded*

A pass conceded may be granted to students where the mark in the subject is slightly below the required standard and whose overall performance warrants it.

### *Terminating Pass*

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

## DEFERRED EXAMINATIONS

Deferred examinations may be granted in the following cases:

- (i) When a student through illness or some other acceptable circumstance has been prevented from taking the annual examination or has been placed at a serious disadvantage during the annual examinations. Applications for deferred examinations in the first category must be lodged with the Registrar with appropriate evidence of the circumstances (e.g., medical certificate) not later than seven days after the examination concerned. All such applications shall be reported to the Head of the School responsible for the subject. Before a deferred examination is granted on medical grounds, regard shall be paid to the student's class and assignment work in the subject, to his general performance in the year, and to the significance of the annual examination in compiling the composite mark.
- (ii) To help resolve a doubt as to whether a student has reached the required standard in a subject.
- (iii) To allow a student by further study to reach the required standard in a subject. The granting of a deferred examination in such cases will be based on the general quality of the student's performance.
- (iv) Where a student's standing at the annual examinations is such that his progression or graduation could depend on his failure in one subject only, then his position in that subject shall be again reviewed with a view to determining whether a deferred examination may be granted notwithstanding his failure otherwise to qualify for such concession.

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

Normally, the student will be directed to the nearest University for the conduct of the deferred examination.

A student eligible to sit for a deferred examination must lodge with the Accountant an application, accompanied by the fee of \$8 per subject, by the date indicated on the notification of results.

### **Conceded Deferred Examination**

A conceded deferred examination, may be granted to a student where the mark in the subject is below the standard at which deferred examinations have been granted in the subject but whose overall performance warrants such a concession.

### **APPLICATION FOR ADMISSION TO DEGREE OR DIPLOMA**

Applications for admission to a degree or diploma of the University must be made on the appropriate form by 30th September, in a student's final year. Applicants should ensure that they have completed all requirements for the degree or diploma, including industrial training where necessary. Any variation, such as cancelling of application in order to proceed to an honours degree or submission of an application following discontinuation of honours programme, must be submitted in writing to the Registrar no later than 30th January.

### **RESTRICTION UPON STUDENTS RE-ENROLLING**

The University Council has adopted the following rules governing re-enrolment with the object of requiring students with a record of failure to show cause why they should be allowed to re-enrol and retain valuable class places. These rules apply retrospectively from 1st January, 1971.

1. (i) A student shall show cause why he should be allowed to repeat a subject in which he has failed more than once. (Failure in a deferred examination as well as in the initial examination counts, for the purpose of this regulation, as one failure.) Where such subject is prescribed as a part of the student's course he shall be required to show cause why he should be allowed to continue the course.

Notwithstanding the provisions of Clause 1(i)

- (ii) A student enrolled in the first year or first stage of any course, other than the medical course, who has failed in more than half the programme in which he is enrolled for that year or stage shall be required to show cause why he should be allowed to continue in the course.
- (iii) A student enrolled in the first year of the Medical course who has failed in more than one subject of that year

shall be required to show cause why he should be allowed to continue in the Medical course.

- (iv) The provisions of sections (ii) and (iii) of this rule shall be deemed to apply to any student on transfer from another course or institution whose programme of studies in the first year of enrolment immediately following transfer is comprised of subjects so chosen that half or more of such subjects are listed in the University Calendar as first year subjects.

2. Notwithstanding the provisions of Clause 1, a student shall be required to show cause why he should be allowed to continue a course which he will not be able to complete in the time set down in the following schedule:

Number of years in course	Total time allowed from first enrolment to completion (years)
3	5
4	6
5	8
6	9
7	11
8	12

3. No full-time student shall, without showing cause, be permitted to continue a course unless all subjects of the first year of his course are completed by the end of his second year of attendance. No student in the Faculty of Arts shall, without showing cause, be permitted to continue a course unless he completes four subjects by the end of his second year of attendance. No full-time student in the Bachelor of Social Work course shall without showing cause be permitted to continue with the course unless he completes the equivalent of four full subjects by the end of his second year of attendance.

No part-time student in a course in which progression is by stage shall without showing cause be permitted to continue a course in which he will not be able to complete all subjects of the first two stages by the end of his fourth year of attendance and all subjects of the third year and fourth stages of his course by the end of his seventh year of attendance.

No part-time student in the Science course shall without showing cause be permitted to continue a course in which he

will not be able to complete level one Mathematics and six other level one units by the end of his fourth year of attendance and fourteen units inclusive of at least three at level two of his course by the end of his seventh year of attendance.

No student in the Faculty of Medicine shall, without showing cause, be permitted to continue with the medical course unless he completes the second year of the course by the end of his third year of attendance, and the third year of the course by the end of his fourth year of attendance.

4. A student who has a record of failure in a course at another University shall be required to show cause why he should be admitted to this University. A student admitted to a course at this University following a record of failure at another University shall be required to show cause, notwithstanding any other provisions in these rules, why he should be permitted to continue in that course if he is unsuccessful in the annual examinations in his first year of attendance at this University.
5. Any student excluded under any of the Clauses 1-3 may apply for re-admission after two academic years and such application shall be considered in the light of any evidence submitted by him.
6. A student wishing "to show cause" under these provisions shall do so in writing to the Registrar. Any such application shall be considered by a committee, hereinafter referred to as the Re-enrolment Committee, appointed by the Professorial Board, which shall determine whether the cause shown is adequate to justify his being permitted to continue his course or re-enrol as the case may be.
7. The Vice-Chancellor may on the recommendation of the Re-enrolment Committee exclude from attendance in a course or courses any student who has been excluded from attendance in any other course under the rules governing re-enrolment and whose record at the University demonstrates, in the opinion of the Re-enrolment Committee and the Vice-Chancellor, the student's lack of fitness to pursue the course nominated.
8. A student who has failed, under the provisions of Clause 6 of these rules, to show cause acceptable to the Re-enrolment Committee why he should be permitted to continue in his course, and who has subsequently been permitted to re-enrol

in that course or to transfer to another course, shall also be required to show cause, notwithstanding any other provisions in these rules, why he should be permitted to continue in that course if he is unsuccessful in the annual examinations immediately following the first year of resumption or transfer of enrolment as the case may be.

9. Any student who is excluded from attendance in any course or subject under the provisions of these rules may appeal to an Appeal Committee constituted by Council for this purpose. The decision of the Appeal Committee shall be final.
10. The notification to any student of a decision by the Re-enrolment Committee to exclude the student from attendance in any course or subject shall indicate that the student may appeal against the decision to an Appeal Committee. In lodging such application the student shall ensure that a complete statement is furnished of all grounds on which the application is based and shall indicate whether or not the student wishes to appear in person before the Appeal Committee.

In considering an appeal the Appeal Committee, on the basis of the student's academic record and the stated grounds for review, shall decide:

- (i) whether there are grounds which justify the Committee seeing the student in person, or
  - (ii) whether there is sufficient information available to the Committee to allow decision without seeing the student in person
- and so proceed to determine the application accordingly.

#### RE-ADMISSION AFTER EXCLUSION

Applications for re-admission must be made on the standard form and lodged with the Registrar not later than 30th June of the year prior to that for which re-admission is sought. An application should include evidence of appropriate study in the subjects (or equivalents) on account of which the applicant was excluded. In addition, evidence that the circumstances which were deemed to operate against satisfactory performance at the time of exclusion are no longer operative or are reduced in intensity should be furnished. An applicant may be required to take the annual examinations in the relevant subjects as qualifying examinations in which case re-admission does not imply exemption from the subject.

Late applications cannot be considered where, in the opinion of the University, insufficient time will be available for the student

to prepare himself for any qualifying examinations which may be required.

It should be noted that a person under exclusion may not be enrolled in miscellaneous subjects unless he has received the approval of the Professorial Board on the recommendation of the Admissions Committee.

Persons who intend applying for re-admission to the University at a future date may seek advice as to ways in which they may enhance their prospects of qualifying for re-admission. Enquiries should be made on a form obtainable from the Examinations and Student Records Section, and lodged with the Registrar.

### OWNERSHIP OF STUDENTS' WORK

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

### CHANGE OF ADDRESS

Students are requested to notify the Student Records Section of the Registrar's Division of any change in their address, as soon as possible. Failure to do this could lead to important correspondence not reaching students. The University cannot accept responsibility if official communications fail to reach students who have not notified their change of address. A Change of Address Advice form is available at Faculty and School offices and at the Enquiry Counters on the Ground Floor of the Chancellery Building.

### NOTICES

Official University notices are displayed on the notice boards and students are expected to be acquainted with the contents of those announcements which concern them.

### LOST PROPERTY

All enquiries concerning lost property should be made to the Superintendent on Extension 2503 or to the Lost Property Office at the Union.

## PARKING WITHIN THE UNIVERSITY GROUNDS

Because of the limited amount of parking space available, only the following categories of students may apply for a permit; motor cycle owners (annual fee \$3.90); higher degree students (limited issue, annual fee \$7.80); postgraduate, and senior undergraduate students who have completed three years of a full-time or part-time course (annual fee \$3.90). A permit will allow access to the campus between 5 p.m. and 11 p.m. on weekdays and during library hours on Saturdays, Sundays and public holidays. Enquiries should be made to the Property Section, Room 240, The Chancellery Building, or phone 663 0351, extension 2920. It should be noted that increasing demand for parking space may require the imposition of further restrictions.

## APPLICATION OF RULES

### General

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

### Appeals

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



# STUDENT SERVICES

---

## THE LIBRARY

The University library is on the upper campus and adjacent to the Chancellery, and the Arts and Commerce Buildings. The Bio-Medical Library is in the Biological Sciences Building with a branch at Prince Henry Hospital ('Phone: 661-0111). The Law Library is temporarily housed on the 4th Floor of the Science Building on the upper campus.

The Library's Undergraduate Collection covers the teaching and research interests of the Faculty, and students are expected to read widely and critically from it.

It is recommended that students attend the *Introduction to the Library* which is held at advertised times during Orientation Week and the first week of Session 1. The *Introduction* uses audio-visual aids to describe the physical layout of the undergraduate library and the services available to readers.

Copies of the booklet *Guide to the Library* are available on request.

Students who are interested in a subject approach to information may attend a course which outlines methods of searching for information in libraries. This course runs for eight hours over a period of one week.

Individual assistance for readers with specific library problems is provided by the *Reader Assistance Unit* which is located in the foyer.

Staff and students must use a machine readable identification card to borrow from the main University Library. Personal identification is required in the other libraries listed. For students a current union card is acceptable. Staff must apply to the Library for a library card.

## THE UNIVERSITY UNION

The University Union, housed in the circular building and joined by a courtyard to an adjacent rectangular building, is located near the entrance to the Kensington campus from Anzac Parade. The third building in the Union complex was completed in 1971. Membership of the Union is compulsory for all

registered students of the University and is also open to all members of staff and graduates of the University.

On the lower campus the range of facilities provided by the Union includes a cafeteria service and other dining facilities, a large shopping centre, cloak room, banking and hairdressing facilities, showers, a women's lounge, common, games, reading, meeting, music, practice, craft and dark rooms. Photocopying, sign printing, and stencil cutting services are also available. On the upper campus there is a cafeteria and coffee bar on the ground floor of the Sciences Building, a vending area and lounge off the Science Plaza, a similar facility off the Commerce Courtyard and a Snack Bar at the Golf House on the corner of High and Botany Streets.

The Union also sponsors and conducts courses in many facets of the arts including weaving, photography, creative dance and yoga.

## STUDENT ACCOMMODATION

### Residential Colleges

#### *The Kensington Colleges*

Accommodation for students is provided within the group of The Kensington Colleges which comprise Basser College, Goldstein College and Philip Baxter College. The group houses 450 men and women students, as well as staff members. Tutors in residence provide tutorial assistance in a wide range of subjects.

Board and residence fees, which are payable on a session basis, amount to \$336 per session. Intending students should apply in writing to the Master, Box 24, Post Office, Kensington, N.S.W. 2033, from whom further information is available.

#### *International House*

International House accommodates over 180 students of whom half are Australian; the remaining half is made up of students from some 20 different countries. First-year students who have come to the University straight from school are not eligible for residence because preference is given to mature undergraduates and postgraduate students. Fees are \$24 per week.

Students should apply as soon as possible if they wish to reside at International House at a later date. They should write to the Warden, International House, P.O. Box 88, Kensington, N.S.W. 2033 for information.

### *New College*

This Church of England College is the first of the independent Colleges on the Campus of the University. There are no religious tests, and accommodation is available for 220 men and women in single study-bedrooms. Fees are \$25 per week and may change in 1974.

Enquiries should be addressed to The Master, New College, Anzac Parade, Kensington, N.S.W. 2033.

### *Warrane College*

This College, an affiliated Roman Catholic residential college, was completed in 1970, and provides accommodation for 200 students and fourteen resident tutors.

Basic fees are \$28 per week for board and residence, payable on a session basis, and a registration fee of \$20. Fees may change in 1974. Intending students should write to The Master, Warrane College, Box 123, P.O., Kensington, N.S.W. 2033.

### *Shalom College*

Shalom College, first occupied in 1973, provides accommodation for 86 men and women students. The basic fee for residents is \$28 a week, although this may change in 1974. Non-resident membership is available to students who wish to avail themselves of the Kosher dining room and tutorial facilities.

Applications for residence and further information should be addressed to The Master, Shalom College, The University of New South Wales, Box 1, P.O., Kensington, N.S.W. 2033.

### **Other Accommodation**

Students requiring other than Residential College accommodation may make personal application to the Housing Officer (Ext. 3260) at the Student Amenities Unit. Current lists are kept of accommodation available at recognized boarding houses, private homes, and in serviced and unserviced apartments.

## STUDENT AMENITIES UNIT

The Amenities Unit is concerned with student welfare and its activities are associated with sport and recreation, travel and student accommodation. It works in close liaison with the Sports Association, assisting the various clubs, and administers sporting facilities for both grade and social competitions. The Unit also has the added responsibility of the Physical Education and

Research Centre where attractive recreational programmes for students and staff are provided. Concessional application forms for all types of travel may also be obtained at the Enquiry Desk in the Chancellery or at the Student Amenities Unit. A Housing Officer is also available to assist students with any off-campus accommodation problems.

**Location:** The Student Amenities Unit is located in Hut B at the foot of Basser Steps.

**Phone:** 663 0351, Extension 2235 Sports Association

3271 Physical Education and  
Recreation Centre

3261 Travel

3260 Accommodation

### STUDENT EMPLOYMENT UNIT

The Student Employment Unit offers assistance with career employment for final year students and graduates of the University. This service includes the mailing of regular job vacancy notices to registered students and a campus interview programme for final year students. Careers advice and assistance is also available to undergraduates. Assistance is offered in finding vacation employment which gives either course related experience or industrial training experience where this is a course requirement. Information and advice regarding cadetships, undergraduate and postgraduate scholarships is also available.

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

Telephone: 663 0351 ext. 3259 for employment and careers  
advice, or

663 0351 ext. 2086 for cadetships and industrial  
training information.

### CHAPLAINCY SERVICE

This service is provided for the benefit of students and staff by five Christian Churches and by the Jewish congregation. Chaplains are in attendance at the University at regular times. A Chapel is also available for use by all denominations.

The University Chapel and full-time chaplains are located in Hut F near the Chemistry Building. They may be contacted by phone at the following extensions: Anglican, 2684; Jewish, 3273; Roman Catholic, 2379; Churches of Christ, Methodist and Seventh Day Adventist, 2683.

## STUDENT HEALTH UNIT

A student health and first aid centre is situated within the University. It is staffed by two qualified medical practitioners, assisted by a nursing sister and two secretaries.

The medical service, although therapeutic, is not intended to replace private or community health services. Thus, where chronic or continuing conditions are revealed or suspected, the student is referred to a private practitioner or to an appropriate hospital for specialist opinion and/or treatment. The health service is not responsible for fees incurred in these instances. The service is confidential and students are encouraged to attend for advice on matters pertaining to health.

The service is available to all enrolled students by appointment, free of charge between 9 a.m. and 5 p.m. Mondays to Fridays, and additionally to part-time students from 6 p.m. to 8 p.m. on Tuesdays and Thursdays during session. For staff members, immunizations are available, and first-aid service in the case of injury or illness on the campus.

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

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

## STUDENT COUNSELLING AND RESEARCH UNIT

The Student Counselling and Research Unit offers a free, confidential counselling service to help students, individually or in groups, to deal with problems, and to make plans and decisions associated with their personal, academic, and vocational progress.

Interviews and group programmes are available between 9 a.m. and 8 p.m. each week-day. Appointments may be made at the Unit, which is located at the foot of Basser Steps, or by ringing 663-0351, extensions 2600-2605 between 9 a.m. and 5 p.m.

## FINANCIAL ASSISTANCE TO STUDENTS

In addition to the Tertiary Allowances Scheme financed by the Australian Government (see **Scholarships** for details), the following forms of assistance are available.

- (a) The Students' Union and the University have co-operated to provide assistance to students who are in financial difficulties which are considered likely to prejudice their progress with their studies.

Three main forms of assistance are available:

1. *Deferment of Payment of Fees*

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

In exceptional circumstances the University may consider granting deferments for up to twelve months or even longer. In cases where payment is deferred to 31st December, examination results will not be published or made available until such time as the outstanding fees are paid. Where deferments are granted to a date beyond 31st December, the University may require the student to enter into a formal agreement to repay the fees.

2. *Short Terms Cash Loans*

Donations from the Students' Union, the University Union and other sources have made funds available for urgent cash loans not exceeding \$100.00. These loans are normally repayable within one month.

3. *Long Term Cash Loans*

An amount of up to \$300.00 is available from this fund, repayable usually after twelve months or within twelve months of graduation or upon withdrawal from the course. This scheme is funded jointly by the University and the Students' Union. Students are required to enter into a formal agreement with the University to repay such a loan.

- (b) Early in 1973 the Australian Government made funds available to the University to provide loans to students in financial difficulty. The loans are to provide for living allowances and other approved expenses associated with attendance at University. Under this scheme allowances are paid approximately monthly during the academic year. Repayments usually commences after twelve months of graduation or upon withdrawal from the course. Students are required to enter into a formal agreement with the University to repay the loan.

From the same source of funds as mentioned in the preceding paragraph students who are in extremely difficult financial circumstances may apply for assistance by way of non-repayable grant. In order to qualify for a grant a student must generally

show that the financial difficulty has arisen from misfortune beyond his control.

Application for all forms of assistance may be made personally to the Deputy Registrar (Student Services).

### **FINANCIAL ASSISTANCE TO ABORIGINAL STUDENTS**

Financial assistance is available from a number of sources to help Aboriginal students. Apart from the Australian Government's Tertiary Allowances Scheme, to be introduced in 1974, there is a Commonwealth Aboriginal Study Grant Scheme. Furthermore, the University may assist Aboriginal students with some essential living expenses in exceptional circumstances.

All enquiries relating to this scheme should be directed to the Deputy Registrar (Student Services).

### **UNIVERSITY CO-OPERATIVE BOOKSHOP LTD.**

Membership is open to all students, on payment of a fee of \$5, refundable when membership is terminated. Members receive an annual rebate on purchases of books.

### **LOCATION OF LABORATORIES OUTSIDE KENSINGTON CAMPUS**

#### **Randwick**

The Schools of Highway and Traffic Engineering and the Structures Laboratory of the School of Civil Engineering occupy new buildings on the site of the old Tramway Depot at King Street, Randwick.

#### **Manly Vale**

The Water Research Laboratory of the School of Civil Engineering.

# STUDENT ACTIVITIES

---

## THE STUDENTS' UNION

The Students' Union was formed in 1952 as an organization, duly recognised by the University Council, to represent the student body and to provide a central organisation for the administration of student activities. In the words of its constitution, "The Students' Union is formed for the purpose of advancing the interests of University men and women, facilitating their general scientific and technical education, and fostering a University spirit among them".

The Union affords a recognised means of communication between the student body and the University administration, and represents its members in all matters affecting their interests. It aims to promote the cultural, educational and recreational life of the University and to encourage a permanent interest among graduates in the life and progress of the University.

Membership of the Union is compulsory for all registered students of the University and the annual subscription is \$7.

The Students' Union is governed by a Council consisting of student representatives from the various faculties of the University, representatives of Life Members, overseas students, and of the University and the Sports Association. The Council is elected annually.

## THE SPORTS ASSOCIATION

The Sports Association is a student organization within the University, and it caters for a variety of competitive sports for both men and women.

In December 1952 the University Council approved the establishment of the Sports Association which consisted of five clubs. As the University has grown, the Association has expanded, and today includes over thirty clubs.

The controlling body of the Association is the General Committee which consists of a President, Secretary, Treasurer, eight Vice-Presidents and two delegates from each of the affiliated clubs.



Membership of the Association is compulsory for all registered students, and the annual subscription is \$4.

### PHYSICAL EDUCATION AND RECREATION CENTRE

The Physical Education and Recreation Centre consists of eight squash courts and a main building. The latter has a large gymnasium and ancillary practice rooms for fencing, table tennis, judo and weightlifting. The Supervisor of Physical Recreation is responsible for this Centre and provides a recreational programme for both students and staff. Those who desire to participate in the recreational programmes should contact the Supervisor on Extension 3271.

### STUDENT CLUBS AND SOCIETIES

Students have the opportunity of joining a wide range of clubs and societies. Affiliated with the Students' Union are the School and Faculty associations, and the numerous religious, social and cultural clubs. There are also many sporting clubs (33) affiliated with the Sports Association.

Clubs and societies seeking to use the name of the University in their title, or seeking University recognition, must submit their constitutions either to the Students' Union or the Sports Association if they wish to be affiliated with either of these bodies, or to the Registrar for approval by the University Council.

### THE UNIVERSITY REGIMENT

Enquiries should be made to the Adjutant at the Regimental Depot in Day Avenue just west of Anzac Parade.

### THE NSW UNIVERSITY SQUADRON

Enquiries should be made to the Commanding Officer at Squadron Headquarters at the corner of City and Darlington Streets, Darlington 2008.

### ROYAL AUSTRALIAN NAVY

Enquiries should be made to the Royal Australian Naval Liaison Officer, Professor J. S. Ratcliffe, Commander, R.A.N.V.R., at the School of Chemical Engineering. Phone 663 0351, ext. 2406.

# UNDERGRADUATE SCHOLARSHIPS AND PRIZES

---

## SCHOLARSHIPS

Students undertaking courses in the Faculty of Engineering are eligible to apply for the following scholarships. Not all scholarships are offered each year. Towards the end of December prospective applicants should enquire from the Student Employment and Scholarships Unit which scholarships are available.

Except where otherwise specified, applications on the forms obtainable from the Admissions Office (phone: 663-0351, ext. 2485) must be lodged with the Registrar, the University of New South Wales, P.O. Box 1, Kensington 2033. A separate application must be lodged for each category of scholarship.

In addition to these scholarships, a number of industrial organizations and Government Departments sponsor students at the University.

In the past, such students generally had their University fees paid by the employer and were employed at cadet rates of pay during the course. However these schemes, details of which are set out in Section B of the University Calendar, are currently under review and interested persons should contact the relevant organization or department for up-to-date information.

### **Tertiary Allowances Scheme**

In 1974, no new awards will be offered under the Commonwealth University Scholarship Scheme. Instead a new system of Australian Government Assistance for tertiary students, called the Tertiary Allowances Scheme, will operate. This scheme will apply to students who commence approved courses in 1974 as well as those who commenced their courses earlier.

*Means-tested* living and other allowances will be available to full-time students enrolled in an approved course who satisfy certain academic and residence requirements, are unbonded and who do not receive assistance in excess of \$350 from other scholarships. *No age limit will apply.*

Students enrolled in the following types of university courses will be eligible for assistance:

- Undergraduate and postgraduate bachelor degree courses
- Postgraduate diplomas
- Combined bachelor degree courses offered by institutions
- Master's qualifying courses

### **Benefits**

*Means-tested Living Allowance.* The maximum rates of living allowance are \$850 per annum for students living at home and \$1,400 per annum for students living away from home.

The maximum rates of living allowance will be paid where the adjusted family income is equal to or less than \$5,300 per annum. The adjusted family income is assessed by subtracting from the gross income of both parents business expenses and an amount of \$450 for each dependent child other than the student.

When the adjusted family income exceeds \$5,300 p.a. the amount of living allowance will be reduced by \$2 for every \$10 of income until the family income exceeds \$10,600 per annum. After this level, the living allowance will be reduced by \$3 for every \$10 of income.

A concession may be made where there are other children in the family undertaking tertiary education with scholarship assistance of less than \$350 p.a. from schemes other than the Tertiary Allowances Scheme.

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

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

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

*Dependant's Allowance:* This is made up of allowances of \$8 per week for a dependent spouse and \$4.50 per week for each child.

*How to Apply:* Higher School Certificate students will be able to obtain application forms from their school. Students who do not already hold a scholarship may obtain forms from the Admissions Office, or from The Regional Director, New South Wales

State Office, Department of Education, Sydney Plaza Building, 59 Goulburn Street, Sydney, N.S.W. 2000 (Telephone 20929).

*N.B.: Current Commonwealth Scholarship holders will have application forms posted to them. All forms should be returned to the above address as soon as possible.*

## AUSTRALIAN POSTGRADUATE AWARDS

### Australian Postgraduate Course Awards

The Australian Government provides a number of awards for full-time postgraduate study in courses leading to the degree of Master by formal course work. Persons permanently domiciled in Australia who are under 45 years of age on 1 January of the year in which the award is to be taken up and who are University graduates or will graduate in the current academic year, are eligible for the awards. Award holders receive a living allowance of \$2,900 paid over the academic year. Other allowances may also be paid in certain cases.

Application for awards tenable at the University must be lodged with the Registrar by 30 September each year.

### Australian Postgraduate Research Awards

The Australian Government also provides each year a number of awards for full-time postgraduate study and research. The awards are renewable annually up to a maximum duration of two years in the case of a candidate for a Masters degree or three years in the case of a PhD candidate. In special circumstances, a PhD candidate may be granted an extension of tenure into a fourth year. Persons permanently domiciled in Australia who are under 35 years of age on 1 January of the year in which the award is to be taken up and who are University graduates or will graduate in the current academic year, are eligible for the awards. Award holders receive a living allowance of \$3,050 per annum. Other allowances may also be paid in certain cases. The closing date for applications is 31 October each year.

## OTHER AWARDS

### Bursaries

A number of Bursaries tenable at the University are awarded to candidates of merit at the Higher School Certificate Examination whose family income falls within certain limits prescribed by the Bursary Endowment Board. Applications should be made to the Secretary, Bursary Endowment Board, Box 7077, G.P.O., Sydney 2001.

**The Fell Scholarship (University Residential Colleges)**

The Fell Scholarship is available to any undergraduate who is or will be in residence at one of the Colleges under the administration of Kensington Colleges Ltd. during the year of the award. The annual value of the Scholarship is \$100. It may be held concurrently with other scholarships.

In awarding the scholarship the academic merit and financial need of the applicant will be taken into consideration.

Applications must be made on the appropriate form and lodged with the Master, Kensington Colleges Ltd., Box 24, P.O., Kensington 2033 (Telephone 663-0651).

**Joint Coal Board Scholarships**

The Joint Coal Board is offering scholarships in full-time courses in Mining Engineering and Applied Geology. While scholarship holders are not under bond, it is expected that they will obtain employment in coal mining or a related industry on graduation. Applications on forms obtainable from principals or from the Secretary, Joint Coal Board, Box 3842, G.P.O., Sydney, must be lodged with the Board's secretary not later than seven days after the publication of the Higher School Certificate results.

**The Tyree Electrical Company Scholarship in Electrical Engineering**

The Tyree Electrical Company Pty. Ltd., has undertaken to provide scholarships for students enrolling in the full-time courses in Electrical Engineering. The value of the scholarships is between \$500 and \$1,500 per annum, payable in fortnightly instalments as a living allowance to students. They will normally be tenable for four years but may be extended to a fifth year when the holder intends to qualify for the two degrees, Bachelor of Science and Bachelor of Engineering. They may be held concurrently with any other scholarship.

**The Fox Memorial Manufacturing Company Scholarship**

The Company offers annually a scholarship to students in the first and later years of the full-time course in Mechanical Engineering.

**Regent Scholarship in Engineering for Women Undergraduates**

Mrs. G. O'Riordan and Mrs. J. Kouvelis provide annually a \$200 scholarship for a female student enrolled in a full-time engineering course, and is normally tenable for four years. The award of the scholarship is based on the applicant's scholastic merit and financial need.

## PRIZES

<i>School/Department</i>	<i>Donor/Name of Prize</i>	<i>Value</i>	<i>Awarded for</i>
General	Sydney Technical College Union Award	\$ 50.00	Leadership in the development of student affairs and academic proficiency throughout the course.
	University of New South Wales Alumni Association	Statuette	Achievement for community benefit—students in their final or graduating year.
Faculty of Engineering	The Dean's Faculty Hour	25.00	Best essay on a topic discussed in Faculty Hour, Faculty of Engineering, by a graduating student.
	The Dean's Faculty Hour	25.00	Best essay on a topic discussed in Faculty Hour, Faculty of Engineering, by a non-graduating student.
School of Chemistry	Australian Chemical Holdings Ltd.	21.00	2.001 Chemistry I.
	George Wright	10.50	2.001 Chemistry I—Full-time students only.
School of Civil Engineering	Harbin Polytechnical Alumni Association	50.00	Subject selected by Head of School.
	Chamber of Manufactures of New South Wales	10.00	Subject selected by Head of School.
	The Association of Consulting Structural Engineers of New South Wales	(1) 20.00 and books to the value of 30.00 (2) 20.00 and books to the value of 30.00	General proficiency—Structures in the Bachelor of Engineering Course in Civil Engineering General proficiency—Structures in the Bachelor of Science (Engineering) Course in Civil Engineering.
	Water Board Gold Medal	Medal	Public Health Engineering.

School of Electrical Engineering	Austral Bronze Crane Cop- per Ltd.	50.00	Bachelor of Engineering in Electrical Engineering, Year III.
		80.00	Power or Control elective.
	Chamber of Manufactures of New South Wales	10.00	Subject selected by Head of School.
	F.P.E. (Aust.) Pty. Ltd.	A book	Subject selected by Head of School.
	J. Douglas Maclurcan	10.50	Control Systems.
	Standard Telephones & Cables Pty. Ltd.	30.00	Subject selected by Head of School.
	The Wilfred Holmes Mem- orial Award	100.00	A student eligible to enter the final year of the course and who is deemed to be in necessitous circumstances.
Department of Industrial Engineering	Austral Bronze Crane Cop- per Ltd.	50.00	Bachelor of Engineering Course in Industrial Engineering, Year III.
	Chamber of Manufactures of New South Wales	10.00	Subject selected by Head of School.
	T.R.W. Australia Ltd.	10.50	Bachelor of Science (Engineering) Course in Industrial Engineering, Stage 6.
	Industrial Engineering Prize	25.00	Bachelor of Engineering in Industrial Engineering, Year IV.
School of Mathematics	School of Mathematics	25.00	Higher Mathematics I.

(Continued overleaf)

## PRIZES (continued)

<i>School/Department</i>	<i>Donor/Name of Prize</i>	<i>Value</i>	<i>Awarded for</i>
School of Mechanical Engineering	Babcock & Wilcox Aust. Ltd.	\$ 21.00	Subject selected by Head of School.
	Chamber of Manufactures of New South Wales	10.00	Subject selected by Head of School.
	Vickers Cockatoo Dockyard Pty. Ltd.	4.20	Bachelor of Science (Engineering) Course in Naval Architecture, Stage 5.
	Colonial Sugar Refining Co. Ltd.	30.00	Subject selected by Head of School.
	Ford Motor Co. of Aust. Ltd.	20.00	Subject selected by Head of School.
	Harbin Polytechnical Alumni Association	50.00	5.113 Mechanical Engineering Design.
	Jeremy Hirschhorn	20.00	Theory of Machines.
	Royal Institute of Naval Architects	20.00	Bachelor of Engineering or Bachelor of Science (Engineering) Course in Naval Architecture, final year or stage.
	Staedtler (Pacific) Pty. Ltd.	50.00 (order)	General proficiency in Bachelor of Engineering Course in Mechanical Engineering, Year II.
School of Physics	School Prize for Physics II	40.00	Physics II.
School of Surveying	Board of Surveyors Medal	Medal	Bachelor of Surveying Course, Final Year



## UNDERGRADUATE COURSES

---

The Faculty of Engineering consists of seven Schools—Civil, Electrical, Mechanical and Industrial, Highway, Nuclear, Transportation and Traffic, and Surveying. The Schools of Civil, Electrical, and Mechanical and Industrial offer full-time courses leading to the degree of Bachelor of Engineering, and part-time courses leading to the degree of Bachelor of Science (Engineering). The School of Surveying offers a full-time and part-time course leading to the degree of Bachelor of Surveying. The Schools of Highway Engineering, Nuclear Engineering and Transportation and Traffic Engineering offer graduate courses only.

All the postgraduate activities of the Faculty are co-ordinated under the Graduate School of Engineering. For full details of such activities please see the Graduate School of Engineering Handbook and the University Calendar, or contact the appropriate school.

### Common First Year

The Schools of Civil, and Mechanical and Industrial Engineering have similar first year courses in physics, mathematics and chemistry, facilitating the transfer of students from one Bachelor of Engineering course to another within these schools at the end of their first year without loss of standing.

The first year courses in the Schools of Electrical Engineering and Surveying differ from the courses offered by the Schools of Civil Engineering and Mechanical & Industrial Engineering. However, notwithstanding the fact that the courses are not identical, sympathetic consideration will be given to requests by students who have completed first year to transfer to an allied course without loss of standing. When such transfer is desired an application must be made with the Registrar.

### Progression

Progression in all undergraduate courses in the Faculty of Engineering is now permitted by subject. However:

- (1) Course programmes will continue to be stated and time-tabled by Year or Stage and it cannot be guaranteed that non-standard programmes can be completed in the minimum number of years.
- (2) Students must satisfy the rules governing re-enrolment: in particular, these require all subjects of the first year to be

completed by the end of two years of full-time (or four years of part-time) study.

- (3) Before enrolling in any subject a student must have satisfied the relevant prerequisite and co-requisite requirements. This will usually necessitate a student completing or attempting all subjects of a particular Year or Stage before proceeding to a subject in the next part of a course. Further details are available from the appropriate School.
- (4) Only in exceptional circumstances will a student be permitted to enrol in subjects extending over more than two years of the course or for more than twenty-eight hours of course work per week if a full-time student or fourteen hours per week if a part-time student.

Students repeating subjects are required to choose a programme which limits their hours of course work to twenty-two per week if a full-time student, and to eleven per week if a part-time student, unless they have the express permission of the Head of School to exceed these hours.

- (5) Notwithstanding the above, before a student can enrol in any non-standard programme, such programme must meet with the approval of the Head of School. A non-standard programme is one which involves enrolment in subjects from more than one Year or Stage, or comprises subjects which do not normally constitute a particular year's course work.

### FULL-TIME COURSES

Full-time courses of four-years' duration are offered in Civil, Electrical, Mechanical, Industrial, and Aeronautical Engineering, and in Naval Architecture: all of these lead to the degree of Bachelor of Engineering. A four-year full-time course in Surveying is offered by the School of Surveying leading to the degree of Bachelor of Surveying.

The award of the degree of Bachelor of Engineering is recognized by the Institution of Engineers, Australia, as giving complete exemption from the examinations required for admission to the grade of Member. In nearly all cases substantial or complete recognition is accorded to these courses by overseas engineering institutions.

### General Studies Programme

Almost all undergraduates in Faculties other than Arts and Law are required to complete a General Studies programme. Courses (in addition to the Faculties of Arts and Law) which do not have this requirement are Bachelor of Science in Psychology, Bachelor of Science in Economic Geography, Bachelor of Science (Educa-

tion) and Bachelor of Health Administration. The Department of General Studies publishes its own Handbook which is available free of charge. All details regarding General Studies courses and requirements are contained in it, and students are advised to obtain a copy. All enquiries about General Studies should be made to the General Studies Office, Room G15, Morven Brown Building (663-0351 Extn. 2091).

### **Industrial Training Requirements**

All full-time engineering courses incorporate industrial training and reference should be made to the entries under each School heading for details of the arrangements applicable. All students are strongly recommended to gain further industrial experience in those long vacations where such training is not already prescribed.

The staff of the University will, where possible, assist students to obtain this employment, but it is emphasized that the primary responsibility for obtaining suitable industrial experience rests with each student. Progression to succeeding years of the course and the award of the degree are dependent on the completion of the requisite periods of industrial employment of a standard approved by the University.

### **PART-TIME COURSES**

Since 1961 the Schools of the Faculty have offered six-year part-time courses in a variety of engineering fields leading to the degree of Bachelor of Science (Technology). From 1971 the name of this degree became Bachelor of Science (Engineering) but is not awarded retrospectively. Courses for the BSc(Eng) degree are offered in Civil, Electrical, Industrial and Mechanical Engineering and in Naval Architecture and Aeronautical Engineering (these last two being offered by the School of Mechanical and Industrial Engineering).

The General Studies programme is the same for part-time as for full-time students, except that part-time students do not do an Advanced Elective.

The award of the degree of BSc(Eng) is recognized at present by the Institution of Engineers, Australia, as giving complete exemption from the examinations required for admission to the grade of Member.

Recognition by overseas engineering institutions varies in the different branches of engineering, and particular enquiries on this matter should be addressed to the head of the appropriate School.

A student completing the BSc(Eng) degree course and wishing to qualify for the corresponding BE degree may, on the recom-

mendation of the Head of the School, transfer to the corresponding full-time BE course provided he does not take out the BSc (Eng) degree. Further, provided he continues as a registered student on transfer from one course to the other, he may retain any concession granted in the BSc(Eng) degree course.

Holders of the BSc(Eng) award are eligible to proceed to the degree of Master of Engineering, Master of Engineering Science or Master of Surveying Science subject to the conditions for the award of these degrees set out in Section C of the University Calendar.

Courses leading to the BSc(Eng) award are basically part-time and the prescribed industrial experience should be gained concurrently with the course of study (a minimum of three years of suitable engineering experience is required). Students transferring from full-time courses must, therefore, also satisfy these industrial experience requirements before being admitted to the degree of BSc(Eng).

The BSc(Eng) degree programme may in some cases be accelerated by a student attending for one or more years full-time. For example, in all courses of the Faculty it is possible to take the equivalent of the first two part-time years in the full-time first year.

The School of Surveying offers a part-time course of seven years' duration for the degree of Bachelor of Surveying.

### FACULTY OF APPLIED SCIENCE

The Faculty of Applied Science offers courses to students desiring a career in a specialized technology with an engineering element. These courses are as follows:

	<i>Full-time</i>	<i>Part-time</i>
Chemical Engineering	BE	BSc(Tech)
Ceramic Engineering	BSc	BSc(Tech)
Metallurgy	BSc	BSc(Tech)*
Mining Engineering	BE	BSc(Eng)†
Textile Engineering	BSc	—

Entrance to these courses, which are of four years' duration full-time (pass or honours) and six years' duration part-time, is conditional upon completion of the full subject Chemistry I. Except in the case of Mining Engineering, transfer should be made at the end of first year to achieve maximum standing. Full-time Engineer-

\* A part-time course is also available at Wollongong.

† A part-time course in Mining Engineering leading to the award of the BSc(Eng) degree is available at Wollongong and Broken Hill. A part-time course in Mineral Processing leading to the award of the BSc(Tech) degree is available in Broken Hill.

ing students may enter the Mining Engineering course after the second year of courses in Mechanical, Electrical or Civil Engineering without loss in standing of subjects completed.

Part-time engineering students may enter the courses offered by the Schools of Chemical Engineering, Chemical Technology and Metallurgy after the second stage part-time or the full-time first year. They may enter the Mining Engineering course after the fourth stage. In all cases the requirements for the degree of BSc(Tech) demand three years approved concurrent industrial training.

Holders of the degrees of BE (pass or honours) and BSc(Tech) in Chemical Engineering and in Mining Engineering are recognized by the Institution of Engineers of Australia as being eligible for Corporate Membership without further examination.

### **Ceramic Engineering**

Ceramics are inorganic, non-metallic materials which usually require the use of high temperatures in their processing. Products of the industry include glass, refractories, bricks, tiles, pipes, abrasives, cement, plaster, nuclear ceramics, whitewares, enamels and electric insulators, dielectrics and magnetic materials. The ceramic engineer is concerned with the relationship between the atomic and crystal structure of materials and their chemical, physical and engineering properties, as well as the methods of their manufacture and fabrication into useful shapes.

Graduates in Ceramic Engineering take positions in the fields of research and development, production control, product evaluation and technical service.

### **Chemical Engineering**

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

### **Metallurgy**

Metallurgy deals with the nature, production, properties and uses of metals. Its importance today is associated with the demands for better materials for aircraft, rockets, and nuclear reactors, as well as the more conventional engineering structures, machines and appliances. Metallurgists are also closely involved with the development of new and more efficient processes for extracting metals from their ores and contributing to mineral production.

The School of Metallurgy is located at Kensington, and also has a department in Wollongong. It has excellent facilities for teaching and research. Emphasis in these courses is on the application of science to technological problems and in this respect there is a close relationship between metallurgy and engineering. Information on the Metallurgy courses and on opportunities for postgraduate work for engineering graduates in the School of Metallurgy may be obtained from the University Calendar, or from Professor Hugh Muir at the School of Metallurgy.

### **Mining Engineering**

The aim of the training is to give students a thorough foundation in Mining Engineering and so permit them to enter quarrying, coal mining, metalliferous mining or the petroleum industry, and to be employed in any of the phases of these industries ranging from exploration to production.

During the undergraduate course, students will spend portion of the long vacations obtaining practical experience in mining. Mining companies prepare programmes so that the students obtain a comprehensive experience in many aspects of the profession. This experience is important and it is related to the academic training received in the School. Practical experience in mining, gained as a student, can contribute to the experience record of mining engineers when making application for a statutory certificate of competency from one of the Australian State Government Departments of Mines.

The School of Mining Engineering offers a part-time course in Mineral Processing at Broken Hill, leading to the degree of Bachelor of Science (Technology). Part-time courses leading to the degree of Bachelor of Science (Engineering) are available at Broken Hill and Wollongong.

### **Textile Engineering**

The textile industry, being a manufacturing one, depends on many types of machinery and engineering services to produce its products. In order to cope with technological problems in production, quality control and research, a competent textile engineer must have a good understanding of the fundamental sciences and extensive theoretical and practical knowledge of the applied textile and engineering sciences.

There are many challenging positions for textile engineers in industry and research.

Full details of the above courses may be obtained from the University Calendar or the Faculty of Applied Science Handbook.

# GRADUATE SCHOOL OF ENGINEERING

---

## HIGHER DEGREES

### Research Degrees

The higher degrees of Master of Engineering, Master of Surveying, and of Doctor of Philosophy are awarded on the presentation of a thesis, satisfactory to the examiners, which embodies the results of an original investigation or design. Candidates for these degrees must possess a bachelor's degree in an appropriate field and meet the conditions governing the award of these degrees. The full conditions are set out in the University Calendar and in the Handbook of the Graduate School of Engineering.

The degree of Doctor of Science is also awarded for a contribution of distinguished merit in the field of engineering.

## GRADUATE COURSES

### Courses of Study for Graduate Awards

In addition to the research degrees listed above, the Faculty offers courses of instruction at the graduate level leading to the award of the degree of Master of Engineering Science, Master of Surveying Science or to a graduate diploma.

#### *Courses for the Degrees of Master of Engineering Science and Master of Surveying Science*

These degrees may be gained by —

- (i) formal course work;
- (ii) a combination of formal course work and the completion of a report on a project or a research thesis; or
- (iii) completion of a research thesis.

Candidates proceeding to the degree of Master of Engineering Science and Master of Surveying Science are encouraged to develop interdisciplinary attitudes and with the approval of the Head of School may take subjects from other schools of the Faculty, other Faculties of the University and other universities or institutions. By means of this system, a student, with the approval of the Head of School, is able to select a programme of studies best suited to his needs.

*Courses for Graduate Diplomas*

Highway Engineering, Human Communication, Industrial Engineering and Transport.

Full details of all these courses are given in the section on postgraduate study in the University Calendar, in the Handbooks of the appropriate Schools, and in the Handbook of the Graduate School of Engineering or may be obtained from the Dean of the Faculty of Engineering.

The Faculty of Engineering also supervises the Graduate Diploma course in Human Communications, offered by the Division of Postgraduate Extension Studies.

**Special Courses**

Short, intensive graduate and special courses are provided throughout each year designed to keep practising engineers in touch with the latest developments in their various fields. The programmes of such courses for this year are published separately.



# OUTLINES OF UNDERGRADUATE COURSES

---

## SCHOOL OF CIVIL ENGINEERING

The School of Civil Engineering offers two courses in Civil Engineering: a four year full-time or equivalent part-time course leading to the degree of Bachelor of Engineering (BE) and a six year part-time course leading to the degree of Bachelor of Science (Engineering) (BSc(Eng)). In the full-time course, a period of forty working days of industrial training must be completed between Years 3 and 4 and it is strongly recommended that further industrial experience be gained in the long vacation between Years 2 and 3. Part-time students are required to gain a minimum of three years of suitable engineering experience concurrently with the University course. Students enrolled in the final year of either course may be required to present a seminar and attend a prescribed number of seminar sessions as part of their programme.

A student who has completed the requirements for the award of the BSc(Eng) degree in Civil Engineering but has not taken out the degree by formal graduation may apply to the Head of School for enrolment on a part-time basis in the BE degree course. It is anticipated that, in normal cases, the additional requirements for the BE degree may be completed in one year of part-time study.

The degree of Bachelor of Engineering may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class 1, and Class 2 in two divisions, and the award and grade of Honours are made in recognition of superior performance throughout the course. The degree of Bachelor of Science (Engineering) may be awarded with Merit in recognition of superior performance throughout the course.

## 362. CIVIL ENGINEERING—FULL-TIME COURSE

## Bachelor of Engineering

		Hours per week			
		SESSION 1		SESSION 2	
YEAR 1		Lec.	Lab. Tut.	Lec.	Lab. Tut.
1.001	Physics I <i>or</i>				
1.011	Higher Physics I	3	3	3	3
2.021	Chemistry IE	3	3	0	0
5.010	Engineering A	4	2	0	0
5.020	Engineering B	0	0	3	2
5.030	Engineering C	0	0	4	2
10.001	Mathematics I <i>or</i>				
10.011	Higher Mathematics I	4	2	4	2
		14	10	14	9
YEAR 2					
8.172	Mechanics of Solids II	2	2	0	0
8.181	Structural Design I	1	1½	1	1½
8.272	Civil Engineering Materials I	1½	2½	1½	2½
8.301	Systems Engineering	2	2	0	0
8.571	Hydraulics I	0	0	1½	1½
8.671	Engineering Construction	2	1	0	0
10.022	Engineering Mathematics II	2	2	2	2
29.441	Engineering Surveying	0	0	3	3
29.491	Survey Camp†				
	Two Electives*	2	1	2	1
		12½	12	11	11½

†Students are required to attend a one-week Survey Camp, equivalent to 40 class contact hours.

\*Of ten electives (see footnote, Years 3 and 4 on next page), at least four shall be in General Studies, and at least four shall be in technical electives. Two of the General Studies electives shall be taken prior to Year 4.

## YEAR 3

8.010	Projects	0	3	0	3
8.152	Structures	3	1	3	1
8.161	Engineering Mathematics	1½	1½	1½	1½
8.252	Civil Engineering Materials	1½	½	1½	½
8.301	Systems Engineering	1	1	1	1
8.531	Water Engineering	2½	1½	2½	1½
	Two General Studies Electives	2	1	2	1
		11½	9½	11½	9½

		Hours per week			
		SESSION 1		SESSION 2	
		Lab.		Lab.	
YEAR 4		Lec.	Tut.	Lec.	Tut.
	Engineering Electives†	2	2	2	2
8.153	Structures	3	2	3	2
8.253	Civil Engineering Materials	3	2	3	2
8.532	Water Engineering	1½	1½	1½	1½
8.631	Civil Engineering	3	½	3	½
	Two General Studies Electives*	2	1	2	1
		14½	9	14½	9

†The approved electives are: 8.011 Project, 8.012 Architecture, 8.013 Bridge Engineering, 8.014 Computer Applications in Civil Engineering, 8.015 Road Engineering, 8.016 Hydraulics, 8.017 Transportation Engineering, 8.018 Construction and Administration, 8.019 Railway Engineering, 8.020 Hydrology, 8.021 Environmental Aspects of Civil Engineering, 8.022 Elasticity and Plasticity in Soil and Rock Mechanics, 8.023 Flow in Porous Media, 8.024 Foundation Engineering, 8.025 Structural Concrete, 8.026 Systems Methods in Civil Engineering, 8.027 Timber, Plastics and Composite Engineering.

\*One elective must be advanced; as an alternative to it, students may take the Sociology IIIA (53.113) option "Science, Technology and Society."

#### YEAR 3†

8.173	Structural Analysis I	2	1	0	0
8.174	Structural Analysis II	0	0	2	1
8.182	Structural Design II	1	2	1	2
8.273	Civil Engineering Materials II	1½	1½	1½	1½
8.351	Engineering Mathematics	2½	2½	0	0
8.572	Hydraulics II	1½	1½	0	0
8.573	Hydraulics III	0	0	1½	1½
8.581	Water Resources I	1½	1½	0	0
8.582	Water Resources II	0	0	1½	1½
8.672	Planning and Management I	0	0	2	2
	Two Electives*	2	1	2	1
		12	11	11½	10½

†Available in 1975 for the first time.

\*Of ten electives (see footnote, Year 2, on previous page), at least four shall be in General Studies, and at least four shall be technical electives. Two of the General Studies electives shall be taken prior to Year 4.

**YEAR 4†**

8.191	Structural Engineering	1½	1½	0	0
8.274	Civil Engineering Materials III	1½	1½	1½	1½
8.583	Water Resources III	1	2	0	0
8.673	Planning and Management II	1	2	1	2
8.051	Design Projects I	0	0	0	2½
8.052	Design Projects II	0	0	0	2½
	Six Electives*	4½	4½	4½	4½
		<hr/>		<hr/>	
		9½	11½	7	13
		<hr/>		<hr/>	

†Available in 1976 for the first time.

\*Of ten electives (see footnote, Year 2, earlier), at least four shall be in General Studies, and at least four shall be technical electives. Two of the General Studies electives shall be taken prior to Year 4.

**363. CIVIL ENGINEERING—PART-TIME COURSE****Bachelor of Science (Engineering)**

		Hours per week			
		SESSION 1		SESSION 2	
		Lab.		Lab.	
STAGE 1		Lec.	Tut.	Lec.	Tut.
1.001	Physics I <i>or</i>	3	3	3	3
1.011	Higher Physics I				
10.001	Mathematics I <i>or</i>	4	2	4	2
10.011	Higher Mathematics*				
		<hr/>		<hr/>	
		7	5	7	5
		<hr/>		<hr/>	

\*Not available in the evening in 1974.

**STAGE 2**

2.021	Chemistry IE	3	3	0	0
5.010	Engineering A	4	2	0	0
5.020	Engineering B	0	0	3	2
5.030	Engineering C	0	0	4	2
	Elective I*	1	½	1	½
		<hr/>		<hr/>	
		8	5½	8	4½
		<hr/>		<hr/>	

\*The part-time programme is being revised. See \* footnote, Year 2 and Year 4 above.

## Hours per week

STAGE 3		SESSION 1		SESSION 2	
		Lab.		Lab.	
		Lec.	Tut.	Lec.	Tut.
8.172	Mechanics of Solids II	0	0	2	2
8.272	Civil Engineering Materials I	1½	2½	1½	2½
10.022	Engineering Mathematics II	2	2	2	2
29.441	Engineering Surveying*	3	3	0	0
29.491	Survey Camp†	—		—	
		<hr/> 6½ 7½ <hr/>		<hr/> 5½ 6½ <hr/>	

\*42 hours of Saturday fieldwork is an essential part of this subject.

†Students are required to attend a one-week Survey Camp, equivalent to 40 class contact hours.

## STAGE 4

5.711	Thermodynamics†	0	0	1	1
6.801	Electrical Engineering	1	2	1	2
8.510	Hydraulic†	2	2	0	0
8.621	Engineering Construction	1½	½	1½	½
25.101	Geology for Engineers* †	0	0	2	2
	General Studies Elective	1	½	1	½
		<hr/> 5½ 5 <hr/>		<hr/> 6½ 6 <hr/>	

\*Two one-day Geology excursions are an essential part of the course.

†Normally offered in both sessions as a complete course. At enrolment students are grouped into the appropriate session.

## STAGE 5

8.152	Structures	3	1	3	1
8.161	Engineering Mathematics	1½	1½	1½	1½
8.301	Systems Engineering	1	1	1	1
8.531	Water Engineering	2½	1½	2½	1½
		<hr/> 7½ 4½ <hr/>		<hr/> 7½ 4½ <hr/>	

## STAGE 6

8.154	Structures	2	2	2	2
8.252	Civil Engineering Materials	3	1	0	0
8.254	Civil Engineering Materials	0	0	2	4
8.632	Civil Engineering	1½	0	1½	0
	General Studies Elective	1	½	1	½
		<hr/> 7½ 3½ <hr/>		<hr/> 6½ 6½ <hr/>	

## SCHOOL OF ELECTRICAL ENGINEERING

The School consists of the Departments of Communications, Computer Science, Electric Power Engineering, Solid State Electronics and Systems and Control Engineering and offers undergraduate and postgraduate training in all branches of the profession of electrical engineering. The School's teaching and research programmes are constantly under review to meet the ever changing challenges of present and future needs.

The School offers a full-time course of four years' duration leading to the degree of Bachelor of Engineering, and a six-year part-time course for the degree of Bachelor of Science (Engineering). The courses may also be completed by a combination of part-time and full-time study. Graduate courses are described elsewhere.

The degrees of Bachelor of Engineering and Bachelor of Science (Engineering) are recognized by the Institution of Engineers, Australia, the Institution of Radio and Electronics Engineers, Australia, and the Institution of Electrical Engineers, London, as giving complete exemption from the examinations required for admission to Graduate or Corporate membership.

Electrical engineering, perhaps more than most other branches of engineering, is closely linked with the pure sciences, and requires a scientific outlook and approach for a proper understanding of its problems.

In the early years of the electrical engineering courses, students concentrate on acquiring knowledge of the basic sciences, particularly mathematics and physics, with an engineering component which increases progressively to the final year, when students elect, with the approval of the Head of the School, to study in specialized fields of electrical engineering. Students in doubt as to which programme patterns are desirable or permissible should consult the Head of the School.

Each student in the BE course is required to work on an individual or group project under the guidance of members of the lecturing staff. Generally, the project will involve the design and construction of experimental apparatus together with laboratory tests. Where possible the projects will be related to the research programme of the School and chosen to develop the student's initiative. Each student is required to lead a seminar and to prepare a thesis or take part in the preparation of a group thesis based on the results of the project work.

All students in the BScEng course must complete three years of appropriate industrial experience. Students in the BE course are

strongly recommended to obtain practical experience in the long vacations.

In the Bachelor of Engineering course the same formal programme is offered to both pass students and to those aiming at honours. Honours will be awarded for meritorious performance over the course; special attention is paid to a candidate's performance in the final year thesis project. A student with a creditable performance in the Bachelor of Science (Engineering) course may be awarded a degree with Merit.

### 364. ELECTRICAL ENGINEERING—FULL-TIME COURSE

#### Bachelor of Engineering

The full-time course is of four years' duration and leads to the degree of Bachelor of Engineering (pass or honours). Each of the four years of the course requires full-time day attendance at the University for twenty-eight weeks.

		Hours per week			
		SESSION 1		SESSION 2	
		Lec.	Lab. Tut.	Lec.	Lab. Tut.
<b>YEAR 1</b>					
1.001	Physics I*	3	3	3	3
5.010	Engineering A	4	2	0	0
6.010	Electrical Engineering I	0	0	2	4
10.001	Mathematics I*	4	2	4	2
<i>Either</i>					
2.001	Chemistry I	3	3	3	3
<i>or</i>					
2.021	Chemistry IE	3	3	0	0
5.030	Engineering C	0	0	3	2
		<hr/>	<hr/>	<hr/>	<hr/>
		14	10	12	11/12
<b>YEAR 2</b>					
1.112A	Electromagnetism (Session 2)	} *		3	3
1.112B	Modern Physics (Session 1)			2	0
1.112C	Waves in Continuous Media and Thermodynamics*			3	3
6.021	Electrical Engineering II			2	1½
8.111	Civil Engineering			1½	½
10.111A	Pure Mathematics II (Linear Algebra)*			1½	½
10.111B	Pure Mathematics II (Analysis)*			1½	½
10.211A	Applied Mathematics II (Mathematical Methods)*			1½	½
	One General Studies subject			1	½
				<hr/>	<hr/>
				15½	9½

\*Students who have achieved a certain standard may attempt similar material at a higher level.

## Hours per week for 2 sessions

		Lec.	Lab. Tut.
<b>YEAR 3</b>			
5.661	Mechanical Engineering III	2	1
10.033	Electrical Engineering Mathematics III	2	0
10.361	Statistics SE	1	$\frac{1}{2}$
<i>Electrical Engineering III</i>			
6.031A	Systems and Circuit Theory	2	2
6.031B	Energy Conversion, Transmission and Utilization	2	2
6.031C	Electronic Circuits and Signal Processing	2	2
6.031D	Computing	1	1
6.031E	Electron Physics and Devices	2	0
	Two General Studies subjects	2	1
		<hr/> 16	<hr/> 9 $\frac{1}{2}$

**YEAR 4***Electrical Engineering IV* (6 units)

6.911	Thesis or		
6.931	Group Thesis		
	One General Studies subject†	1	$\frac{1}{2}$

†At least one General Studies advanced elective is required in the course.

*Electrical Engineering IV*

A number of general topics are offered and each Department offers specialized electives. Not all electives will be offered every year. Students will be advised each year which electives are available.

Four units are taken in Session 1 and two in Session 2. Each elective is 5 hours per week (2 Lecture, 3 Lab. Tut.) for one session. The list of electives is:

- 6.041 Fields and Measurements
- 6.042 Circuits, Signals and Information Theory
- 6.044 Electrical Product Design and Reliability
- 6.202 Power Systems I
- 6.203 Power Systems II
- 6.212 Machines
- 6.222 High Voltage and High Current Technology
- 6.303 Communication Electronics
- 6.313 Wave Radiation and Guidance
- 6.322 Electronics
- 6.333 Communication Systems
- 6.383 Biomedical Engineering
- 6.412 Automatic Control
- 6.422 Computer Control
- 6.512 Advanced Semiconductor Device Theory
- 6.522 Transistor and Integrated Circuit Design
- 6.612 Computer Systems Engineering
- 6.622 Computer Application and Software



The programme selected by each student must be approved by the Head of School.

*Thesis or Group Thesis*

In Session 1 two hours per week and in Session 2 three clear days per week are devoted to directed laboratory and research work on an approved subject with special reading and study associated with the presentation of a seminar and the preparation of a thesis. The thesis must be submitted by the last Monday in November.

### 365. ELECTRICAL ENGINEERING—PART-TIME COURSE

Bachelor of Science (Engineering)

The six-year part-time course in Electrical Engineering leads to the degree of Bachelor of Science (Engineering).

		Hours per week for 2 sessions	
		Lec.	Lab. Tut.
<b>STAGE 1</b>			
1.001	Physics I	3	3
10.001	Mathematics I	4	2
		<hr/>	<hr/>
		7	5
		<hr/>	<hr/>
<b>STAGE 2</b>			
2.001	Chemistry I	3	3
5.010	Engineering A (Session 1)	4	2
5.030	Engineering C (Session 2)	3	2
<b>STAGE 3</b>			
1.112C	Waves in Continuous Media and Thermodynamics	2	0
6.021	Electrical Engineering II	3	3
10.111A	Pure Mathematics II (Linear Algebra)	1½	½
10.111B	Pure Mathematics II (Analysis)	1½	½
	One General Studies subject	1	½
		<hr/>	<hr/>
		9	4½
		<hr/>	<hr/>
<b>STAGE 4</b>			
1.112A	Electromagnetism (Session 2)	3	3
1.112B	Modern Physics (Session 1)		
6.031	Electrical Engineering III	2	2
	Unit A: Systems and Circuit Theory		
10.211A	Applied Mathematics II (Mathematical Methods)	1½	½
		<hr/>	<hr/>
		6½	5½
		<hr/>	<hr/>

## Hours per week for 2 sessions

## STAGE 5\*

	Lec.	Tut.
4.921 Materials Science	1	0
6.043 Measurements	1	1
Two General Studies subjects	2	1

*Communications Option*

6.031 Electrical Engineering III		
Unit C: Electronic Circuits and Signal Processing	2	2
Unit E: Electron Physics and Devices	2	0

*Power and Control Option*

6.031 Electrical Engineering III		
Unit B: Energy Conversion, Transmission and Utilization	2	2
Unit D: Computing	1	1
	<hr/> 8/7	<hr/> 4/5

\*In Stage 5 students take either the Communications or the Power and Control Option. Whichever option is chosen must be continued in Stage 6, where Power and Control Students choose different electives and substitute 5.661 Mechanical Engineering for 6.031 Unit E (Electron Physics and Devices).

## STAGE 6

*Communications Option*

6.031 Electrical Engineering III		
Unit B: Energy Conversion, Transmission and Utilization	2	2
Unit D: Computing	1	1
Two Communications Electives*	3	3
	<hr/> 6	<hr/> 6

*Power and Control Option*

6.031 Electrical Engineering III		
Unit C: Electronic Circuits and Signal Processing	2	2
5.661 Mechanical Engineering	2	1
Two Power and Control Electives*	3	3
	<hr/> 7	<hr/> 6

\*The list of electives to be offered will largely correspond to those in the Electrical Engineering IV list (see the BE programme). The full range of electives will not be offered in the BSc(Eng) course; students who can arrange day attendance may request approval to substitute Electrical Engineering IV electives.

## ELECTRICAL ENGINEERING— COMBINED FULL-TIME/PART-TIME COURSES

The subjects of the BSc(Eng) course are generally identical with a subject of the BE programme and the requirements of these subjects can be completed by either day or evening study in most cases. Timetables will be arranged to suit the yearly programmes given above. Provided prerequisites are met and the programme can be timetabled, a student in either course may, with the approval of the Head of the School, complete the requirements by a combination of full-time and part-time study.

## ELECTRICAL ENGINEERING— SUBSTITUTION OF SUBJECTS

To suit the special abilities or needs of individual students a limited amount of substitution is permitted within each course. Any such substitution *must have prior approval of the Head of School* who will ensure that:

1. The replacement subject is *at least* of the same length and level as the prescribed subject it replaces; and
2. The resulting overall programme of study is suited to the award of either the BE or BSc(Eng) as applicable.

Examples are:

- (a) Replacement of two General Studies subjects by an approved Arts subject;
- (b) Replacement of one or two General Studies subjects by an approved (by the Head of the Department of General Studies) subject from areas such as:

Life Sciences;

Earth Sciences;

Accounting and Business Administration;

Law;

Economics;

Industrial Management.

- (c) If students proposing to attempt the BSc BE pattern include some Computer Science or additional Applied Mathematics in their Second Year Electrical Engineering Programme they open up a wider choice of subjects in their Science Third Year. This can be substituted for 8.111 or the General Studies courses. If the BSc programme is completed these courses could be put back into the student's Third Year of Electrical Engineering;

- (d) The normal Fourth Year of the BE programme includes 6 units of Electrical Engineering IV. Students may substitute for ONE of these units, a subject of suitable level and difficulty from an area outside the School of Electrical Engineering.

### DOUBLE DEGREE OF BSC BE IN ELECTRICAL ENGINEERING

Students in Electrical Engineering may qualify for this double degree in five years of full-time study. Having completed the first and second years of the Electrical Engineering course, students with a credible performance may transfer to Science (this is subject to the recommendation of the Head of the School of Electrical Engineering and the approval of the Deans of the Faculties of Engineering and Science) and do the appropriate General Studies subjects and four level III units chosen from related disciplines and no less than four other units of either level II or level III chosen in accordance with the Science Course regulations. In their fourth year the students revert to the Faculty of Engineering. Depending on the programme followed in their year in Science they will have already completed parts of the normal third year programme of the Electrical Engineering course, and they will be required to omit these from their programme and to include an equivalent amount of other courses chosen with the approval of the Head of School. In their fifth year they will complete the fourth year of the Electrical Engineering course.

### DOUBLE DEGREE BA BE IN ELECTRICAL ENGINEERING

The double degree BA BE in Electrical Engineering may be gained by a five-year course of combined study. Students wishing to enrol for this double degree may do so.

- (i) by initially enrolling as a student proceeding to the double degree, or
- (ii) by transferring to the BA BE programme with advanced standing after partially completing the requirements of either degree, provided that suitable courses have been studied.

Any student wishing to enrol in, transfer into or continue in the double degree course BA BE shall have complied with all the

requirements for prerequisite study and academic attainment of both the Faculties concerned. Students wishing to enrol in or to transfer into the double degree course may do so only after receiving the approval of the respective Deans of the Faculties of Arts and Engineering. Guidance should be sought from the School of Electrical Engineering, the relevant schools in the Faculty of Arts and the Arts Faculty Office.

### 1. Initial Enrolment for BA BE

A student enrolling initially for the double degree shall pursue a programme for four years in which he studies at least nine courses in accordance with the regulations of the Faculty of Arts, provided that they include:

- (i) the subjects in Table A below, and
- (ii) a major sequence of courses available within the Faculty of Arts (see Schedule A of that Faculty's regulations) in addition to his studies in the School of Mathematics.

In addition he shall also study concurrently subjects selected from Table B in accordance with an acceptable programme loading. Upon completion of this four year programme he may then complete his studies by satisfying the remaining requirements of a normal BE programme in Electrical Engineering

- (a) less the General Studies subjects, and
- (b) less the equivalent of ONE non-electrical engineering subject of the BE course, and
- (c) less either strand B or strand E of Electrical Engineering III, and
- (d) less one of the six units of Electrical Engineering IV.

Table A

10.001	Mathematics I	or	10.011	Higher Mathematics I	
{	10.111A	Pure Mathematics II (Linear Algebra)	{	10.121A	Higher Pure Mathe- matics II (Algebra)
	10.111B	Pure Mathematics II (Analysis)		10.121B	Higher Pure Mathe- matics II (Real and Complex Analysis)
	10.211A	Applied Mathematics II (Mathematical Methods)		10.221A	Higher Applied Mathe- matics II (Mathema- tical Methods)
		or			
1.001	Physics I	or	1.011	Higher Physics I	
1.112	Physics II				

Table B

2.001	Chemistry	or	{2.021 Chemistry IE 5.030 Engineering C
5.010	Engineering A		
5.661	Mechanical Engineering III*		
6.010	Electrical Engineering I		
6.021	Electrical Engineering II		
6.031	Electrical Engineering III*		
8.111	Civil Engineering*		
10.033	Electrical Engineering	}	(If these or equivalent units not already selected as an approved subject)
	Mathematics III		
10.361	Statistics SE		

## NOTES:

- (i) The substitution rule for the BE in Electrical Engineering if invoked (see Electrical Engineering—Substitution of Subjects) may modify the requirements set out in Table B.
- (ii) In addition it may be possible to defer strand B or strand D of 6.031 Electrical Engineering III into the fifth year of the combined programme, provided that the student does not wish to major in the relevant strand, i.e. strand B Machines or strand D Computing. Such re-arrangements are to be regarded as special cases and prior approval of the School of Electrical Engineering must be sought and received.
- (iii) The requirements of the appropriate Schools in respect to pre-requisites, sequencing or substitutions shall be adhered to.

## 2. Subsequent Transfer to BA BE Course

Students wishing to pursue this route shall at the time of transfer and subsequently comply with the requirements for students initially enrolling in the double degree BA BE.

## 3. Honours degree in Arts

Students wishing to gain an Honours degree in Arts as part result of their combined BA BE double degree programme shall meet all the relevant requirements of the Faculty of Arts and of the appropriate Schools. Such students may enrol for the Honours year in Arts only after receiving the approval of the respective Deans of the Faculties of Arts and Engineering.

---

\*Permission may be given for some portion of the subjects marked with an asterisk to be deferred until after the completion of the four year programme.

## SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

The courses in this School are planned to provide the appropriate academic training for the professional engineer in the fields of aeronautical, industrial and mechanical engineering, and for the naval architect.

The study of the basic sciences—Mathematics, Physics and Chemistry—together with an introduction to Engineering, comprises the first year. In the second year further mathematical studies are undertaken together with a study of the Engineering Sciences—Thermodynamics, Fluid Mechanics, Engineering Mechanics, Mechanics of Solids and their application in the field of Design.

The full-time courses of Mechanical, Industrial and Aeronautical Engineering and of Naval Architecture have common subjects for the first two years. The third and fourth years contain a number of common core subjects together with specific departmental requirements. In the fourth and final year, in addition to core subjects and departmental requirements, provision is made for a limited degree of specialization in one or more elective subjects. Each full-time student is required to present a thesis at the end of his final year and to deliver a short paper on the subject of his thesis. General studies form a regular part of all courses. In certain instances and with permission from the Head of the School students may substitute an Arts subject in lieu of two General Studies subjects.

Industrial experience is an integral part of the full-time courses. All students enrolled in the School must complete forty working days of approved industrial training between Years 3 and 4, and, irrespective of their specialization, are strongly recommended to gain as much industrial training as possible between Years 1 and 2 and between Years 2 and 3.

The full-time courses in Aeronautical, Industrial and Mechanical Engineering and in Naval Architecture are of four years' duration and lead to the degree of Bachelor of Engineering (BE).

All students will be considered for the award of Honours which will be granted for meritorious performance in the course with particular emphasis on the later years. With the approval of the Head of School, students may proceed to the BE degree via a combination of full-time and part-time study.

Part-time courses of six years' duration leading to the degree of Bachelor of Science (Engineering) are offered in the same four fields as the full-time courses.

Part-time courses may also be completed by a combination of part-time and of full-time study. Students proceeding to the BSc(Eng) degree whether by a combination of part-time and of full-time study, or by part-time study alone, are required to undergo a minimum period of three years approved concurrent industrial training. (See also conditions for the award of the Degree of BSc(Eng) in Section B of the calendar.)

A student who has successfully completed the first two stages of any of the Bachelor of Science (Engineering) courses mentioned above may transfer to the second year of any of the full-time BE courses offered by the School. A part-time student will be able to transfer at the end of Stage 4 of his course to the third year of the corresponding BE course. The BSc(Eng) degree may be awarded 'With Merit' to students whose performance in the course is superior.

The award of the degree BE or BSc(Eng) in Mechanical Engineering is recognized by the Institution of Mechanical Engineers, London, as giving exemption from Parts I and II of the examinations required for admission to the grade of Member. Exemption from Part III (The Engineer in Society) of the examinations may also be granted, depending on the particular General Studies subjects taken. Exemption from Part III is considered on a case by case basis, and is not automatic. Specific enquiries on this matter should be addressed to the Head of the School.

The award of the degree of BE or BSc(Eng) in Industrial Engineering is similarly recognized by the Institution of Production Engineers, London.

The Institution of Engineers, Australia, grants full exemption from examinations for admission to the grade of Member to holders of the degree of BE or BSc(Eng) in any of the undergraduate courses offered by the School.



# 368. MECHANICAL ENGINEERING—FULL-TIME COURSE

## Bachelor of Engineering

		Hours per week			
		SESSION 1		SESSION 2	
		Lec.	Lab. Tut.	Lec.	Lab. Tut.
<b>YEAR 1</b>					
1.001	Physics I <i>or</i>	3	3	3	3
1.011	Higher Physics I				
2.021	Chemistry IE	3	3	3	3
5.010	Engineering A*	4	2	4	2
5.020	Engineering B	0	0	4	2
5.030	Engineering C*	3	2	3	2
10.001	Mathematics I <i>or</i>	4	2	4	2
10.011	Higher Mathematics I				

\*One session only. Students will take this subject in either Session 1 or Session 2.

<b>YEAR 2</b>					
5.032	Experimental Engineering II	1	1	1	1
5.061	Technical Orientation	$\frac{1}{2}$	0	$\frac{1}{2}$	0
5.111	Mechanical Engineering Design I	2	2	2	2
5.311	Engineering Mechanics*	$1\frac{1}{2}$	1	$1\frac{1}{2}$	1
5.611	Fluid Mechanics/Thermodynamics I	2	2	2	2
6.801	Electrical Engineering	1	2	1	2
8.151	Mechanics of Solids	2	1	2	1
8.259	Properties of Materials	2	1	2	1
10.022	Engineering Mathematics II	2	2	2	2
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$

\*One session only. Students will take this subject in either Session 1 or Session 2.

<b>YEAR 3</b>					
5.033	Experimental Engineering III	1	$\frac{1}{2}$	1	$\frac{1}{2}$
5.043	Industrial Training	0	0	0	0
5.071	Engineering Analysis	$2\frac{1}{2}$	1	$2\frac{1}{2}$	1
5.112	Mechanical Engineering Design II	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
5.331	Dynamics of Machines I	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$
5.412	Mechanics of Solids I	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$
5.612	Fluid Mechanics/Thermodynamics II	$2\frac{1}{2}$	1	$2\frac{1}{2}$	1
6.802	Electrical Engineering*	2	1	2	1
18.011	Industrial Engineering IA <i>or</i>	1	1	$1\frac{1}{2}$	$\frac{1}{2}$
18.021	Industrial Engineering IB	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$
	General Studies Elective	2	1	2	1

\*One session only. Students will take this subject in either Session 1 or Session 2.

		Hours per week			
		SESSION 1		SESSION 2	
YEAR 4		Lec.	Lab. Tut.	Lec.	Lab. Tut.
5.051	Thesis	0	6	0	6
5.062	Communications	2	0	2	0
5.324	Automatic Control Engineering	2	1	2	1
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$

Plus 12 hours from the following Technical Electives:

4.913	Materials Science	2	1	2	1
5.113	Mechanical Engineering Design III	1 $\frac{1}{2}$	4 $\frac{1}{2}$	1 $\frac{1}{2}$	4 $\frac{1}{2}$
5.332	Dynamics of Machines II	2	1	2	1
5.413	Mechanics of Solids II	2	1	2	1
5.613	Fluid Mechanics/Thermodynamics III	4	2	4	2
18.012	Industrial Engineering IIA	2	1	2	1
18.022	Industrial Engineering IIB	2	1	2	1
18.431	Design for Production	2	1	2	1
18.551	Operations Research	2	1	2	1
23.057	Nuclear Power Technology	2	1	2	1

### 369. MECHANICAL ENGINEERING—PART-TIME COURSE

#### Bachelor of Science (Engineering)

This course is of six years' duration, and leads to the degree of Bachelor of Science (Engineering).

		Hours per week			
		SESSION 1		SESSION 2	
STAGE 1		Lec.	Lab. Tut.	Lec.	Lab. Tut.
1.001	Physics I or	3	3	3	3
1.011	Higher Physics I				
10.001	Mathematics I or	4	2	4	2
10.011	Higher Mathematics I*				
		7	5	7	5

\*Not available in the evening in 1974.

#### STAGE 2

2.021	Chemistry IE	3	3	3	3
5.010	Engineering A*	4	2	4	2
5.020	Engineering B†	0	0	4	2
5.030	Engineering C*	3	2	3	2

\*One session only. Students will take this subject in either Session 1 or Session 2.

†Broken Hill students take 5.301 Engineering Mechanics (1 — 1) in lieu of 5.020.

		Hours per week			
		SESSION 1		SESSION 2	
		Lec.	Lab. Tut.	Lec.	Lab. Tut.
<b>STAGE 3</b>					
5.311	Engineering Mechanics*	1	$\frac{1}{2}$	1	$\frac{1}{2}$
8.151	Mechanics of Solids	2	1	2	1
8.259	Properties of Materials	2	1	2	1
10.022	Engineering Mathematics II	2	2	2	2
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
		8	5	8	5

\*One session only. Students will take this subject in either Session 1 or Session 2.

<b>STAGE 4</b>					
5.032	Experimental Engineering II	1	1	1	1
5.111	Mechanical Engineering Design I	2	1	2	1
5.611	Fluid Mechanics/Thermodynamics I	2	2	2	2
6.801	Electrical Engineering	1	2	1	2
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
		7	6 $\frac{1}{2}$	7	6 $\frac{1}{2}$

<b>STAGE 5</b>					
5.071	Engineering Analysis	2 $\frac{1}{2}$	1	2 $\frac{1}{2}$	1
5.112	Mechanical Engineering Design II	1 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1
5.331	Dynamics of Machines I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.412	Mechanics of Solids I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.612	Fluid Mechanics/Thermodynamics II	2	1	2	1
		9	4	9	4

<b>STAGE 6</b>					
5.324	Automatic Control Engineering	2	1	2	1
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
<i>Plus 9 hours from Mechanical Engineering Electives:</i>					
4.913	Materials Science	2	1	2	1
5.113	Mechanical Engineering Design III	1 $\frac{1}{2}$	4 $\frac{1}{2}$	1 $\frac{1}{2}$	4 $\frac{1}{2}$
5.332	Dynamics of Machines II	2	1	2	1
5.413	Mechanics of Solids II	2	1	2	1
5.613	Fluid Mechanics/Thermodynamics III	4	2	4	2

### 361. AERONAUTICAL ENGINEERING— FULL-TIME COURSE

#### Bachelor of Engineering

The first and second years of this course are identical with the first two years of the full-time course in Mechanical Engineering.

		Hours per week			
		SESSION 1		SESSION 2	
YEAR 3		Lec.	Lab. Tut.	Lec.	Lab. Tut.
5.033	Experimental Engineering III	1	$\frac{1}{2}$	1	$\frac{1}{2}$
5.071	Engineering Analysis	2 $\frac{1}{2}$	1	2 $\frac{1}{2}$	1
5.303	Mechanical Vibrations	1	$\frac{1}{2}$	0	0
5.412	Mechanics of Solids I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.800	Aircraft Design	0	0	1 $\frac{1}{2}$	1
5.811	Aerodynamics I	2	1	2	1
5.822	Analysis of Aerospace Structures I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
6.802	Electrical Engineering*	2	1	2	1
18.011	Industrial Engineering IA <i>or</i>	1	1	1 $\frac{1}{2}$	$\frac{1}{2}$
18.021	Industrial Engineering IB	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
	General Studies Elective	2	1	2	1

\*One session only. Students will take this subject in either Session 1 or Session 2.

#### YEAR 4

5.051	Thesis	0	6	0	6
5.062	Communications	1	1	1	1
5.801	Aircraft Design	2	2	2	2
5.812	Aerodynamics II	2	1	2	1
5.823	Analysis of Aerospace Structures II	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.831	Aircraft Propulsion	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
<i>Plus one technical elective from:—</i>					
4.913	Materials Science	2	1	2	1
5.324	Automatic Control Engineering				
18.022	Industrial Engineering IIB				
18.551	Operations Research				
		11	12 $\frac{1}{2}$	11	12 $\frac{1}{2}$

## 360. AERONAUTICAL ENGINEERING— PART-TIME COURSE

Bachelor of Science (Engineering)

This course is of six years' duration and leads to the degree of Bachelor of Science (Engineering). The first four stages are identical with the Mechanical Engineering part-time course.

		Hours per week			
		SESSION 1		SESSION 2	
		Lab.		Lab.	
STAGE 5		Lec.	Tut.	Lec.	Tut.
5.071	Engineering Analysis	2½	1	2½	1
5.303	Mechanical Vibrations	1	½	0	0
5.412	Mechanics of Solids I	1½	½	1½	½
5.811	Aerodynamics I	2	1	2	1
5.822	Analysis of Aerospace Structures I	1½	½	1½	½
		8½	3½	7½	3

### STAGE 6

5.801	Aircraft Design	2	2	2	2
5.812	Aerodynamics II	2	1	2	1
5.823	Analysis of Aerospace Structures II	1½	½	1½	½
5.831	Aircraft Propulsion	1½	½	1½	½
	General Studies Elective	1	½	1	½
		8	4½	8	4½

## 370. NAVAL ARCHITECTURE—FULL-TIME COURSE

The first and second years of this course are identical with the first two years of the full-time course in Mechanical Engineering. Subject to the Head of the School of Mechanical and Industrial Engineering being satisfied that the present extent of equivalences is maintained, and on his recommendation, Faculty has approved an arrangement by which students who satisfy the requirements of the first two years of the Mechanical Engineering degree course at any other Australian university may be admitted to a two-year full-time programme leading to the Bachelor of Engineering degree in Naval Architecture.

		Hours per week			
		SESSION 1		SESSION 2	
YEAR 3		Lec.	Lab. Tut.	Lec.	Lab. Tut.
5.033	Experimental Engineering III	1	$\frac{1}{2}$	1	$\frac{1}{2}$
5.071	Engineering Analysis	2 $\frac{1}{2}$	1	2 $\frac{1}{2}$	1
5.303	Mechanical Vibrations	1	$\frac{1}{2}$	0	0
5.412	Mechanics of Solids I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.911	Naval Architecture	2 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$	1 $\frac{1}{2}$
5.921	Ship Structures I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.931	Principles of Ship Design IA	1	$\frac{1}{2}$	0	0
5.932	Principles of Ship Design IB	0	0	1	$\frac{1}{2}$
5.951	Hydrodynamics	1	$\frac{1}{2}$	0	0
18.021	Industrial Engineering IB	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
	General Studies Elective	2	1	2	1
		15 $\frac{1}{2}$	7	13 $\frac{1}{2}$	6
YEAR 4					
5.051	Thesis	0	6	0	6
5.062	Communications	2	0	2	0
5.922	Ship Structures II	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.933	Principles of Ship Design	2	1	2	1
5.934	Ship Design Project	0	3	0	3
5.941	Ship Propulsion and Systems	2 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$	1 $\frac{1}{2}$
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
<i>Plus one elective from:—</i>					
4.913	Materials Science	2	1	2	1
18.022	Industrial Engineering IIB				
18.551	Operations Research				
		11	13 $\frac{1}{2}$	11	13 $\frac{1}{2}$

## 371. NAVAL ARCHITECTURE—PART-TIME COURSE

## Bachelor of Science (Engineering)

This course is of six years' duration and leads to the degree of Bachelor of Science (Engineering). The first four stages are identical with the Mechanical Engineering part-time course.

		Hours per week			
		SESSION 1		SESSION 2	
		Lab.		Lab.	
STAGE 5		Lec.	Tut.	Lec.	Tut.
5.071	Engineering Analysis	2½	1	2½	1
5.303	Mechanical Vibrations	1	½	0	0
5.412	Mechanics of Solids I	1½	½	1½	½
5.911	Naval Architecture	2½	1½	2½	1½
5.921	Ship Structures I	1½	½	1½	½
5.932	Principles of Ship Design IB	0	0	1	½
		9	4	9	4

STAGE 6					
5.922	Ship Structures II	1½	½	1½	½
5.933	Principles of Ship Design II	2	1	2	1
5.934	Ship Design Project	0	3	0	3
5.941	Ship Propulsion and Systems	2½	1½	2½	1½
	General Studies Elective	1	½	1	½
		7	6½	7	6½

## DEPARTMENT OF INDUSTRIAL ENGINEERING

The Department of Industrial Engineering offers a full-time and a part-time course in industrial engineering leading to the degree of Bachelor of Engineering and Bachelor of Science (Engineering) respectively. These courses are designed for students with engineering ability whose interests lie in the planning, developing and control of manufacturing or service operations.

The first two years of the full-time course and the first four years of the part-time course provide the student with a sound foundation in the basic science and engineering subjects, and this knowledge is used and extended in the later years in the study of the industrial subjects. Finally, the problems associated with the practical economics of manufacturing operations are studied. These three fields of study provide the student with the training necessary to carry out an industrial job and to examine it critically in the light of economic efficiency.

Traditional engineering courses do not embrace the problems which are characteristic of industrial engineering. These problems include the analysis of a product to ensure satisfactory functioning with regard to methods and sequence of manufacturing operations; the disposition of buildings and of equipment in relation to buildings to permit efficient handling of materials; the avoidance or elimination of bottlenecks; the related problems of quality and cost control, testing and inspection; labour and personnel relations; and, finally, the problem of distribution and sales.

The financial and economic aspects are studied as the problem in manufacturing has not been solved until the final translation of the product into money has been accomplished successfully. While it is not intended to develop an expert in accounting practice or economics, it is intended to produce an engineer with an appreciation of the problems of cost and one who can apply considerations of ultimate economy to all industrial problems. The techniques of operations research may be applied here, where mathematical models of real life situations are constructed and manipulated to yield optimal solutions as guides to management.

All full-time students must obtain industrial training for a period each of forty working days between Years 3 and 4. They



are also strongly advised to obtain further experience during the long vacations between Years 1 and 2 and between Years 2 and 3.

### **The Work of the Industrial Engineer**

The industrial engineer may initially be employed in any of the following major areas of industrial activity:

#### **(a) Industrial Economic Analysis**

One of the principal functions of industrial engineering is to analyse a product, project or process from the economic point of view to ensure that an adequate profit can be obtained from it. A general working knowledge of economics and management skill has to be directed towards the making of decisions on how to operate an enterprise most efficiently. The basis for such decisions is furnished largely by the logical application of mathematics and statistics

#### **(b) Planning and Control of Production**

Manufacturing processes and operations must be planned in detail throughout an enterprise to ensure that they proceed smoothly and economically. Functions in this field include the establishment of production standards, the setting of production targets and, finally, control of quality.

The ultimate responsibility of those in charge of the planning and control of production is to ensure that the goods, as originally specified, perform satisfactorily and are produced when required at an optimum cost. Modern electronic computers may be called upon to help achieve this.

#### **(c) Product and Process Design**

The design interest of the industrial engineer goes beyond normal mechanical design to develop a product that will not only function effectively but also have a pleasing appearance.

Further, the product has to be adapted to suit existing manufacturing equipment, or a manufacturing process has to be developed by means of which an existing product can be manufactured at the right price and of the right quality. The design work of the industrial engineer incorporates also problems of equipment selection and application for both economy and performance.

Fundamental scientific studies of manufacturing processes such as metal machining, forming and casting are continually being made to improve their efficiency.

**(d) Methods Engineering**

Methods engineering is particularly concerned with the co-ordination of men, materials and machines, so that an enterprise will run at maximum efficiency. A considerable knowledge of engineering in general, as well as an understanding of human factors and materials science, is necessary for methods engineering work. Time and motion study is part of methods engineering. In many cases the methods engineer works in close co-operation with the design department and executives engaged in industrial economic analysis.

**(e) Operations Research**

This is the attack of modern science on complex problems arising in the direction and management of large systems of men, machines, materials and money in industry, business, government, and defence. The distinctive approach is to develop a scientific model of the system, incorporating measurements of factors such as chance and risk, with which to predict and compare the outcomes of alternative decisions, strategies or controls. The purpose is to help management determine its policy and actions scientifically.

Employment in any of these fields may well lead to a position of responsibility in industrial management if the engineer is so inclined.

### 366. INDUSTRIAL ENGINEERING—FULL-TIME COURSE

#### Bachelor of Engineering

The first and second years of this course are identical with the first two years of the full-time course in Mechanical Engineering.

YEAR 3		Hours per week			
		SESSION 1		SESSION 2	
		Lec.	Lab. Tut.	Lec.	Lab. Tut.
5.033	Experimental Engineering III	1	$\frac{1}{2}$	1	$\frac{1}{2}$
5.071	Engineering Analysis	2 $\frac{1}{2}$	1	2 $\frac{1}{2}$	1
5.112	Mechanical Engineering Design II	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$
5.331	Dynamics of Machines I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
5.412	Mechanics of Solids I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
14.001	Introduction to Accounting	1 $\frac{1}{2}$	0	1 $\frac{1}{2}$	0
18.011	Industrial Engineering IA	1	1	1 $\frac{1}{2}$	$\frac{1}{2}$
18.021	Industrial Engineering IB	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
	General Studies Elective	2	1	2	1
		14	6 $\frac{1}{2}$	14 $\frac{1}{2}$	6

		Hours per week			
		SESSION 1		SESSION 2	
		Lab.		Lab.	
YEAR 4		Lec.	Tut.	Lec.	Tut.
5.051	Thesis	0	6	0	6
5.062	Communications	1	1	1	1
5.324	Automatic Control Engineering	2	1	2	1
18.012	Industrial Engineering IIA	2	1	2	1
18.022	Industrial Engineering IIB	2	1	2	1
18.551	Operations Research	2	1	2	1
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
<i>Plus one elective from:—</i>					
4.913	Materials Science	2	1	2	1
5.332	Dynamics of Machines II				
5.413	Mechanics of Solids II				
18.431	Design for Production				
		12	12 $\frac{1}{2}$	12	12 $\frac{1}{2}$

### 367. INDUSTRIAL ENGINEERING—PART-TIME COURSE

#### Bachelor of Science (Engineering)

This course is of six years' duration and leads to the degree of Bachelor of Science (Engineering).

For outline of the first four stages see the Mechanical Engineering part-time course.

#### STAGE 5

5.071	Engineering Analysis	2 $\frac{1}{2}$	1	2 $\frac{1}{2}$	1
5.112	Mechanical Engineering Design II	1 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1
5.331	Dynamics of Machines I	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
14.001	Introduction to Accounting	1 $\frac{1}{2}$	0	1 $\frac{1}{2}$	0
18.011	Industrial Engineering IA	1	1	1 $\frac{1}{2}$	$\frac{1}{2}$
18.021	Industrial Engineering IB	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$
		9 $\frac{1}{2}$	4	10	3 $\frac{1}{2}$

#### STAGE 6

18.012	Industrial Engineering IIA	2	1	2	1
18.022	Industrial Engineering IIB	2	1	2	1
18.431	Design for Production	2	1	2	1
18.551	Operations Research	2	1	2	1
	General Studies Elective	1	$\frac{1}{2}$	1	$\frac{1}{2}$
		9	4 $\frac{1}{2}$	9	4 $\frac{1}{2}$

## SCHOOL OF SURVEYING

The School of Surveying offers a four year full-time course and a seven year part-time course both leading to the degree of Bachelor of Surveying. The degree is divided into eight parts of one session each and can also be attained through a combination of part-time and full-time study. Part 7 comprises professional training and a survey camp.

The course is designed to provide the appropriate academic training for a professional surveyor working in any of the many branches of surveying. Since these branches cover a wide range, the course is broad in its scope. First and second years are concerned mainly with the basic sciences, but the basic surveying subjects are also included. In the third year the major surveying subjects appear: geodesy, photogrammetry, astronomy and land studies. With the addition of some elective courses these are continued into fourth year. The graduate can take up cadastral or property surveying, engineering surveying, geodetic surveying, photogrammetry, cartography or hydrographic surveying. The course is also an appropriate first qualification for those wishing to specialize in astronomy, satellite geodesy, geodynamics, computing and systems analysis, town and regional planning, land and resources development or environmental sciences.

The full-time and part-time courses have undergone comprehensive revision. Features of the revisions include: decreased lecture time to allow use of teaching methods which involve more student participation; an extended period of professional experience in the final year; Land Studies, a group of subjects designed to provide a broad understanding of the ecology of land and its development; and a survey camp of six weeks in the final year. Throughout the course the theoretical studies are complemented by practical exercises in the field and the laboratory. Students make use of the most modern measuring instruments and computing equipment. As far as possible each stage of the part-time course is equivalent to one part (one session) of the full-time course. However Stage 7 includes the Survey Camp of Part 7 as well as subjects of Part 8.

The existing part-time course will be phased out over the period 1975-1980. It will be replaced by a sandwich course. Students attending the sandwich course will attend full-time for one session per year, and will be free to undertake full-time employment for the remainder of the year, approximately 35 weeks. The minimum time for completion of the sandwich course will be seven years, as for the present part-time course. It will

also be possible for a student in the sandwich course to attend for both sessions in a year, thus decreasing the length of his course by one year.

The transition arrangements are as follows: part-time students who commenced before 1973 will be unaffected. Those who commenced in 1973 will move into the sandwich system in 1975 and each year from then on will attend full-time for one session of each year. Students commencing the part-time course in 1974 will enter the sandwich system in 1976.

The Bachelor of Surveying degree may be awarded as a Pass degree, Honours Class I, or Honours Class II in two divisions. Honours are awarded in recognition of superior performance throughout the course.

Students wishing to become Registered Surveyors after graduation are advised to gain practical experience under a Registered Surveyor. Some reduction in the period of practical experience required before registration may be granted because of practical experience gained during the University course, provided the New South Wales Surveyors' Board has been informed in the prescribed manner. Details are obtainable from the Registrar, Surveyors' Board, Department of Lands, Bridge Street, Sydney 2000.

The degree of Bachelor of Surveying confers exemption from all written examinations of the Surveyors' Board.

### 374. SURVEYING—FULL-TIME COURSE

#### Bachelor of Surveying

		Hours per week	
		Lec.	Lab. Tut.
YEAR 1—SESSIONS 1 AND 2 (PARTS 1 and 2)			
1.001	Physics I	3	3
5.010	Engineering A*	4	2
5.030	Engineering C†	3	2
10.001	Mathematics I	4	2
29.101	Surveying I	1½	3
29.181	Cartography	0	1½

\*Materials Option (Session 2).

†Introduction to Systems and Computers Option (Session 1).

**YEAR 2—SESSION 1 (PART 3)**

10.022	Engineering Mathematics II	2	2
10.341	Statistics	1½	0
29.102	Surveying II	2	4
29.151	Survey Computations I	3½	2½
31.212	Geometrical Optics	1½	1½
		<hr/>	<hr/>
		10½	10

**Hours per week****YEAR 2—SESSION 1 (PART 4)**

		Lec.	Lab. Tut.
6.822	Electronics	1½	1½
8.711	Engineering for Surveyors	3	0
10.022	Engineering Mathematics II	2	2
10.341	Statistics SU	1½	0
29.102	Surveying II	1½	1½
29.192	Survey Camp*	—	—
29.611	Land Studies I†	4	2
	General Studies Elective	2	1
		<hr/>	<hr/>
		15½	8

\*Students are required to attend a two-week survey camp, held in October, which is equivalent to 80 class contact hours.

†A one-day field tutorial is an essential part of this course.

**YEAR 3—SESSION 1 (PART 5)**

8.712	Engineering for Surveyors	3	0
29.103	Surveying III	4	3
29.152	Survey Computations II	1	2
29.612	Land Studies II†	4	1
36.411	Town Planning	1½	1½
	General Studies Elective	2	1
		<hr/>	<hr/>
		15½	8½

†A one-day field tutorial is an essential part of this course.

**YEAR 3—SESSION 2 (PART 6)**

29.211	Geodesy I	4	2
29.311	Astronomy I	2	1
29.511	Photogrammetry I	3	3
29.613	Land Studies III	2	0
29.614	Land Studies Project	1	2
	General Studies Elective	2	1
		<hr/>	<hr/>
		14	9

**YEAR 4—SESSION 1 (PART 7)**

29.193 Professional Training

5 Months

29.194 Survey Camp\*

{ 4 Weeks: Field  
2 Weeks: Office

\*Students are required to attend a six-week survey camp, equivalent to 40 hours of class contact per week.

**Hours per week****YEAR 4—SESSION 2 (PART 8)**

	Lec.	Lab. Tut.
--	------	--------------

29.212 Geodesy II

2 1

29.312 Astronomy II

2 1

29.512 Photogrammetry II

1½ 1½

Management

2 0

General Studies Advanced Elective

2 1

Two Electives†

4 2

---

13½ 6½

---

†Electives chosen from:

29.213 Geodesy III

29.313 Astronomy III

29.513 Photogrammetry III

29.615 Land Studies

29.173 Project

### 374. SURVEYING—PART-TIME COURSE

#### Bachelor of Surveying

**Hours per week****STAGE 1**

	Lec.	Lab. Tut.
--	------	--------------

1.001 Physics I

3 3

10.001 Mathematics I

4 2

---

7 5

---

**STAGE 2**

5.010 Engineering A\*

4 2

5.030 Engineering C†

3 2

29.101 Surveying I

1½ 3

29.181 Cartography

0 1½

\*Materials Option (Session 2).

†Introduction to Systems and Computers Option (Session 1).

## Hours per week

**STAGE 3**

10.022	Engineering Mathematics II
29.102	Surveying II
29.151	Survey Computations I

SESSION 1		SESSION 2	
Lec.	Lab. Tut.	Lec.	Lab. Tut.
2	2	2	2
1	1½	3	3½
3½	2½	0	0
6½	6	5	5½

**STAGE 4**

6.822	Electronics
8.711	Engineering for Surveyors
10.341	Statistics SU
29.192	Survey Camp*
29.611	Land Studies I†
31.212	Geometrical Optics
	General Studies Elective

0	0	1½	1½
3	0	0	0
1½	0	1½	0
0	0	0	0
0	0	4	2
1½	1½	0	0
1	½	1	½
7	2	8	4

\*Students are required to attend a two-week survey camp, held in October, equivalent to 80 class contact hours.

†A one-day field tutorial is an essential part of this course.

**STAGE 5**

8.712	Engineering for Surveyors
29.103	Surveying III
29.152	Survey Computations II
29.612	Land Studies II†
36.411	Town Planning
	General Studies Elective

1½	0	1½	0
2	2	2	2
1	2	0	0
0	0	4	1
1½	1½	0	0
1	½	1	½
7	6	8½	3½

†A one-day field tutorial is an essential part of this course.



## Hours per week

**STAGE 6**

	Lec.	Lab. Tut.
29.211 Geodesy I	2	1
29.311 Astronomy I	1	$\frac{1}{2}$
29.511 Photogrammetry I	$1\frac{1}{2}$	$1\frac{1}{2}$
29.613 Land Studies III	1	0
29.614 Land Studies Project	$\frac{1}{2}$	1
General Studies Elective	1	$\frac{1}{2}$
General Studies Advanced Elective	1	$\frac{1}{2}$
	<hr/> 8	<hr/> 5

**STAGE 7\* §**

29.212 Geodesy II	1	$\frac{1}{2}$
29.313 Astronomy II	1	$\frac{1}{2}$
29.512 Photogrammetry II	1	$\frac{1}{2}$
Management	1	0
Two Electives†	2	1
29.194 Survey Camp†		
	<hr/> 6	<hr/> 2½

§Students who have completed Stage 6 in 1973 should enrol in this stage, and should consult the School's Enrolment Officer.

\*The academic requirements of the subject, 29.193 Professional Training must be fulfilled normally before a student attempts Stage 7.

†Electives chosen from

- 29.213 Geodesy III
- 29.313 Astronomy III
- 29.513 Photogrammetry III
- 29.613 Land Studies
- 29.173 Project

†Students are required to attend a six-week survey camp, equivalent to 40 hours of class contact per week. Academic subjects are arranged so as not to clash with the camp.



# DESCRIPTIONS OF SUBJECTS

## TEXT AND REFERENCE BOOKS

(For General Studies subjects see the Department of General Studies Handbook.)

---

### SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

#### 5.010 Engineering A

*Engineering Mechanics I:* Two and three dimensional force systems, composition and resolution of forces, laws of equilibrium. Statics of rigid bars, pin-jointed frames. Shear force, axial force, bending moment. Simple states of stress. Kinematics of the plane motion of a particle. Kinetics of the plane motion of a particle; equations of motion, dynamic equilibrium, work and energy.

*Introduction to Engineering Design:* Engineering method, problem identification, creative thinking, mathematical modelling, computer aided design, materials and processes, communication of ideas, the place of engineering in society.

and either

- (i) *Materials:* An introductory course on the production, structure, and properties of the main types of engineering materials, with a brief introduction to the process used in shaping and fabricating them.

or

- (ii) (Civil Engineering students must take this option) *Introduction to Materials I:* Role of engineering materials in design process. Traditional and new engineering materials. Concepts of stress and strain. Structure of crystalline and amorphous solids. Phase diagrams. Transformations at constant temperature and constant cooling rate. Tensile test. Relationship of macro properties to structure. Compression test. Hardness.

#### TEXTBOOKS

Svensson, N. L. *Introduction to Engineering Design*. N.S.W. U.P.

Waldron, K. J. *Engineering Mechanics*. Wiley.

Walshaw, A. C. *SI Units in Worked Examples*. Longman.

and

For *Introduction to Materials I:*

Richards, C. W. *Engineering Materials Science*. Chapman & Hall.

## REFERENCE BOOKS

Beakley, G. C. & Chilton, E.G. *Introduction to Engineering Design and Graphics*. Macmillan.

Beer, F. P. & Johnston, E.R. *Statics and Dynamics*. Vector ed. McGraw-Hill.

Harrisberger, L. *Engineersmanship*. Wadsworth.

Higdon, A. & Stiles, W.B. *Engineering Mechanics*. Vector ed. Prentice Hall.

Krick, E. V. *Introduction to Engineering and Engineering Design*. Wiley.

McCormick, E. J. *Human Engineering*. McGraw-Hill.

Meriam, J. L. *Statics and Dynamics*. Wiley.

and

For *Materials*:

Aitchison, L. *A History of Metals*. Vols. I & II. MacDonald & Evans.

Dennis, W. H. *Extractive Metallurgy*. McGraw-Hill.

Gilchrist, J. D. *Extraction Metallurgy*. Pergamon.

Guy, A. C. *Physical Metallurgy for Engineers*. Addison-Wesley.

Newton, J. *Extractive Metallurgy*. Wiley.

Street, A. *Metals in the Service of Man*. Penguin.

Timoshenko, S. *History of the Strength of Materials*. Van Nostrand.

and

For *Introduction to Materials I*:

Davis, H. E., Troxell, G. E. & Wiskocil, G. J. *Testing and Inspection of Engineering Materials*. McGraw-Hill.

Gordon, J. E. *The New Science of Strong Materials*. Pelican.

**5.020 Engineering B**

*Engineering Mechanics II*: Further development of Mechanics I together with: Virtual work. Cables and catenaries. Geometric properties of plane figures. Kinetics of systems of particles; impulse and momentum. Rotation of a rigid body about a fixed axis.

and either

- (i) *Introduction to Systems and Computers*: Introduction to computers to follow the computer work in Mathematics I. To develop: (a) familiarity with algorithms; (b) the use of procedure oriented languages; and (c) an introduction to computing equipment.

Systems. To give students an appreciation of some of the concepts used in engineering, to relate the concepts to phenomena within their experience, and to illustrate them by case histories and engineering examples. Quantities. Concepts. Components. Systems.

or

- (ii) Civil Engineering students must take this option) *Introduction to Materials II*: Creep of materials. Relaxation. Fatigue. Experimental techniques. Variability of materials. Temperature effects. Rate of loading. Casting, annealing, normalizing. Physical and mechanical properties of polymers and elastomers including wood.

## TEXTBOOKS

Waldron, K. J. *Engineering Mechanics*. Wiley.

Walshaw, A. C. *SI Units in Worked Examples*. Longman.

and

For *Introduction to Systems and Computers*:

Karbowiak, A. E. & Huey, R. M. eds. *Information Computers, Machines and Humans*. N.S.W. U.P.

and

For *Introduction to Materials II*:

Richards, C. W. *Engineering Materials Science*. Chapman & Hall.

## REFERENCE BOOKS

Beer, F. P. & Johnston, E.R. *Statics and Dynamics*. Vector ed. McGraw-Hill.

French, A. P. *Newtonian Mechanics*. Nelson.

Higdon, A. & Stiles, W. B. *Engineering Mechanics*. Vector ed. Prentice-Hall.

Meriam, J. L. *Statics and Dynamics*. Wiley.

and

For *Introduction to Materials II*:

Davis, H. E., Troxell, G. E. & Wiskocil, G. J. *Testing and Inspection of Engineering Materials*. McGraw-Hill.

Gordon, J. E. *The New Science of Strong Materials*. Pelican.

## 5.030 Engineering C

*Engineering Drawing*: Fundamental concepts of descriptive geometry, including reference systems, representation of point, line and plane; fundamental problems of position and measurement. Application of descriptive geometry to certain problems arising in engineering practice. Special emphasis on ability to visualize problems and processes involved in their solution. Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning. Orthographic and isometric projections.

end either\*

- (i) *Introduction to Systems and Computers*: Introduction to computers to follow the computer work in Mathematics I. To develop: (a) familiarity with algorithms; (b) the use of procedure oriented languages; and (c) an introduction to computing equipment.

Systems: introduction and concepts: concepts and introduction to systems. To give students an appreciation of some of the concepts used in engineering, to relate the concepts to phenomena within their experience, and to illustrate them by case histories and engineering examples. Quantities. Concepts. Components. Systems.

---

\* Options are specified according to course requirements.

or

- (ii) *Production Technology*: Description and appraisal of the processes classified as: forming from liquid or solid, material removal, material joining. Machines. Analysis of the primary functions of the machine tools and an appraisal of their limitations. Principles of operation of common machine tools and illustrations of their use.

or

- (iii) Civil Engineering students must take this option) *Mechanics of Solids I*: Statics of bars. Free-body diagrams, bending moment, shear force, axial force. Direct stress and strain. Hooke's Law, Poisson's Ratio. Compound bars. Flexibility and stiffeners. Simple theory of bending. Shear flow and shear stress. Torsion. Strain energy. Mohr's circle of stress and strain. Combined stresses.

or

- (iv) (Chemical Engineering students must take this option) *Introduction to Chemical Engineering*: Routes to and end uses of industrial chemicals. Likely new industrial chemicals. A survey of several Australian chemical industries for the point of view of their historical and economic importance. Examination of the unit operations involved in the industry and the raw materials, equipment and services used. Environmental aspects of the chemical industry.

#### TEXTBOOKS

Robertson, R. G. *Descriptive Geometry*. Pitman.

Thomson, R. *Exercises in Graphic Communication*. Nelson.

and

For *Introduction to Systems and Computers*:

Karbowiak, A. E. & Huey, R. M. eds. *Information, Computers, Machines and Man*. Wiley.

and

For *Production Technology*:

De Garmo, E. P. *Materials and Processes in Manufacturing*. Macmillan.

and

For *Mechanics of Solids I*:

Hall, A. S. *Introduction to the Mechanics of Solids*. Wiley.

#### REFERENCE BOOKS

For *Mechanics of Solids I*:

Popov, E. P. *Introduction to Mechanics of Solids*. Prentice-Hall.

Shanley, F. R. *Strength of Materials*. McGraw-Hill.

Smith, J. O. & Sidebottom, O. M. *Elementary Mechanics of Deformable Bodies*. Macmillan.

### 5.032 Experimental Engineering II

*Prerequisites*: 1.051, 5.010, 5.020, 10.001. *Co- or prerequisites*: 5.311, 6.801, 8.151, 5.611.

A series of lectures, demonstrations and experiments designed to show the theory and techniques of instrumentation in Mechanical Engineering.

#### TEXTBOOK

Beckwith, T. G. & Buck, N. L. *Mechanical Measurements*. 2nd ed. Addison-Wesley, 1969.

### 5.033 Experimental Engineering III

*Prerequisite: 5.032. Co- or prerequisite: 5.071.*

A series of experiments and associated lectures to illustrate some common problems in experimental work.

### 5.043 Industrial Training

An industrial training report must be submitted to the School for assessment after completion of the period of training and must meet School requirements.

### 5.051 Thesis

*Prerequisite: All subjects in Years 1, 2 and 3. Co- or prerequisite: 5.324.*

For students in the full-time courses in the School of Mechanical and Industrial Engineering.

### 5.061 Technical Orientation

Designed to inform students of the art and technique of technical communication, the forms of engineering professional work and the nature of the courses of instruction. A major objective is to bring staff and students together in an atmosphere of discussion and enquiry. May include one or two visits to special establishments.

#### TEXTBOOK

Cooper, B. M. *Writing Technical Reports*. Pelican.

#### REFERENCE BOOKS

*Roget's Thesaurus*.

*The Concise Oxford Dictionary*.

Ulman, J. N. Jr. *Technical Reporting*. Holt, Rinehart & Winston, 1952.

### 5.062 Communications

The mathematical theory of communication, followed by the basic techniques of communication by various media, as required by the professional man. Drawings as a means of communication, pictorial sketches and drawings as illustrations, instructions and visual aids. Basic photographic techniques, the grammar of cine film and of television. Library searching, collation of information, preparation of a seminar and relevant visual aids. Techniques of public speaking and chairmanship. Preparation of a technical paper and its illustrations including graphs, charts and tables of data. The work of an editor. Methods of reproducing information. Copyright and fair copying. Computerized data storage.

Production of a short cine film, videotape and slide sequence; pictorial illustrations. Participation in a seminar and writing of a thesis.

#### TEXTBOOK

Rosenstein, A. B. et al. *Engineering Communications*. Prentice-Hall.

#### REFERENCE BOOKS

Davis, D. *The Grammar of T.V. Production*. Barrie.

McLuhan, M. *Understanding Media*. Sphere.

Willis, A. H. *The Technical Lecture*. Quest.

**5.071 Engineering Analysis***Prerequisite: 10.022.*

*Digital Computer Programming: Numerical Methods*—Roots of non-linear equations. Systems of linear equations. Finite differences; numerical differentiation and integration. Solution of ordinary differential equations — series and stepwise methods. Solution of partial differential equations — finite difference and iterative methods. Emphasis to be placed on the use of digital computers. *Statistics*—An introduction to probability theory. Random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of  $\chi^2$ ,  $t$  and  $F$ . Estimation by moments and maximum likelihood; Confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to linear regression.

**TEXTBOOKS**Freund, J. E. *Mathematical Statistics*. Prentice-Hall.Southworth, R. W. & De Leeuw, S. L. *Digital Computation and Numerical Methods*. McGraw-Hill.*Statistical Tables*.**REFERENCE BOOKS**Derman, C. & Klein, M. *Probability and Statistical Inference for Engineers*. O.U.P.Freeman, H. *Introduction to Statistical Inferences*. Addison-Wesley.Hald, A. *Statistical Theory with Engineering Applications*. Wiley.Martin, H. C. & Carey, G. F. *Introduction to Finite Element Analysis*. McGraw-Hill.Nielsen, K. L. *Methods in Numerical Analysis*. Macmillan.Plumb, S. C. *Introduction to Fortran Programming*. McGraw-Hill.Salvadori, M. G. & Baron, M. L. *Numerical Methods in Engineering*. Prentice-Hall.**5.111 Mechanical Engineering Design I***Prerequisites: 5.010, 5.020. Co- or prerequisites: 5.311, 5.611, 8.151, 8.259.*

Introductory lectures illustrating the interdependence of design and technology. Mechanical technology. Interpretation of engineering drawing practice. Philosophy and technique of design. Simple creative design assignments. Basic engineering elements.

**TEXTBOOKS***Australian Standard Engineering Drawing Practice*. I.E. Aust., 1973.Grant, H. E. *Engineering Drawing with Creative Design*. McGraw-Hill.Shigley, J. E. *Mechanical Engineering Design*. 2nd ed. McGraw-Hill.**REFERENCE BOOKS**ISO. *Limits and Fits*. 4500/1969.De Garmo, E. P. *Materials and Processes in Manufacturing*. Macmillan.Dixon, J. R. *Design Engineering*. McGraw-Hill.Edel, D. H. *Introduction to Creative Design*. Prentice-Hall.Faires, V. M. *Design of Machine Elements*. Collier-Macmillan.Matousek, R. *Engineering Design*. Blackie.Vidosic, J. P. *Elements of Design Engineering*. Ronald.



### 5.112 Mechanical Engineering Design II

*Prerequisites:* 5.111, 5.311, 8.151, 8.259. *Co- or prerequisites:* 5.331, 5.412, 5.612.

*Design for Production* — Principles of tolerance specification, standard procedures for gauging, dimensioning and surface finish specification. *Design of Machine Elements* — Application of fundamental principles to the design of common machine elements, such as shafts, springs, bearings, power transmission devices.

Text and Reference Books as for 5.111, together with:

#### TEXTBOOK

French, M. J. *Engineering Design, Conceptual Stage*. H.E.B.

#### REFERENCE BOOKS

B.S. 2517. *Definitions for Use in Mechanical Engineering*. B.S.I., 1959.

Merritt, H. E. *Gear Engineering*. Pitman.

Miles, L. D. *Techniques of Value Analysis and Engineering*. McGraw-Hill.

Oberg, E. & Jones, F. D. *Machinery's Handbook*. Machinery Pub.

Woodson, T. T. *Introduction to Engineering Design*. McGraw-Hill.

### 5.113 Mechanical Engineering Design III

*Prerequisites:* 5.112, 5.331, 5.412. *Co- or prerequisite:* 5.612.

*Design Theory and Technique* — Fundamental concepts of the design process, decision theory. Process and technique of optimization. Principles of material selection. Special analytical and experimental techniques of engineering design. *Design Practice* — Minor and major creative design projects, application of sophisticated design techniques in major fields of mechanical engineering.

#### REFERENCE BOOKS

As for 5.112, together with:

Asimow, M. *Introduction to Design*. Prentice-Hall.

Goodwin, A. B. *Power Hydraulics*. Cleaver-Hume Press.

Juvinall, R. C. *Engineering Consideration of Stress, Strain & Strength*. McGraw-Hill.

Rudd, D. F. & Watson, C. C. *Strategy of Process Engineering*. Wiley.

Spotts, M. F. *Mechanical Design Analysis*. Prentice-Hall.

Thoma, J. *Hydraulic Power Transmissions*. Trade & Tech.

### 5.301 Engineering Mechanics

*Prerequisites:* 1.051, 5.010. *Co- or prerequisite:* 10.001.

Kinematics and kinetics of the plane motion of particles. Rectilinear, curvilinear and relative translational motion; work and energy; impulse and momentum.

#### TEXTBOOK

Meriam, J. L. *Dynamics*. Wiley.

#### REFERENCE BOOK

Beer, F. P. & Johnston, E. *Mechanics for Engineers: Dynamics*. Vector ed. McGraw-Hill.

### 5.303 Mechanical Vibrations

*Prerequisites:* 5.311, 10.022.

Periodic motion, Fourier analysis, simple harmonic motion. Laplace Transform and phasor methods. Single degree-of-freedom system (free and forced vibrations). Some vibration-measuring instruments. Vibration insulation.

Multi-degree-of-freedom systems. Systems with negligible damping, Dunkerley's formula. Introduction to beam vibrations.

#### REFERENCE BOOKS

Church, A. H. *Mechanical Vibrations*. Wiley.

Thomson, W. T. *Vibration Theory and Applications*. Prentice-Hall.

### 5.311 Engineering Mechanics

*Prerequisites: 1.051, 5.011. Co- or prerequisite: 10.001.*

Kinematics and kinetics of the plane motion of rigid bodies. Absolute motion, relative translational motion and relative angular motion; dynamic equilibrium; work and energy; impulse and momentum.

#### TEXTBOOK

Meriam, J. L. *Dynamics*. Wiley.

#### REFERENCE BOOKS

Beer, F. P. & Johnston, E., *Mechanics for Engineers: Dynamics*. Vector ed. McGraw-Hill.

Higdon, A. & Stiles, W. B. *Engineering Mechanics*. Vector ed. Prentice-Hall.

Waldron, K. J. *Engineering Mechanics*. Wiley.

### 5.324 Automatic Control Engineering

*Prerequisite: 10.022.*

Block diagrams and Laplace transform methods for system analysis. Transfer functions. Response functions. The general criterion for stability. Routh's criterion. Electronic Analogue Computer and its use in system simulation. Nyquist criterion and Nyquist diagrams. Bode diagrams and frequency response analysis. Root locus methods. Types of controller action and their effects on system response. Optimum settings, ultimate period method and maximum gain method. Analysis of several types of pneumatic controllers and other control system components. Application of automatic control to typical mechanical systems.

#### TEXTBOOK

Raven, F. H. *Automatic Control Engineering*. 2nd ed. McGraw-Hill.

#### REFERENCE BOOKS

Atkinson, P. A. T. *Feedback Control Theory for Engineers*. H.E.B.

Chestnut, H. & Mayer, R. W. *Servomechanisms and Regulating System Design*. Vol. 1. Wiley.

Dransfield, P. *Engineering Systems & Automatic Control*. Prentice-Hall.

Harrison, H. L. & Bollingen, J. G. *Introduction to Automatic Control*. 2nd ed. International Text Book.

### 5.331 Dynamics of Machines I

*Prerequisites: 5.311, 10.022.*

*Dynamics of Planar Mechanisms:* Analytical and graphical methods for the analysis of velocities, accelerations and forces in planar mechanisms. Kinematics of gear tooth profiles. Static and dynamic rotor balancing.

*Mechanical Vibrations:* Simple harmonic motion. One degree of freedom systems, free and forced vibrations, transmissibility and motion isolation. Whirling of shafts. Laplace transform methods and transfer functions.

#### TEXTBOOKS

Hirschhorn, J. *Dynamics of Machinery*. Nelson.

Morrison, J. L. M. & Crossland, B. *Mechanics of Machines*. Longman.

## REFERENCE BOOKS

- Cannon, R. H. *Dynamics of Physical Systems*. McGraw-Hill.  
 Church, A. H. *Mechanical Vibrations*. Wiley.  
 French, A. P. *Newtonian Mechanics*. Nelson.  
 Hannah, J. & Stevens, R. C. *Mechanics of Machines—Advanced*. Arnold.  
 Mabie, H. H. & Ocvirk, F. W. *Mechanics and Dynamics of Machinery*. Wiley.  
 Merrit, H. E. *Gear Engineering*. Pitman.

**5.332 Dynamics of Machines II**

*Prerequisite: 5.331.*

*Dynamic Response:* Vibration of multiple degree of freedom systems. Time domain analysis of single and multiple degree of freedom systems.

*Rigid Body Dynamics:* Dynamic effects in machinery. Angular momentum and inertia properties in spatial systems. Equations of motion of spatial systems.

*Kinematic Analysis and Synthesis:* Analysis of complex mechanisms and an introduction to the synthesis of planar mechanisms.

## TEXTBOOK

Meriam, J. L. *Dynamics*. Wiley.

## REFERENCE BOOKS

- Burton, R. *Vibrations and Impact*. Addison-Wesley.  
 Church, A. H. *Mechanical Vibrations*. Wiley.  
 Den Hartog, J. P. *Mechanical Vibrations*. McGraw-Hill.  
 Hartenberg, R. S. & Denavit, J. *Kinematic Synthesis of Linkages*. McGraw-Hill.  
 Hirschhorn, J. *Kinematics and Dynamics of Plane Mechanisms*. McGraw-Hill.  
 Holowenko, A. R. *Dynamics of Machinery*. Wiley.  
 Mabie, H. H. & Ocvirk, F. W. *Mechanics and Dynamics of Machinery*. Wiley.  
 Morrison, J. L. M. & Crossland, B. *Mechanics of Machines*. Longman.  
 Thomson, W. T. *Vibration Theory and Applications*. Prentice-Hall.

**5.412 Mechanics of Solids I**

*Prerequisites: 8.151, 8.259, 10.022.*

Three-dimensional stress and strain, principal values, plane stress, plane strain. Theories of failure. Fatigue strength, combined stresses, non zero mean stress. Shear centre. Unsymmetrical bending of beams, composite beams. Energy methods of analysis of beams, frames and rings; deflections and redundants. Buckling of columns, combined loadings. Torsion of prisms and thin-walled members. Stress distribution in thick-walled cylinders.

Experimental stress analysis, photoelasticity, strain gauges.

## TEXTBOOK

Seely, F. B. & Smith, J. O. *Advanced Mechanics of Materials*. Wiley, 1952.

## REFERENCE BOOKS

- Den Hartog, J. P. *Advanced Strength of Materials*. McGraw-Hill, 1952.  
 Hearn, E. J. *Problems in Strength of Materials — Shafts, Springs, Cylinders*. Longman.  
 Hearn, E. J. *Problems in Strength of Materials — Complex Stresses and Strains*. Longman.  
 Higdon, A. et al. *Mechanics of Materials*. Wiley.

Juvinall, R. C. *Engineering Considerations of Stress, Strain and Strength*. McGraw-Hill, 1967.

Shanley, F. R. *Mechanics of Materials*. McGraw-Hill.

Timoshenko, S. *Strength of Materials*. Parts I and II. Van Nostrand.

## 5.413 Mechanics of Solids II

*Prerequisite:* 5.412.

*Elasticity:* Continuum Mechanics: Equilibrium and compatibility. Plates and shells, rotating discs. Contact stresses. Thermal stresses.

*Stress Analysis:* Experimental stress analysis. Numerical stress analysis.

*Plasticity:* Elastic and plastic creep. Residual stress. Limit theorems. Ship-line field theory. Metal forming processes.

### TEXTBOOK

Ford, H. *Advanced Mechanics of Materials*. Longman.

### REFERENCE BOOKS

Den Hartog, J. P. *Advanced Strength of Materials*. McGraw-Hill, 1952.

Freudenthal, A. M. *Introduction to the Mechanics of Solids*. Wiley.

Jaeger, J. C. *Elementary Theory of Elastic Plates*. Pergamon.

Johnson, W. J. & Mellor, R. S. *Plasticity for Mechanical Engineers*. Van Nostrand.

Seely, F. B. & Smith, J. O. *Advanced Mechanics of Materials*. Wiley.

Smith, S. O. & Sidebottom, O. M. *Inelastic Behaviour of Load Carrying Members*. Wiley.

Timoshenko, S. *Theory of Elasticity*. McGraw-Hill.

## 5.611 Fluid Mechanics/Thermodynamics I

*Prerequisites:* 1.051, 5.010, 5.020, 10.001. *Co- or prerequisites:* 5.311, 10.022.

Dimensional systems, units, dimensional analysis, properties of substances. Statics of Fluids. One dimensional flow. Mass, energy and momentum equations. Laminar and turbulent motion. Flow in pipes. Elementary boundary layer theory Drag. Fluid measurements. Angular momentum equation. Turbomachines. Concepts and conservation principles of thermodynamics. First and second laws of thermodynamics. Properties of ideal gases, liquids and vapours. Non-flow and flow processes. Ideal cycles Factors limiting performance of real cycles.

### TEXTBOOKS

Streeter, V. L. *Fluid Mechanics*. 4th ed. McGraw-Hill.

or

Massey, B. S. *Mechanics of Fluids*. Van Nostrand.

Wark, K. *Thermodynamics*. 2nd ed. McGraw-Hill, 1971.

or

Lee, J. F. & Sears, F. W. *Thermodynamics*. 2nd ed. Addison-Wesley.

Reynolds, W. *Thermodynamics*. 2nd ed. McGraw-Hill, 1968.

## 5.612 Fluid Mechanics/Thermodynamics II

*Prerequisites:* 5.311, 5.611, 10.022.

Dimensional analysis similitude and modelling. Fields. Mass and momentum equations. Vorticity, deformation, dilation. Existence conditions for stream and potential functions. One-dimensional gas dynamics. Nozzle flows, normal shock wave, constant area flow with friction and heat addition. Isothermal flow. Non-reactive mixtures. Refrigeration and air

conditioning processes, Design considerations. Steady and unsteady state conduction heat transfer. Convective heat transfer. Radiant heat transfer. Combined modes of heat transfer.

#### TEXTBOOKS

Holman, J. P. *Heat Transfer*. 2nd ed. McGraw-Hill.

Chapman, A. J. & Walker, W. F. *Introductory Gas Dynamics*. Holt, Rinehart & Winston, 1971.

Streeter, V. L. *Fluid Mechanics*. 4th ed. McGraw-Hill.

#### REFERENCE BOOK

Sharpe, G. J. *Fluid Flow Analysis*. Heinemann, 1967.

### 5.613 Fluid Mechanics/Thermodynamics III

*Prerequisite: 5.612.*

Cartesian tensors. Compressible flows. Navier-Stokes and energy equations. Turbulent motion. Reynolds stresses. Boundary layer theory. Forced convection in laminar and turbulent flows. Free convection. Diffusion. Mass transfer. Radial flow and axial flow turbomachinery. Design considerations. Cavitation. Matching of component characteristics. General thermodynamics relations. Statistical mechanics. Quantum mechanics. Monatomic gases and solids. Diatomic and polyatomic gases. Chemical equilibrium. Statistical mechanics of dependent particles. Real gases and solids. Irreversible processes.

#### REFERENCE BOOKS

Kays, W. M. *Convection Heat and Mass Transfer*. McGraw-Hill, 1966.

Shepherd, D. G. *Principles of Turbomachinery*. Macmillan, 1957.

Van Wylen, G. J. & Sonntag, R. E. *Fundamentals of Classical Thermodynamics*. Wiley, 1965.

Van Wylen, G. J. & Sonntag, R. E. *Fundamentals of Statistical Thermodynamics*. Wiley, 1966.

### 5.661 Mechanical Engineering III

*Prerequisites: 1.001, 5.010, 10.211A.*

Fluids and fluid properties. The differential equations of fluid flow. Flow of nonviscous fluids. Flow of viscous fluids. Turbulence. Dimensional analysis and its applications. Turbulent flow in pipes; pipe flow problems. Boundary layers. Convection heat transfer. Laminar and turbulent flow. Heat transfer in closed conduits. Conduction and radiation. Engineering units, tables and charts. Analysis of some heat-power cycles (I.C., steam, refrigeration). Steam turbines. Elementary theory of pumps and turbines. Specific speed. Design parameters. Cavitation. Scale up laws.

#### TEXTBOOK

Rogers, G. F. C. & Mayhew, Y. R. *Engineering Thermodynamics Work & Heat Transfer*. Longman.

#### REFERENCE BOOKS

Eskinazi, S. *Principles of Fluid Mechanics*. 2nd ed. Allyn & Bacon, 1968.

Knudsen, J. G. & Katz, D. L. *Fluid Dynamics and Heat Transfer*. McGraw-Hill, 1958.

Streeter, V. L. *Fluid Mechanics*. 5th ed. McGraw-Hill, 1971.

### 5.711 Thermodynamics

*Prerequisites: 1.051, 5.011, 10.001.*

The system; work and heat interactions. Properties of pure substances. First law of thermodynamics. Steady flow processes. Second law of thermodynamics. Power and refrigeration cycles; air standard cycles.

#### TEXTBOOK

Van Wylen, G. J. *Thermodynamics*. SI unit ed. Wiley.

### 5.800 Aircraft Design

*Prerequisites: 5.111, 5.311, 8.151, 8.259. Co- or prerequisite: 5.412.*

Aircraft types and development, overall design process, wing load, shear force, bending moment and torque distributions. Detailed stressing of lugs, sockets, pins, bearings, fittings, hinges, gears, rivetted, welded and bonded joints. Design and drawing of small fittings such as hinge assembly, spar for tailplane, control stick or landing gear component.

### 5.801 Aircraft Design

*Prerequisites: 5.303, 5.412, 5.800 (full-time only), 5.811, 5.822. Co- or prerequisite: 5.823.*

- (a) *Aerodynamic Design* — Design authorities, criteria, flight envelope, design cases. Airloads. Weight and Balance. Performance and stability estimation. Aerodynamic design of an aircraft.
- (b) *Design of Aircraft Structures* — Significance of design requirements: proof and ultimate load, load and safety factors, interpretation of V-g diagram, Stressing cases. Detailed structural and mechanical design of airframe, controls, joints; choice of materials; use of structures data sheets. Practical design of a simple aircraft structural component.

#### TEXTBOOKS

Bruhn, E. F. *Analysis and Design of Flight Vehicle Structures*. Tri-State Offset Co., 1965.

Maccabee, F. ed. *Light Aircraft Design Handbook*. Loughborough Univ. of Technology, 1969.

Royal Aeronautical Society. *Handbook of Aeronautics No. 1, Structural Principles and Data*. Pitman.

#### REFERENCE BOOKS

Ashkouti, J. A. *Aircraft Mechanics Pocket Manual*. Pitman, 1957.

Australian Department of Civil Aviation. *Air Navigation Orders, Sections 100, 101*. D.C.A.

Pazmany, L. *Light Aircraft Design*. Author, San Diego, Calif., 1963.

Royal Aeronautical Society. *Data Sheets*. R.Ae.S.

Shanley, F. R. *Weight-Strength Analysis of Aircraft Structures*. 2nd ed. Dover, 1965.

U.K. Air Registration Board. *British Civil Airworthiness Requirements. Sections D, K*. A.R.B.

U.S. Federal Aviation Agency. *Federal Aviation Regulations Part 23: Airworthiness Standards*.

Wood, K. D. *Aerospace Vehicle Design*. Vol. 1. *Aircraft Design*. Univ. of Colorado, 1963 or later.

## 5.811 Aerodynamics I

*Prerequisites: 5.311, 5.611, 10.022.*

Navier-Stokes equations; elementary boundary layer theory; turbulence, convection, friction and form drag; airfoil characteristics. Vorticity and circulation; Prandtl wing theory, induced drag, spanwise lift distribution, wing characteristics. Static longitudinal stability and control. Manoeuvrability. Standard atmosphere, performance calculations. One-dimensional gas dynamics, isentropic, adiabatic and nozzle flow; rocket equation.

### REFERENCE BOOKS

- Abbott, I. H. & Von Doenhoff, A. E. *Theory of Wing Sections*. Dover.  
 Glauert, H. *The Elements of Aerofoil & Airscrew Theory*. C.U.P.  
 Houghton, E. L. & Brock, A. E. *Aerodynamics for Engineering Students*. Arnold, London.  
 Kuethe, A. M. & Schetzer, J. D. *Foundations of Aerodynamics*. 2nd ed. Wiley, 1959.  
 Perkins, C. D. & Hage, R. E. *Airplane Performance Stability and Control*. Wiley.  
 Martinov, A. K. *Practical Aerodynamics*. Pergamon, 1965.  
 Rauscher, M. *Introduction to Aeronautical Dynamics*. Wiley.  
 Royal Aeronautical Society Data Sheets. *Aerodynamics and Performance*.  
 Streeter, V. L. *Fluid Dynamics*. McGraw-Hill.  
 Von Karman, T. *Aerodynamics*. Cornell U.P., 1954.

## 5.812 Aerodynamics II

*Prerequisites: 5.811, 5.303.*

Potential theory of an ideal fluid, conformal Kutta-Joukowski transformation. Vortex streets. Aircraft dynamic stability. Advanced performance calculations. Normal oblique and conical shock and expansion waves. High speed wing theory.

### TEXTBOOKS

- Abbott, I. H. & Von Doenhoff, A. E. *Theory of Wing Sections*. Dover.  
 Kuethe, A. M. & Schetzer, J. D. *Foundations of Aerodynamics*. 2nd ed. Wiley, 1959.  
 Perkins, C. D. & Hage, R. E. *Airplane Performance Stability and Control*. Wiley.

### REFERENCE BOOKS

- Etkin, B. *Dynamics of Flight*. 2nd ed. Wiley.  
 Gessow, A. & Myers, G. C. *Aerodynamics of the Helicopter*. Macmillan.  
 Royal Aeronautical Society. *Aerodynamics and Performance Data Sheets*. R.Ae.S.  
 Seckel, E. *Stability and Control of Aeroplanes and Helicopters*. A.P., 1964.

## 5.822 Analysis of Aerospace Structures I

*Prerequisites: 5.311, 8.151, 8.259, 10.022. Co- or prerequisites 5.412.*

Equilibrium of forces, plane frames, space frames; inertia forces, load factors; beams: two-moment equation, shear and bending-stress distribution in various thin-webbed beams, tapered beams, beams with variable flange areas. Semi-monocoque structures. Deflection of structures: Maxwell's and

Castigliano's theorems, virtual work method. Statically indeterminate structures: beams, trusses, stiff-jointed frames; methods of superposition, energy, moment distribution, elastic centre; shear distribution in two-cell beam. Aircraft materials, physical properties and their measurement. Dimensionless stress-strain data.

### TEXTBOOK

Peery, D. J. *Aircraft Structures*. McGraw-Hill.

### REFERENCE BOOK

Timoshenko, S. *Strength of Materials*. Part I. Van Nostrand.

## 5.823 Analysis of Aerospace Structures II

*Prerequisites: 5.412, 5.822.*

Stress functions. Shear lag. Strain gauge rosettes and structural testing. Sandwich construction and analysis. Buckling of columns; elastic, perfect, imperfect and inelastic columns; empirical equations. Buckling of plates with various loadings and edge conditions. Thin walled columns, local buckling, cuppling. Stiffened panels. Tension field beams, monocoque cylinders. Warping of open and closed sections. Torsional instability. Introduction to matrix methods of structural analysis. Fatigue. Aero-elasticity.

### TEXTBOOK

Rivello, R. M. *Theory and Analysis of Flight Structures*. McGraw-Hill, 1969.

### REFERENCE BOOKS

Bruhn, E. F. *Analysis and Design of Flight Vehicle Structures*. Tri-State Offset Co.

Hendry, A. W. *Elements of Experimental Stress Analysis*. Pergamon.

Timoshenko, S. & Gere, J. M. *Theory of Elastic Stability*. McGraw-Hill, 1961.

Timoshenko, S. & Goodier, J. M. *Theory of Elasticity*. McGraw-Hill, 1970.

Williams, D. *Theory of Aircraft Structures*. Arnold, 1960.

## 5.831 Aircraft Propulsion

*Prerequisites: 5.611, 5.811.*

Aircraft power plant and propulsion systems. Basic thrust equations; propulsive efficiency. Propeller theory, characteristics and performance. Power plant thermodynamics. Fuels and combustion. Internal aerodynamics. Compressors and turbines, subsonic and supersonic intake diffusers, nozzles. Design and performance of aircraft reciprocating internal combustion engine and gas turbine systems. Ramjets, Rockets.

### TEXTBOOK

Hesse, W. J. & Mumford, N. V. *Jet Propulsion*. Pitman.

### REFERENCE BOOKS

Hill, P. G. & Peterson, C. R. *Mechanics and Thermodynamics of Propulsion*. Addison-Wesley.

Morley, A. W. *Aircraft Propulsion*. Longmans, 1953.

Schmidt, F. *The Internal Combustion Engine*. Chapman & Hall.

Shapiro, A. H. *Dynamics and Thermodynamics of Compressible Fluid Flow*. Vol. I. Ronald, 1953.

Shepherd, D. G. *Introduction to the Gas Turbine*. Constable, London.

Sutton, G. P. *Rocket Propulsion Elements*. 3rd ed. Wiley.

Zucrow, M. J. *Principles of Jet Propulsion and Gas Turbines*. Wiley, N.Y.



## 5.911 Naval Architecture

*Prerequisite: 5.311. Co- or prerequisite: 5.951 (full-time only).*

Hydrostatic calculations. Stability at small angles. Free-surface effects. Inclining experiment. Trim due to weights and flooding. Grounding. Effects of permeability. Stability at large angles. Stability after flooding. Dynamic stability. Floodable length. Requirements of damaged-stability. Wave theory. Wave patterns. Rolling, heaving and pitching. Launching.

### TEXTBOOK

Comstock, J. P. *Principles of Naval Architecture*. Soc. of Naval Architects & Marine Engineers, 1967.

### REFERENCE BOOKS

Rawson, K. J. & Tupper, E. C. *Basic Ship Theory*. Longman, 1968.

Robb, A. M. *Theory of Naval Architecture*. Griffin & Co.

## 5.921 Ship Structures I

*Prerequisites: 8.151, 8.259, 10.022. Co- or prerequisite: 5.412.*

Longitudinal strength of ship structures: load types and load prediction; section modulus, shear lag, torsion, superstructure, discontinuities. Transverse strength: frame and finite element analysis. Limit analysis of beams. Brackets and connections. Combined axial and lateral loads. Laterally loaded plates, grillages and stiffened panels.

### TEXTBOOK

Comstock, J. P. *Principles of Naval Architecture*. Soc. of Naval Architects & Marine Engineers, N.Y., 1967.

### REFERENCE BOOKS

Clarkson, J. *The Elastic Analysis of Flat Grillages*. C.U.P., 1965.

D'Arcangelo, A. M. *A Guide to Sound Ship Construction*. Cornell Maritime Press, 1964.

D'Arcangelo, A. M. *Ship Design and Construction*. Soc. of Naval Architects & Marine Engineers, N.Y., 1969.

Lloyd's Register of Shipping. *Rules and Regulations for the Construction and Classification of Steel Ships*. Published Annually.

Muckle, W. *Strength of Ships' Structures*. Arnold, 1967.

## 5.922 Ship Structures II

*Prerequisites: 5.071, 5.412, 5.921.*

Buckling of plates and stiffened panels; combined loads; limit analysis. Structural details. Fatigue and brittle fracture. Design for production. Finite element method. Rational design synthesis: reliability, optimization, computer-aided structural design.

### TEXT AND REFERENCE BOOKS

As for 5.921.

### 5.931 Principles of Ship Design IA

Modern ship types and developments. The overall design process. Ship structural arrangements.

#### TEXTBOOKS

D'Arcangelo, A. M. *A Guide to Sound Ship Construction*. Cornell Maritime P., 1964.

D'Arcangelo, A. M. *Ship Design and Construction*. Soc. of Naval Architects and Marine Engineers, N.Y., 1969.

### 5.932 Principles of Ship Design IB

*Co-requisite: 5.911 (5.931 Full-time only).*

Lines plan. Freeboard, tonnage, capacity. Rules of Classification Societies. Preliminary estimate of ship dimensions.

#### REFERENCE BOOKS

Board of Trade. *Instructions as to the Tonnage Measurement of Ships*. H.M.S.O.

Board of Trade. *Measurements of Vessels for the Panama Canal*. H.M.S.O.  
The Commonwealth of Australia. *Statutory Rules, No. 25 Navigation (Construction) Regulations, 1968*.

The Commonwealth of Australia. *Statutory Rules, No. 126, Navigation (Load Lines) Regulations, 1968*.

Comstock, J. P. *Principles of Naval Architecture*. Soc. of Naval Architects and Marine Engineers, N.Y., 1967.

D'Arcangelo, A. M. *A Guide to Sound Ship Construction*. Cornell Maritime P., 1964.

D'Arcangelo, A. M. *Ship Design and Construction*. Soc. of Naval Architects and Marine Engineers, N.Y., 1969.

### 5.933 Principles of Ship Design II

*Prerequisite: 5.932.*

Theory and technique of ship design. Development of ship's lines. Design criteria and data. Criteria of statutory bodies relating to design. Details of ship's structure. Rudders and steering arrangements. Structural design requirements of classification societies. Ship arrangements and equipment. Specifications. Modern shipbuilding methods and prefabrication. Ship operation economics.

#### TEXTBOOKS

Buxton, I. L. *Engineering Economics and Ship Design*. The British Ship Research Association.

D'Arcangelo, A. M. *Ship Design and Construction*. Soc. of Naval Architects & Marine Engineers, N.Y., 1969.

#### REFERENCE BOOKS

Arnott, D. *Design and Construction of Steel Merchant Ships*. Soc. of Naval Architects & Marine Engineers.

Board of Trade. *Instructions as to the Survey of Passenger Steamships*. Vols. I & II. H.M.S.O.

Board of Trade. *Instructions as to the Tonnage Measurement of Ships*. H.M.S.O.

Board of Trade. *Measurements of Vessels for the Panama Canal*. H.M.S.O.

- The Commonwealth of Australia. *Statutory Rules, No. 25, Navigation (Construction) Regulations, 1968.*
- The Commonwealth of Australia. *Statutory Rules, No. 126, Navigation (Load Lines) Regulations, 1968.*
- Manning, G. C. *The Theory and Technique of Ship Design.* Wiley.
- Munro-Smith, R. *Merchant Ship Design.* Hutchinson.
- Schokker, J. C., Neuerburg, E. M. & Vossnack, E. J. *The Design of Merchant Ships.* Arkenbout-Schokker.
- Todd, F. H. *Ship Hull Vibration.* Arnold.

### 5.934 Ship Design Project

*Prerequisites: All subjects in Years 1, 2 and 3. Co- or prerequisites: 5.922, 5.933, 5.941.*

Design of a vessel to provide characteristics of hull form, preliminary general arrangement, lines plan, hydrostatic curves, investigation of stability and trim, structural profile and midship section, capacity, freeboard, tonnage, floodable length (if applicable), power requirements, propeller design, investigation of vibration, rudder design and final general arrangement.

#### TEXT AND REFERENCE BOOKS

As for 5.933.

### 5.941 Ship Propulsion and Systems

*Prerequisites: 5.071, 5.951 (full-time only).*

Hydrodynamics. Model testing. Determination of resistance and power requirements of hull form from statistical data. Optimum form characteristics. Propulsion systems. Propeller theory and design. Trials and analysis of data. Steering. Ship vibrations. Prime movers and auxiliaries. Ship systems: ventilation, air-conditioning, refrigeration, pumping, flooding and draining.

#### TEXTBOOK

Comstock, J. P. *Principles of Naval Architecture.* Soc. of Naval Architects & Marine Engineers, N.Y., 1967.

#### REFERENCE BOOKS

- Barnaby, K. C. *Basic Naval Architecture.* 5th ed. Hutchinson.
- Harrington, R. L. ed. *Marine Engineering.* Soc. of Naval Architects & Marine Engineers, N.Y., 1971.
- O'Brien, T. P. *The Design of Marine Screw Propellers.* Hutchinson.
- Robb, A. M. *Theory of Naval Architecture.* Griffin & Co.
- Todd, F. H. *Ship Hull Vibration.* Arnold.
- Van Lammeren, W. P. A. *Resistance, Propulsion and Steering of Ships.* Technical Publishing Co., Holland.

### 5.951 Hydrodynamics

*Prerequisites: 5.311, 5.611, 10.022. Co- or prerequisite: 5.071.*

Kinematics of fluids: stream function, velocity potential and application. Elementary treatment of equations of motion and examples in hydrodynamics.

#### REFERENCE BOOKS

- Glauert, H. *Aerofoil and Airscrew Theory.* C.U.P.
- Li, W. H. & Lam, S. H. *Principles of Fluid Mechanics.* Addison-Wesley.
- Milne-Thomson, L. M. *Theoretical Hydrodynamics.* Macmillan.

## SCHOOL OF ELECTRICAL ENGINEERING

### 6.010 Electrical Engineering I

An orientation subject to acquaint students with the various areas and problems of Electrical Engineering. Secondary school physics and maths applied to some aspects of energy conversion and transmission; electronics; logic, number systems, and computers; systems and circuit theory; probability, information and communication. Laboratory exercises and project work in these areas including instrumentation and device characteristics.

#### TEXT AND REFERENCE BOOKS

To be advised.

### 6.021 Electrical Engineering II

A unified treatment of electrical engineering:

A. SI units. Fundamental laws of electromagnetic field theory. Circuit theory: Kirchhoffs laws, basic elements, power relations. Analysis of linear circuits: systematic circuit equations, phasors, impedance, poles and zeros, transient and complete response, general network theorems.

B. Solid-state electronics: semiconductors, electrons and holes, doping, energy bands, Fermi-Dirac statistics, diffusion. The p-n diode and circuit applications. The junction transistor and circuit applications. Linear analysis of electronic circuits.

C. Magnetic fields and circuits. Transformers, equivalent circuits. Electro-mechanical energy conversions, torque induced voltage. Rotating machines: dc, synchronous and induction types, analysis by equivalent circuits.

#### TEXTBOOK

Del Toro, V. *Electrical Engineering Fundamentals*. Prentice-Hall.

#### REFERENCE BOOKS

Fitzgerald, A. E., Grabel, A. & Higgenbotham, D. E. *Basic Electrical Engineering*. 3rd ed. McGraw-Hill.

Fink, D. G. ed. *Standard Handbook for Electrical Engineers*. (Knowlton.) 10th ed. McGraw-Hill.

Millman, J. & Halkias, C. C. *Electronic Devices and Circuits*. McGraw-Hill, 1967.

Smith, R. J. *Circuits, Devices and Systems*. Wiley.

### 6.031 Electrical Engineering III

A. *Systems and Circuit Theory*: Steady state, transient and three phase circuits. Network topology and matrix methods, state equations. Analysis of feedback systems. Distributed parameter systems.

#### TEXTBOOKS

Chipman, R. A. *Transmission Lines*. Schaum's Outline Series. McGraw-Hill, 1968.

Desoer, C. A., & Kuh, E. S. *Basic Circuit Theory*. McGraw-Hill, 1969.

Di Stepheno III, J. J., Stubberud, A. R. & Williams, I. J. *Feedback and Control Systems*. Schaum's Outline Series. McGraw-Hill, 1967.

#### REFERENCE BOOKS

Close, C. M. *The Analysis of Linear Circuits*. Harcourt, Brace & Javanovich.

Elgerd, O. I. *Control Systems Theory*. McGraw-Hill, 1967.

- Frederick, D. K. & Carlson, A. B. *Linear Systems in Communications and Control*. Wiley, 1971.
- Kuo, T. I. *Automatic Control Systems*. 2nd ed. Prentice-Hall, 1967.
- Kuo, F. F. *Network Analysis and Synthesis*. 2nd ed. Wiley, 1966.
- Ley, B. J., Lutz, S. G. & Reyberg, C. S. *Linear Circuit Analysis*. McGraw-Hill, 1959.
- Moore, R. K. *Traveling-wave Engineering*. McGraw-Hill, 1960.
- Newcomb, R. W. *Concepts of Linear Systems and Controls*. Brooks-Cole, 1968.
- Seshu, S. & Balabanian, N. *Linear Network Analysis*. Wiley, 1959.

**B. Energy Conversion, Transmission and Utilization:** Introduction to energy conversion; electromagnetic machines, transformers. Power transmission, power systems. Utilization of electrical energy; motors and industrial drives; rotating and other high power amplifiers; a.c.-d.c. conversion; rating of plant; tariffs. Earthing, protection and electrical safety.

#### TEXTBOOKS

- Freeman, P. J. *Electric Power Transmission and Distribution*. Harrap.
- Harrison, H. *The Principles of DC and AC Machines*. Univ. of N.S.W.

#### REFERENCE BOOKS

- Fitzgerald, A. E., Kingsley, C. & Kusko, A. *Electric Machinery*. 3rd ed. McGraw-Hill.
- Hancock, N. N. *Electric Power Utilization*. Pitman.
- M.I.T. *Magnetic Circuits and Transformers*. Wiley.
- Weedy, B. M. *Electric Power Systems*. 2nd ed. Wiley.

**C. Electronic Circuits and Signal Processing:** Characterization of transistors and other active devices. Small signal amplifiers, wide band, direct-coupled, tuned. Regulated power supplies. Wave shaping circuits, typical logic circuits, gates. Power amplifiers Classes A, B and C. Oscillators sinewave and limit cycle. Demodulation. Introduction to aerials and propagation. Modulation, need and types. Simple radio transmitter and receiver. Rectifiers and inverters: single and polyphase.

#### TEXTBOOK

- Millman, J. & Halkias, C. *Integrated Electronics: Analog and Digital Circuits and Systems*. McGraw-Hill, 1972.

#### REFERENCE BOOKS

- Abrahams, J. & Pridham, G. *Semiconductor Circuits: Worked Examples*. Pergamon.
- Gibbons, J. *Semiconductor Electronics*. McGraw-Hill.
- Phillips, A. *Transistor Engineering*. McGraw-Hill.

**D. Computing:** Switching algebra, combinational analysis and synthesis of switching circuits, simplification of switching functions. Level sequential and pulse sequential analysis. Flow tables, cycles, races, hazards. Number systems, codes, error detection.

Numerical analysis, errors, interpolation, quadrature linear and non-linear equation, differential equations. Logical organization of computers in functional units.

#### TEXTBOOKS

- Blatt, J. M. *Introduction to Fortran IV Programming*. Goodyear Publishing Co.
- Booth, T. L. *Digital Networks and Computer Systems*. Wiley.

## REFERENCE BOOKS

Heath, F. G. *Digital Computer Design*. Oliver & Boyd.

Hill, F. J., & Peterson, G. R. *Introduction to Switching Theory and Logical Design*. Wiley.

Lewin, C. G. *Logical Design of Switching Circuits*. Nelson.

Marcovitz, A. B. & Pugsley, J. H. *An Introduction to Switching System Design*. Wiley.

Marcus, M. P. *Switching Circuits for Engineers*. Prentice-Hall.

McCluskey, E. J. *Introduction to the Theory of Switching Circuits*. McGraw-Hill.

*E. Electron Physics and Devices*: Classification of solids. Bond model of semiconductors, electron and hole conduction; donors and acceptors, equilibrium carrier densities. Band theory of solids; wave mechanics of electrons, density of states. Statistics, Boltzmann and Fermi-Dirac distributions. Electrons in steady state electric and magnetic fields; effective mass; hole conduction. Electron lattice interactions. Generation and recombination of carriers, diffusion, drift. P-N junctions, surfaces and metal-semiconductor contacts. Junction transistor, power transistors and thyristors, field effect transistors, tunnel diodes. Valves and gas discharge tubes. Luminescent materials and lasers. Ferromagnetism, dielectrics, superconductivity.

## TEXTBOOK

Millman, J. & Halkias, C. *Integrated Electronics: Analog and Digital Circuits and Systems*. McGraw-Hill, 1972.

## REFERENCE BOOKS

Gray, P. E. & Searle, C. L. *Electronic Principles, Physics, Models and Circuits*. Wiley, 1969.

Phillips, A. B. *Transistor Engineering*. McGraw-Hill, 1962.

Van der Ziel, A. *Solid State Physical Electronics*. 2nd ed. Prentice-Hall, 1968.

**6.041 Fields and Measurements**

*Fields*: Applications of field theory not elsewhere treated in the course, selected from: elements of incompressible fluid magnetohydrodynamics; some engineering applications of magnetostatics; analogies between the telegraphist's equations and a variety of potential theory problems, particularly non-electrical; superconductivity.

## TEXTBOOK

To be advised.

## REFERENCE BOOKS

Moore, R. K. *Wave and Diffusion Analogies*. McGraw-Hill, 1964.

Reitz, J. R. & Milford, F. J. *Foundations of Electromagnetic Theory*. Addison-Wesley, 1960.

*Measurements*: Principles of electrical measurements of moderate precision using direct currents and alternating currents of frequency such that lumped circuit techniques are satisfactory.

## TEXTBOOK

Stout, M. B. *Basic Electrical Measurements*. Prentice-Hall.

## REFERENCE BOOKS

Harris, F. K. *Electrical Measurements*. Wiley.

Terman, F. M. & Pettit, J. M. *Electronic Measurements*. McGraw-Hill.

## 6.042 Circuits, Signals and Information Theory

*Circuit theory and network synthesis. Signal Analysis and transmission through networks, including theory of noise and stochastic signals. Includes time frequency and mixed domain presentation; transients and other signals; correlation, convolution, etc.; statistical properties of signals; applications. Information Theory of discrete systems including coding and encoding of patterns. Information theory of continuous systems. Mathematical theory of signal detection, including an introduction to decision theory. Signal and system analysis in the light of information theory.*

### TEXTBOOK

Karbowiak, A. E. *Theory of Communication*. Oliver & Boyd, 1969.

### REFERENCE BOOKS

Abramson, N. *Information Theory and Coding*. McGraw-Hill, 1963.

Beckmann, P. *Probability in Communication Engineering*. Harcourt, Brace & World, 1967.

Beckmann, P. *Elements of Applied Probability Theory*. Harcourt, Brace & World, 1968.

Bendat, J. S. *Principles and Applications of Random Noise Theory*. Wiley, 1958.

Carlson, A. B. *Communication Systems*. McGraw-Hill, 1968.

Goldman, S. *Frequency Analysis Modulation and Noise*. McGraw-Hill, 1948.

Karbowiak, A. E. *Trunk Waveguide Communication*. Chapman & Hall, 1965.

Lathi, B. *Random Signals and Communication Theory*. International Textbook, 1970.

Reza, F. M. *An Introduction to Information Theory*. McGraw-Hill, 1961.

Schwartz, L. S. *Principles of Coding, Filtering and Information Theory*. Cleaver-Hume, 1963.

Schwartz, M. *Information Transmission, Modulation and Noise*. 2nd ed. McGraw-Hill, 1970.

## 6.043 Electrical Measurements

Measurements section of 6.041 Fields and Measurements.

### TEXTBOOK

Stout, M. B. *Basic Electrical Measurements*. Prentice-Hall.

### REFERENCE BOOKS

Hague, B. & Foord, T. R. *Alternating Current Bridge Methods*. 6th ed. Pitman.

Harris, F. K. *Electrical Measurements*. Wiley.

Oliver, B. M. & Cage, J. M. eds. *Electronic Measurements and Instrumentation*. McGraw-Hill.

Terman, F. M. & Pettit, J. M. *Electrical Measurements*. McGraw-Hill.

## 6.044 Electrical Product Design and Reliability

The design and development of reliable, high-quality hardware, from components to systems: product and procurement specifications; factors in choice of system configuration, materials, components, processes; prediction of reliability, availability, system effectiveness; cost-of-ownership optimization; maintainability; thermal design; mechanical design; electromagnetic compatibility; redundancy; ergonomics; design of integrated circuits; interconnection and assembly methods; design reviews; fault-tree analysis; Monte Carlo simulation; worst-case and statistical design; sensitivity analysis and

marginal testing; component screening; product development; life testing, environmental testing, non-destructive testing; quality control, attribute sampling.

### TEXTBOOK

Myers, R., Wong K & Gordy, H. *Reliability Engineering for Electronic Systems*. Wiley, 1964.

### REFERENCE BOOKS

*Proceedings of Annual Symposia on Reliability*. IEEE.

Shooman, M. L. *Probabilistic Reliability, An Engineering Approach*. McGraw-Hill, 1968.

*Standards, published by Australian Dept. of Defence:*

DEF(Aust) 247. *Climatic, Shock and Vibration Testing of Service Equipment*.

DEF(Aust) 3016. *Reliability Tests for Electronic Equipment*.

DEF(Aust) 3017. *Reliability Prediction for Electronic Equipment*.

*Standard, pub. by Standards Association of Australia: AS 1199 Sampling by Attributes*.

Woodson, T. T. *Introduction to Engineering Design*. McGraw-Hill, 1966.

## 6.202 Power Systems I

An elective emphasizing parameters and performance of power system components: transmission lines, power system overvoltages, transformers, fault calculation, circuit interruption, protection.

### TEXTBOOK

Stevenson, W. D. *Elements of Power System Analysis*. 2nd ed. McGraw-Hill, 1963.

### REFERENCE BOOKS

M.I.T. Staff. *Magnetic Circuits and Transformers*. Wiley.

Westinghouse Electric Corporation. *Electrical Transmission and Distribution Reference Book*.

Guile, A. E. & Paterson, W. *Electrical Power Systems*. Vols I & II. Oliver & Boyd, 1972.

## 6.203 Power Systems II

*Prerequisite 6.202.*

A subject emphasizing interconnected system operation, performance and control: synchronous machines, power system analysis, operation and control; power systems in society, distribution systems.

### TEXTBOOK

Stevenson, W. D. *Elements of Power System Analysis*. 2nd ed. McGraw-Hill, 1963.



## REFERENCE BOOKS

- Elgerd, O. I. *Electric Energy System Theory—an Introduction*. McGraw-Hill, 1971.  
 Guile, A. E. & Paterson, W. *Electrical Power Systems*. Vols I & II. Oliver & Boyd, 1972.  
 Kimbark, E. W. *Power System Stability*. Vols I, II & III. Wiley.  
 Taylor, E. O. & Boal, G. A. eds. *Electric Power Distribution*. Arnold, 1966.

**6.212 Machines**

*General Theory of Machines*: power invariant transformations; transient performance; small disturbances and oscillations. *Commutator Machines*: d.c. and a.c. operation; cross field machines; d.c. machines in control systems; thyristors and thyristor speed control. *Induction Machines*: polyphase and single phase; unbalanced operation; speed control. *Synchronous Machines*: cylindrical and salient pole; locus diagrams; transients and faults; motor pull-in, hunting. *Machine Design*: windings; machine inductances; harmonics.

## TEXTBOOK

- Brosan, G. S. & Hayden, J. T. *Advanced Electrical Power and Machines*. Pitman.

## REFERENCE BOOKS

- Adkins, B. *The General Theory of Electrical Machines*. Chapman & Hall.  
 Clayton, A. E. *Performance and Design of D.C. Machines*. Pitman.  
 Draper, A. *Electrical Machines*. Longmans.  
 Gibbs, W. J. *Electric Machine Analysis using Matrices*. Pitman.  
 Hancock, N. N. *Matrix Analysis of Electrical Machines*. Pergamon.  
 Kimbark, E. W. *Power System Stability: Synchronous Machines*. Dover.  
 Say, M. G. *Design and Performance of A.C. Machines*. Pitman.  
 Taylor, E. O. *Performance and Design of A.C. Commutator Motors*. Pitman.  
 Tustin, A. *Direct Current Machines for Control Systems*. Sporn.  
 Veinott, C. J. *Theory and Design of Small Induction Motors*. McGraw-Hill.  
 White, D. C. & Woodson, H. H. *Electromechanical Energy Conversion*. Wiley.

**6.222 High Voltage and High Current Technology**

An elective concerned with aspects of design and testing of high power electrical equipment. Topics selected from: fields and materials in high voltage apparatus; effects of high currents; design considerations; testing and measurements; effects of transients, earthing; applications of superconductivity.

## TEXTBOOKS

No set text.

## REFERENCE BOOKS

- Alston, L. L. *High Voltage Technology*. Harwell/O.U.P.  
 Carter, G. W. *The Electromagnetic Field in its Engineering Aspects*. Longman.  
 Fishlock, D. *A Guide to Superconductivity*. Macdonald/Elsevier.  
 Kuffel, E. & Abdullah, M. *H.V. Engineering*. Pergamon.

**6.303 Communication Electronics**

*Signal Processing and Techniques*: Modulation principles and techniques, DSB, SSB, FM, PM, pulse modulation circuits. Demodulation. Bandwidth, signal to noise ratio, noise factor. Tuned power amplifiers, lumped tuned

circuits, distributed tuned circuits. *Devices*: Properties and circuits of small-signal amplifiers. Noise and high-frequency performance of passive and active devices and circuits. Parametric amplifiers. Quantum electronic devices, e.g., masers and lasers. Semiconductor bulk-effect devices. Microwave high-power vacuum-tube amplifiers.

### TEXTBOOK

Betts, J. A. *Signal Processing, Modulation and Noise*. English U.P., 1970.

### REFERENCE BOOKS

Bennett, W. R. *Introduction to Signal Transmission*. McGraw-Hill, 1970.

Bloom, A. L. *Gas Lasers*. Wiley, 1968.

Carlson, A. B. *Communication Systems*. McGraw-Hill.

Carroll, J. E. *Hot Electron Microwave Generators*. Arnold, 1970.

Goldman, S. *Frequency Analysis Modulation and Noise*. McGraw-Hill.

Hancock, J. C. *An Introduction to the Principles of Communication Theory*. McGraw-Hill.

Haykin, S. S. *Active Network Theory*. Addison-Wesley, 1970.

Howson, D. P. & Smith, R. B. *Parametric Amplifiers*. McGraw-Hill, 1970.

Jolly, W. P. *Low Noise Electronics*. English Universities Press, 1967.

S.E.E.C. *Semi-Conductor Electronics Education Committee Series*. Vols. III, IV, V. Wiley, 1966.

Lathi, B. *Communication Systems*. Wiley.

Sakrison D. *Communication Theory*. Wiley, 1968.

Stein, S. & Jones, J. *Modern Communication Principles*. McGraw-Hill.

Thorp, J. S. *Masers and Lasers*. Macmillan, 1967.

Van der Ziel, A. *Noise: Sources, Characterisation and Measurement*. Prentice-Hall, 1970.

Watson, H. A. ed. *Microwave Semi-Conductor Devices and Their Circuit Applications*. McGraw-Hill, 1969.

## 6.313 Wave Radiation and Guidance

A selection from the following topics:

Maxwell's equations. Poynting's theorem. Plane waves and spherical waves. Conductors and dielectrics. Propagation in free space. Reflection and refraction at the interface of two media. Propagation in anisotropic media. Ionospheric and tropospheric propagation. Guided waves. Types of transmission lines including coaxial and strip lines, surface-wave lines. Waveguides and cavities. Microwave components and signal sources.

Radiator characteristics and concept of spatial filters. Wave-forms and spectra versus aperture distribution and radiation pattern. Noise characteristics in the microwave spectrum. Gain, efficiency and signal-to-noise ratio. Elementary radiators first-principle approach. Phased arrays. Travelling wave and frequency independent radiators. Illustration of applications of antenna theory including radio interferometers, large radio telescopes and satellite communication.

### TEXTBOOK

No set text.

### REFERENCE BOOKS

Glazier, E. V. D. & Lamont, H. R. L. *Transmission and Propagation*. H.M.S.O., 1958.

Hallen, E. G. *Electromagnetic Theory*. Chapman & Hall, 1962.

Huxley, L. G. H. *The Principles and Practice of Waveguides*. Cambridge 1947.

- Jasik, H. *Antenna Engineering Handbook*. McGraw-Hill.  
 Jordan, E. C. *Electromagnetic Waves and Radiating Systems*. Constable.  
 Karbowiak, A. E. *Trunk Waveguide Communication*. Chapman & Hall, 1965  
 Marcuvitz, N. *Waveguide Handbook*. M.I.T. Vol. 7. McGraw-Hill, 1950.  
 Montgomery, C. G. et al. *Principles of Microwave Circuits*. M.I.T. Vol. 8 McGraw-Hill.  
 Ramo, S., Whinnery, J. R., & Van Duzer, T. *Fields and Waves in Communication Electronics*. Wiley, 1965.  
 Reitz, J. R. & Milford, E. J. *Foundations of Electromagnetic Theory*. Addison-Wesley, 1960.

### 6.322 Electronics

Topics in this course include: An introduction to *modern filter theory*; pulse spectra. *Amplifiers*: wide band, compensation; direct coupled, operational amplifiers, regulators. *Pulse and Digital circuits*: semiconductor switches; emitter coupled multivibrators; blocking oscillators. *Integrated Circuits*: non-linear and linear; use in systems. *Power Converters*: polyphase rectifiers, controlled rectifiers; high voltage converters, inverters. *Semiconductor controls*: motor controls, firing circuits, etc. *Reliability Engineering*: calculation of MTBF; statistical and worst case design; environmental and operating stresses.

#### TEXTBOOK

No set text.

#### REFERENCE BOOKS

- G.E. *Silicon Controlled Rectifier Manual*. General Electric.  
 Hemingway, T. K. *Electronic Designers Handbook*. Business Publications.  
 Kuh, E. S. & Pederson, D. O. *Principles of Circuit Synthesis*. McGraw-Hill.  
 Millman, J. & Taub, H. *Pulse, Digital & Switching Waveforms*. McGraw-Hill.  
 Motorola. *Power Transistor Handbook*. Motorola.  
 Motorola. *Silicon Zener Diode and Rectifier Handbook*. Motorola.  
 Motorola. *Switching Transistor Handbook*. Motorola.  
 Myers, R., Wong, K. & Gordy, H. *Reliability Engineering for Electronics Systems*. Wiley.  
 Schaefer, J. *Rectifier Circuits*. Wiley.  
 Storer, J. E. *Passive Network Synthesis*. McGraw-Hill.  
 Texas Instruments. *Transistor Circuit Design*. McGraw-Hill.

### 6.333 Communication Systems

*Sound Systems*: Psychoacoustics, loudness, pitch, masking, binaural effects, characteristics of speech, bandwidth and intelligibility. Sound sources, piston radiator, exponential horn. Acoustic and mechanical equivalent circuits, transducers. Introduction to room acoustics. *Telephone, Telegraph and Data Systems*: General principles, multiplexing, carrier systems, code, speech and data transmission, telemetry, facsimile. *Television Systems*: Physiological aspects of television, television standards, colour systems, transmitters, receivers. *Radar*: Principles of pulse and C.W. radar, distance and direction measuring equipment for navigation and surveying.

#### TEXTBOOKS

- Patchett, G. N. *Colour Television*. Norman Price, 1967.  
 or  
 Townsend, B. *PAL Colour Television*. C.U.P., 1970.

Showalter, L. C. *Closed Circuit T.V. for Engineers and Technicians*. Sams & Co., 1969.

Skolnik, M. I. *Introduction to Radar Systems*. McGraw-Hill, 1962.

#### REFERENCE BOOKS

Beranek, L. L. *Acoustics*. McGraw-Hill.

Brown, J. & Glazier, E. *Telecommunications*. Chapman & Hall, 1966.

Filipowsky, R. & Muehldorf, E. I. *Space Communications Systems*. Prentice-Hall, 1965.

Fraser, W. *Telecommunications*. Macdonald, 1957.

Hamsher, D. H. ed. *Communications System Engineering Handbook*. McGraw-Hill, 1967.

Millman, J. & Taub, H. *Pulse Digital and Switching Waveforms*. McGraw-Hill, 1965.

Olson, H. F. *Elements of Acoustical Engineering*. Van Nostrand.

Skolnik, M. I. *Introduction to Radar Systems*. McGraw-Hill, 1962.

Terman, F. E. *Electronic and Radio Engineering*. 4th ed. McGraw-Hill, 1955.

Townsend, B. *Pal Colour Television*. C.U.P., 1970.

Zworykin, V. K. & Morton, G. A. *Television*. Wiley.

### 6.383 Biomedical Engineering

A course designed to introduce electrical engineering students to the practice of engineering techniques applied to the biological and medical fields. The lectures are supplemented by demonstrations and experimental work, and deal with the basic physiology of cells, tissues, organs and organisms, instrumentation and measurement techniques and modelling of various types of biological systems.

#### TEXTBOOK

No set text.

#### REFERENCE BOOKS

To be advised in class.

### 6.412 Automatic Control

Principles and techniques applicable to the analysis and design of feedback control systems encountered in industrial processes. Frequency transform and state space methods for compensation and stability analysis of single-input single-output linear systems. Extension to include some common nonlinearities. Optimum design including identification of process parameters by both on- and off-line methods.

#### TEXTBOOK

(i) *Fourteen-week Course:*

Stapleton, C. A. *Basic Control—Classic and Modern*. Univ. of N.S.W.

(ii) *Twenty-week Course:*

Takahashi, Y. et al. *Control and Dynamic Systems*. Addison-Wesley, 1970.

#### REFERENCE BOOKS

Melsa, J. L. & Schultz, D. G. *Linear Control Systems*. McGraw-Hill, 1969.

Ogata, K. *Modern Control Engineering*. Prentice-Hall, 1970.

Saucedo, R. & Schiring, E. *Introduction to Continuous and Digital Control Systems*. Macmillan, 1968.

Stapleton, C. A. *Basic Control—Classic and Modern*. Univ. of N.S.W.

Takahashi, Y. et al. *Control and Dynamic Systems*. Addison-Wesley, 1970.

**6.422 Computer Control**

The principles of plant modelling, parameter estimation and optimal control in the computer control of complex processes. The mathematical representation of physical processes. Analogue, digital and hybrid simulation of physical processes. Concepts basic to optimization. Parameter and state estimation in linear systems by regression methods. Parameter and state estimation in linear and nonlinear systems using parameter influence coefficients. Optimal control theory. Adjoint variable techniques applied to parameter and state estimation. The implementation of optimal control.

**TEXTBOOK**

No set text.

**REFERENCE BOOKS**

To be advised in class.

**6.512 Advanced Semiconductor Device Theory**

Characteristics and limitations of semiconductor devices as functions of operating point and environment. Devices include high-frequency and power transistors, FETs, thyristors and negative resistance devices.

**TEXTBOOK**

Lindmayer, J. & Wrigley, C. *Fundamentals of Semiconductor Devices*. Van Nostrand, 1965.

**REFERENCE BOOKS**

Gentry, F. et al. *Semiconductor Controlled Rectifiers*. Prentice-Hall.

Gosling, W., Townsend, W. & Watson, J. *Field Effect Electronics*. Butterworths, 1971.

Grove, A. S. *Physics and Technology of Semiconductor Devices*. Wiley, 1967.

Van der Ziel, A. *Solid State Physical Electronics*. 2nd ed. Prentice-Hall, 1968.

**6.522 Transistor and Integrated Circuit Design**

Development of theory of transistor operation including high injection level effects and three dimensional geometry effects. Kinetics of epigrowth, diffusion and oxide growth as far as these are required to permit the student to specify process cycles. Design of transistor in terms of desired diffusion profiles, oxide growth thicknesses, and the specification of process cycles. Extension of the above to passive components as used in integrated circuits. Design aspects of integrated circuits, covering aspects peculiar to integrated circuits such as distributed parameters, parasitic couplings, correlated component tolerances and variations, special D.C. biasing methods.

**TEXTBOOKS**

Lynn, D. K., Meyer, C. S. & Hamilton, P. J. *Integrated Circuits*. Vol. II. Motorola Series in Solid-State Electronics. McGraw-Hill, 1967.

Warner, R. W. & Fordemwalt, J. N. *Integrated Circuits*. Vol. I. Motorola Series in Solid-State Electronics. McGraw-Hill.

**REFERENCE BOOKS**

To be advised in class.

**6.612 Computer Systems Engineering**

Switching circuits, memory systems, control and sequencing methods, digital to analogue and analogue to digital converters, input output and display devices. Data representation in machines, system architecture, multi-processor systems. Fundamentals of software systems and languages.

Analog and hybrid computing; or advanced machine organization and construction.

#### TEXTBOOK

Hill, F. J. & Peterson, G. R. *Introduction to Switching Theory and Logical Design*. Wiley.

or

Lewin, C. G. *Logical Design of Switching Circuits*. Nelson.

#### REFERENCE BOOKS

Bartee, T., Lebow, I. L. & Reed, I. S. *Theory and Design of Digital Machines*. McGraw-Hill.

Bell, C. G. & Newell, A. *Computer Structures, Readings and Examples*. McGraw-Hill.

Chu, Y. *Digital Computer Design Techniques*. Wiley.

Givone, D. D. *Introduction to Switching Circuit Theory*. McGraw-Hill.

McCluskey, E. J. *Introduction to the Theory of Switching Circuits*. McGraw-Hill, 1965.

Marcovitz, A. B. & Pugsley, J. H. *An Introduction to Switching System Design*. Wiley, 1971.

Marcus, M. P. *Switching Circuits for Engineers*. 2nd ed. Prentice-Hall, 1967.

Peatman, J. B. *The Design of Digital Systems*. McGraw-Hill, 1972.

### 6.622 Computer Application and Software

Topics chosen from the following: simulation, heuristics, numerical analysis, mathematical optimization, data structures, machine organization, high-level languages, compilers and operating systems.

#### REFERENCE BOOK

Gear, C. W. *Computer Organisation and Programming*. McGraw-Hill.

### 6.801 Electrical Engineering

Presentation of principles of circuit theory and elementary electronics, transformers, electrical machines and instrumentation.

#### TEXTBOOK

Smith, R. J. *Circuits Devices and Systems*. 2nd ed. Wiley.

#### REFERENCE BOOKS

Del Toro, V. *Electrical Engineering Fundamentals*. Prentice-Hall.

(Earlier version published as *Principles of Electrical Engineering*. Prentice-Hall.)

Hammond, S. B., & Gehmlich, D. K. *Electrical Engineering*. 2nd ed. McGraw-Hill.

Hayt, G. & Hughes, W. *Introduction to Electrical Engineering*. McGraw-Hill.

### 6.802 Electrical Engineering

Study of electrical and electronic equipment, with emphasis on analogue and digital techniques applicable to the electrical measurement of non-electrical quantities. Open-loop and closed-loop control systems and some of their applications to instrumentation.

#### TEXT AND REFERENCE BOOKS

To be advised in class.

**6.811 Electronic Instrumentation for Surveyors**

Measurement of time, frequency and distance, Propagation of electromagnetic waves affecting the accuracy of tellurometry, time measurement, position finding and navigational aids.

**TEXTBOOK**

No set text.

**REFERENCE BOOKS**

To be advised in class.

**6.822 Electronics**

Conduction in solids; electron emission, vacuum tubes and applications; solid state diodes, transistors, thyristors, unijunction transistors, amplifiers, feed back; block diagrams of complete systems.

**TEXTBOOK**

Smith, R. I. *Circuits, Devices and Systems Theory*. 2nd ed. Wiley, 1972.

**6.841 Electronic Instrumentation**

Fundamentals of electronic instrumentation, in particular the operation and use of equipment at audio and sub-audio frequencies for the measurement and recording of small signals in the presence of noise. The laboratory course comprises mainly demonstration experiments. Up to four weeks of field instruction will be included in the course.

**TEXT AND REFERENCE BOOKS**

To be advised in class.

**6.911 Thesis**

For students in the fourth year of the BE course.

**6.931 Group Thesis**

For students in the fourth year of the BE course.

## SCHOOL OF CIVIL ENGINEERING

### 8.010 Project

*Co-requisites:* 8.152 Structures and 8.531 Water Engineering.  
Assignments in civil engineering topics.

### 8.011 Project

### 8.012 Architecture

Introduction concerning the influence of structural technique in the past on Architectural styles. Effect of modern structural engineering systems on Architecture. Responsibilities of the structural engineer as a consultant.

### 8.013 Bridge Engineering

Not compatible with 8.019 Railway Engineering.

*Pre-or corequisite:* 8.153.

Types of Bridges, Economics, proportions, aesthetics, history. Structural factors in bridge design. Aspects of design of steel, reinforced concrete, prestressed concrete, and composite bridges.

### 8.014 Computer Applications in Civil Engineering

*Pre-or corequisite:* 8.153/8.532.

Programming, revision of Fortran, introduction to PL1. Some numerical techniques used in computing. Applications of computers to problems in structural analysis, systems engineering, water engineering, engineering practice and geomechanics.

#### TEXTBOOKS

Cole, R. W. *Introduction to Computing*. McGraw-Hill.

Peterson, W. W. & Holz, J. L. *Fortran IV and The IBM 360*. McGraw-Hill.

#### REFERENCE BOOKS

Bates, F. & Douglas, M. L. *Programming Language One*. Prentice-Hall.

Blatt, J. M. *Introduction to Fortran IV Programming*. Goodyear.

### 8.015 Road Engineering

*Pre-or corequisite:* 8.631.

Planning, location and design of roads in urban and rural areas. Properties of bitumen and pavement design. Computer applications and the use of aerial photographs in road design.

### 8.016 Hydraulics

*Pre-or corequisite:* 8.532.

Use of hydraulic models for rivers and coastal works. Further studies in open channel flow and estuarine hydraulics.

### 8.017 Transportation Engineering

History, development and characteristics of modes of transport. Fundamentals and evaluation of transport systems—performance and output. Interaction between land use and traffic demand.



**8.018 Construction and Administration**

*Pre-or corequisite: 8.631.*

Advanced construction methods and techniques. Practical construction organization and management.

**8.019 Railway Engineering**

Not compatible with 8.013 Bridge Engineering.

*Pre-or corequisite: 8.631.*

First half of subject consists of the Session 1 lectures and tutorials of the Bridge Engineering elective, the second half is devoted to railway engineering. It includes railway geometry, track rails, traffic, railway development.

**8.020 Hydrology**

*Pre-or corequisite: 8.532.*

Flood estimation with particular reference to design and flood forecasting. Outline of current practices and recent developments. Discussion of possible/likely implications of recent developments for the practising engineer.

**8.021 Environmental Aspects of Civil Engineering**

An interdisciplinary study of the possible aesthetic and ecological effects of Civil Engineering activities on the environment.

**TEXTBOOKS**

Meadows, D. H. et al. *The Limits to Growth*. Earth Island, 1972.

**REFERENCE BOOKS**

Detwyler, T. R. *Man's Impact on Environment*. McGraw-Hill, 1971.

Mumford, L. *The City in History*. Secker & Warburg, 1961.

Odum, E. P. *Fundamentals of Ecology*. 3rd ed. Saunders, 1971.

**8.022 Elasticity and Plasticity**

*Pre-or corequisite: 8.153.*

Aspects of the elasticity and plasticity theories to solution of stress distribution and stability problems.

**8.023 Flow in Porous Media**

*Pre-or corequisite: 8.532.*

Analysis of flow in saturated and unsaturated porous media systems. Application of analytical results to relevant problems in Civil Engineering practice.

**8.024 Foundation Engineering**

*Pre-or corequisite: 8.253.*

In depth study of selected topics in foundation.

**8.025 Structural Concrete**

*Pre-or corequisite: 8.253.*

Study of the application of concrete technology to engineering practice.

**8.026 Systems Methods in Civil Engineering**

Theory and applications of operations research and systems analysis in decision making, optimization, networks, stochastic processes, or system modelling.

**8.027 Timber, Plastics and Composite Engineering**

*Pre-or corequisite: 8.253.*

Properties and applications of timber and developing materials.

**8.051 Design Projects I**

Final year design projects in the fields of structural engineering and civil engineering materials

**8.052 Design Projects II**

Final year design projects in the fields of hydraulics, water resources, planning and management.

**8.111 Civil Engineering**

*Theory of Structures* — Stress; strain; elastic and inelastic deformation. Principal stresses and strains. Compound bars and temperature stresses. Direct stresses and shear stresses in beams. Deflection of beams. Torsion of circular and thin-walled sections. Combined bending, twisting and axial force. Instability of bars in compression.

*Properties of Materials* — Characteristic modes of deformation and fracture of materials under load. Response to steadily applied tension, compression and shear. Response to oscillatory stress, rapidly applied stress and long-term stress. Effect of shape and environmental factors. Critical stress conditions for deformation and fracture. Standard tests of mechanical properties.

*Metallurgy* — Structure of solids. The crystalline nature of metals and ceramics. Defects in crystals and their influence on the behaviour of metals. Solidification of metals. Phase equilibria in metallic alloys. Zone refining and zone levelling. Strengthening mechanisms in solids. Magnetic materials. Corrosion of metals. Ceramics and polymers. Application of the above to electrical and magnetic materials.

**TEXTBOOK**

Hall, A. S. *Introduction to the Mechanics of Solids*. SI ed. Wiley, 1973.

**REFERENCE BOOKS**

Davis, H. E., Troxell, G. E. & Wiskocil, G. T. *Testing and Inspection of Engineering Materials*. McGraw-Hill.

Richards, C. W. *Engineering Materials Science*. Chapman & Hall.

**8.112 Materials and Structures**

*Theory of Structures* — Moduli of elasticity, simple stress and strain. Compound bars, temperature stresses. Thin shells. Stress at a point. Strain at a point. Principal stresses and strain. Relationship between load, shear force and bending moment. Moments of inertia, principal moments of inertia. Stresses due to axial force, bending moment shear force, and torsion. Differential equations of simple beam theory. Deflection of beams. Statically indeterminate beams. Strain energy. Deflections at a single load. Shock loads. Theory of centrally loaded column and eccentrically loaded columns.

*Properties of Materials* — Mechanical behaviour of materials; response to static and dynamic loads. Laboratory techniques. Analysis and presentation of experimental results. Use of material properties in analysis and design.

## REFERENCE BOOKS

- Davis, H. E., Troxell, G. E. & Wiskocil, G. T. *Testing and Inspection of Engineering Materials*. McGraw-Hill.  
Hall, A. S. *Mechanics of Solids*. Wiley, 1968.  
Lancaster, P. R. & Mitchell, D. *The Mechanics of Materials*. McGraw-Hill.  
Richards, C. W. *Engineering Materials Science*. Chapman & Hall.  
Shanley, F. R. *Strength of Materials*. McGraw-Hill.

**8.151 Mechanics of Solids**

Statics of bars. Geometrical properties of plane figures. Stress and strain; uniaxial stress. Stresses and deformations due to bending, shear and torsion. Stress and strain at a point; combined stresses. Assemblages of bars and beams. Structural instability. Dynamic loading.

## TEXTBOOK

Hall, A. S. *Introduction to the Mechanics of Solids*. SI ed. Wiley, 1973.

## REFERENCE BOOKS

- Popov, E. P. *Introduction to Mechanics of Solids*. Prentice-Hall.  
Shanley, F. R. *Strength of Materials*. McGraw-Hill.  
Smith, J. O. & Sidebottom, O. M. *Elementary Mechanics of Deformable Bodies*. Macmillan.

**8.152 Structures**

- (a) *Steel Structures*: Introduction to steel as a building material. Safety precautions. Load factors. Factor of safety. Protection of steel structures. Riveted, bolted (including high strength friction grip and mild steel), welded connections. Design of simple tension members. Design of simple plain and built-up-beams including restrictions imposed by lateral instability and local buckling. Design of single columns. Design of integrated beam-columns in rigid frames. Design of simple pin jointed frames. Introduction to elastic design of rigid frames and multi-storey buildings. Implications of code AS 1250—1972 "Steel Structures Code", and associated codes on manual welding, high strength friction grip bolting, dead, live and wind loads on structures.
- (b) *Concrete Structures*: Introduction to concrete as a building material. Development of reinforced concrete and philosophy of design. Behaviour of beams under pure bending. Working stress method of design. Development of strength equation for pure bending. Design of beams to resist bending moment. Design of continuous beams. Design of beams under bending and shear. Development of bending and shear equations. Design of beams for shear. Design of one way slabs. Bond and anchorage. Behaviour of reinforced concrete under axial loads. Strength equations for combined uni-axial bending and axial force. Design simplifications. Interaction diagrams. Analysis and design of columns. Serviceability requirements for concrete structures. Introduction to torsion design. Implications of Code CA 1972 "Concrete in Buildings".
- (c) *Analysis*: Moment distribution, including sideway with several degrees of freedom. Frames with members which are not mutually orthogonal. Stability, concepts of bifurcation and snap-through, stability of simple mechanisms with linear material response. Discussion of the effects of plastic material response. Virtual work: virtual forces and virtual displacements. Application to trusses. Displacements of static-

ally determinate pin-jointed trusses, matrix methods. Concept of generalized forces, application to truss deflections. Connectivity matrix. Flexibility analysis of simple statically indeterminate trusses. Calculation of displacements in simple structures by the method of volume integrals. Brief treatment of influence lines for statically determinate and indeterminate structures.

### TEXTBOOKS

White R. N. & Gergely, P. *Structural Engineering*. Vol. 2: *Intermediate Structures*. Wiley.

Winter, G. et al. *Design of Concrete Structures*. 8th ed. McGraw-Hill.

*Steel Design Course. Part 1—Design of Beams & Columns. Part 2—Tension Members & Plastic Design*. Australian Institute of Steel Construction, North Sydney, 1971.

AS 1250—1972. *SAA Steel Structures Code*. (Metric Units)

CA2—1973. *SAA Concrete Structures Code*. (Imperial Units)

CA8—Part 1—1965. *SAA Code for Welding in Buildings. Part 1—Manual Welding*.

AS 1170.1—1971. *SAA Loading Code. Part 1—Dead & Live Loads*. (Metric Units)

ASCA 34—Part II—1971. *SAA Loading Code. Part II—Wind Forces*.

ASCA 45—1970. *SAA High Strength Bolting Code*.

### REFERENCE BOOKS

Bresler, B., Lin, T. Y. & Scalzi, J. B. *Design of Steel Structures*. 2nd ed. Wiley, 1968.

Ferguson, P. M. *Reinforced Concrete Fundamentals*. Wiley.

## 8.153 Structures

*Analysis*. Introduction to three-dimensional theory of elasticity. Stress, strain, Hooke's Law, strain compatibility. Three-dimensional principle of virtual displacements. Forces and displacements in statically determinate and indeterminate pin-jointed structures; matrix formulation. Forces and displacements in rigid jointed structures; matrix formulation. Introduction to elastic stability dynamic behaviour of structures.

*Design of Structures*. Design of continuous structures in reinforced concrete. Introduction to ultimate strength design in reinforced concrete. Elements of prestressed concrete. Pre-tensioning and post-tensioning. Design by permissible stress. Checking ultimate-strength of members. Applications limited to statically determinate structures.

Extension of earlier work on steel design to include continuous structures; design of a single storey continuous gable-framed structure using permissible stress method, with emphasis on design of welded joints for continuity. Introduction to plastic method of design of steel structures. Load factor. Principle of redistribution of moments. Simple application such as design of continuous beams.

Timber design. Emphasis on special properties of timber affecting design of timber structures.

Earth retaining structures.

### TEXTBOOK

A.S. Code CA35—1973.

## REFERENCE BOOKS

*Analysis*

- Hoff, N. J. *The Analysis of Structures*. Wiley, 1956.  
 Laursen, H. I. *Structural Analysis*. McGraw-Hill, 1969.  
 Livesley, R. K. *Matrix Methods of Structural Analysis*. Pergamon, 1964.  
 Neal, B. G. *The Plastic Methods of Structural Analysis*. 2nd ed. Chapman & Hall, 1965.

*Design*

- Beedle, L. S. *Plastic Design of Steel Frames*. Wiley.  
 Bresler, B., Lin, T. Y., & Scalzi, J. B. *Design of Steel Structures*. Wiley, 1968.  
 Ferguson, P. M. *Reinforced Concrete Fundamentals*. Wiley.  
 Gerstle, K. H. *Basic Structural Design*. McGraw-Hill.  
 Lin, T. Y. *Design of Prestressed Concrete Structures*. Wiley.  
 Pearson, R. G. et al. *Timber Engineering Design Handbook*. M.U.P.  
 Winter, G., Urquhart, L. C., O'Rourke, C. E. & Nilson, A. H. *Design of Concrete Structures*. 7th ed. McGraw-Hill, 1964.

**8.154 Structures**

*Analysis:* Revision of Energy Theorems. Revision of force method of solving pin-jointed trusses. Extension to rigid-framed structures. Treatment of members of variable cross section. Plastic analysis of steel frames. Stiffness analysis of pin-jointed trusses and rigid-framed structures, including members of variable cross section.

## TEXTBOOK

- White R. N. & Gergely, P. *Structural Engineering*. Vol. 2: *Intermediate Structures*. Wiley.

## REFERENCE BOOK

- Neal, B. G. *The Plastic Methods of Structural Analysis*. 2nd ed. Chapman & Hall, 1965.

*Design of Structures*. As for 8.153.

## REFERENCE BOOKS

As for 8.153.

**8.161 Engineering Mathematics**

*Probability and Statistics* — Introduction to probability. Random variables and standard elementary distributions. Sampling distributions. Statistical inference, hypotheses testing. Engineering applications.

*Engineering Computations* — Flow charts and computer programming. Error propagation. Interpolation, finite differences and regression analysis. Solution of simultaneous equations, matrix operations and eigenvalue problems. Numerical integration and solution of ordinary and partial differential equations.

## TEXTBOOKS

- Freund, J. E. *Mathematical Statistics*. Prentice-Hall, 1962.  
 Salvadori, M. G. & Baron M. L. *Numerical Methods in Engineering*. 2nd ed. Prentice-Hall, 1962.

## REFERENCE BOOKS

- Calderbank, V. J. *A Course in Programming in Fortran IV*. Chapman & Hall and Science Paperbacks, 1969.

- Guttman, I. & Wilks, S. S. *Introductory Engineering Statistics*. Wiley, 1965.  
McCracken, D. D. & Dorn, W. S. *Numerical Methods & Fortran Programming*. Wiley, 1964.  
McCormick, J. M. & Salvadori, M. G. *Numerical Methods in Fortran*. Prentice-Hall, 1964.

### 8.171 Mechanics of Solids I

This subject forms part of 5.030 Engineering C.

Statics of bars, bending moment, shear force, axial force for simple problems. Areas, first and second moment of areas. Concepts of stress, strain. Stress and deformation due to axial force; linear and non-linear. Stresses and deformation due to bending; linear-step functions. Shear stresses in beams. Principal stresses. Torsion of circular sections.

#### TEXTBOOK

Hall, A. S. *Introduction to the Mechanics of Solids*. SI ed. Wiley, 1973.

### 8.172 Mechanics of Solids II

Statics of bars, general case. Bending, non-linear stresses, area-moment methods, conjugate beam. Stresses and deformation due to shear, thin-walled sections, shear centre. Torsion in thin-walled sections and non-circular sections. Principal stresses and strains. Relation between elastic constants. Combined stresses. Bar assemblies. Instability. Dynamic loading.

#### TEXTBOOK

Hall, A. S. *Introduction to the Mechanics of Solids*. SI ed. Wiley, 1973.

#### REFERENCE BOOKS

- Popov, E. P. *Introduction to Mechanics of Solids*. Prentice-Hall.  
Shanley, F. R. *Strength of Materials*. McGraw-Hill.  
Smith, J. O. & Sidebottom O. M. *Elementary Mechanics of Deformable Bodies*. Macmillan.

### 8.173 Structural Analysis I

Aims of structural analysis. Virtual work; contragredience in scalar form. Forces and deformation of statically determinate trusses. Flexibility analysis of indeterminate trusses. Moment distribution. Influence lines. Concept of volume integrals. Forces and deformation of statically determinate rigid-jointed structures. Flexibility analysis.

#### TEXTBOOK

White, R. N., Gergely, P. & Sexsmith, R. G. *Structural Engineering*. Vol. 1. *Introduction to Design Concepts and Analysis*. pp. 1-260. Wiley, 1972.

### 8.174 Structural Analysis II

Plastic analysis of steel structures. Variational forms of the work theorems. Force and displacement transformations. Contragredience in matrix form. Maxwell-Betti theorem. Stiffness analysis of trusses. Stiffness analysis of frames.

### 8.181 Structural Design I

Introduction to structural design. Design loads, factors of safety, load factors, codes of practice.

## TEXTBOOK

Morgan, W. *The Elements of Structures*. Pitman, 1968. Paperback.

## REFERENCE BOOKS

Gerstle, K. H. *Basic Structural Design*. McGraw-Hill, 1967.

Salvadori, M. & Heller, R. *Structure in Architecture*. Prentice-Hall, 1963.

**8.182 Structural Design II**

Design of reinforced concrete structures by ultimate strength and working stress design methods. Simple and continuous beams and slabs; columns; footings; retaining walls; two-way slabs and flat slabs.

Design of statically determinate prestressed concrete beams. Pretensioning and post-tensioning. Design for working stresses and ultimate flexural strength. End block design.

**8.191 Structural Engineering**

- (a) Dynamic analysis. Cable structures. Plates and shells. Finite elements.
- (b) Timber design. Emphasis on special properties of timber affecting the design of timber structures. Introduction to plastic design of steel structures. Application to continuous beams and portal frames.

**8.241 Geomechanics**

Introductory mechanics of solids and properties of materials. Stress and strain. Elasticity and plasticity. Mohr's Circle concepts. Materials testing. Brief review of theories of yield and failure. Engineering behaviour of natural materials. Soil/rock classification. Role of water and effective stress. Consolidation characteristics and shear strength of soils. Active and passive pressure states. Brief treatment of stability of foundations, slopes and earth/rock fill dams. Failure in rock structures. Preferred failure plane orientations. Design of rock bolting grids. Laboratory/tutorial. Engineering tests of soil and rock. Use of testing data to check designs of road pavements, foundations and earth/rock fill dams.

## TEXTBOOKS

Farmer, I. W. *Engineering Properties of Rocks*. Spon, 1968.

Terzaghi, K. & Peck, R. B. *Soil Mechanics in Engineering Practice*. 2nd ed. Wiley, 1967.

## REFERENCE BOOKS

Grim, R. *Applied Clay Mineralogy*. McGraw-Hill, 1962.

Jaeger, J. C. *Elasticity, Fracture and Flow*. 3rd ed. Methuen, 1969.

*Soil Mechanics for Road Engineers*. H.M.S.O., 1959.

## 8.250 Properties of Materials

Mechanical behaviour of materials. Response to static loading in tension, compression, shear and bending. Use of static test data in analysis and design; variability of material properties; factors of safety. Hardness tests. Creep in solid materials. Response to dynamic loading; fatigue; impact. Deterioration of engineering materials. Rheological classification of materials.

### TEXTBOOK

Polakowski, N. H., & Ripling, E. J. *Strength and Structure of Engineering Materials*. Prentice-Hall, 1966.

### REFERENCE BOOKS

Davis, H. E., Troxell, G. E., & Wiskocil, G. T. *Testing and Inspection of Engineering Materials*. McGraw-Hill.

Mann, J. Y. *Fatigue of Materials*. M.U.P.

Marin, J. *Mechanical Behaviour of Engineering Materials*. Prentice-Hall, 1962.

Richards, C. W. *Engineering Materials Science*. Chapman & Hall.

## 8.252 Civil Engineering Materials

*Concrete Technology* — Properties of concrete and its applications; structure and composition. Rheological properties of fresh concrete. Mechanical properties of hardened concrete. Mix design. Methods of testing constituent materials.

*Soil Mechanics* — Pressure and movement of soil moisture, effective stress. Consolidation and settlement. Shear strength and testing of soils. Elastic theory of soil stress. Stability of slopes. Lateral earth pressure, retaining walls.

### TEXTBOOKS

Lambe, T. W., & Whitman, R. V. *Soil Mechanics*. Wiley, 1969.

Troxell, G. E., Davis, H. E., & Kelly, J. W. *Composition and Properties of Concrete*. 2nd ed. McGraw-Hill, 1968.

### REFERENCE BOOKS

Ackroyd, T. N. W. *Concrete Properties and Manufacture*.

A.S.T.M. Standards, Part 10. *Concrete and Mineral Aggregates*. Amer. Soc. for Testing Materials (revised annually in Oct.) Philadelphia.

Bishop, A. W. & Henkel, D. J. *The Measurement of Soil Properties in the Triaxial Test*. Arnold.

BSI Specification (current editions) B.S12 *Portland Cement (Ordinary and Rapid Hardening)*; B.S812 *Sample and Testing of Mineral Aggregates, Sands and Fillers*; B.S882 *Concrete Aggregates from Mineral Sources*; B.S1881 *Methods of Testing Concrete*. Br. Stand. Instit. London.

*Concrete Manual*. U.S. Bureau of Reclamation.

*Design, Control and Characteristics of Concrete*. Cement & Concrete Association of Australia.

Fulton, F. S. *Concrete Technology*. Portland Cement Instit. 1964. Johannesburg.

Robson, T. D. *High Alumina Cements and Concretes*. Contractors Record 1962, London.



- S.A.A. Code CA2 Concrete in Buildings.* Stand. Assoc. of Aust. (incl. 1968 amendments).
- S.A.A. Specifications* (current editions) *A2 Portland Cement*;  
*A64 Ready Mixed Concrete*; *A167-170 Aggregates for Concrete*;  
*A100-A113 Methods of Testing Portland Cement Concrete*;  
*A130 Los Angeles Test for Coarse Aggregate.* Stand. Assoc. of Aust.
- Soil Mechanics for Road Engineers.* H.M.S.O.
- Taylor, W. H. *Concrete Technology and Practice.* 3rd ed. A. & R.
- Terzaghi, K. *Theoretical Soil Mechanics.* Wiley.
- Terzaghi, K. & Peck, R. B. *Soil Mechanics in Engineering Practice.* 2nd ed. Wiley, 1967.

## 8.253 Civil Engineering Materials

*Part I — Materials of Construction.* The mechanical behaviour of real materials; elasticity, inelasticity, plasticity, anelasticity and damping. Multi-phase theory of elastic behaviour. Theories of failure.

Structural steel. Resumé of metallurgy, manufacture and types of steels. Specifications for and selection of steels; precautions. Corrosion protection. Structural aluminium alloys, properties, selection, applications and limitations. Polymers. Structural applications of plastics, reinforced plastic and plastic laminates. Wood technology. Structural model materials.

Concrete: mechanical properties. Multi-phase theory of elastic behaviour, effect on deflection of structural members. Bond with reinforcement. Volume change. Influence on stress distribution of reinforced and prestressed concrete members and mass concrete. Special requirements in design and construction methods. Durability. Permeability, extensibility and crack resistance. Thermal effects, residual stresses. Physical and chemical deterioration. Concrete manufacture, field control and acceptance. Special non-destructive tests. Special applications. Non-destructive testing and methods of measurement.

*Laboratory.* Examination of concrete properties and concrete-making materials; proportioning methods; analysis, manufacture and testing of reinforced concrete members.

### REFERENCE BOOKS

- A.C.I. *Manual of Concrete Practice.* 3 vols. 1968.
- A.S.T.M. Standards, Part 10. *Concrete and Mineral Aggregates.* Amer. Soc. for Testing Materials (revised annually in Oct.), Philadelphia.
- Beuche, F. *Physical Properties of Polymers.* Wiley.
- Concrete Manual.* U.S. Bureau of Reclamation.
- Desch, H. E. *Timber, Its Structure and Uses.* 3rd ed. Macmillan.
- Fulton, F. S. *Concrete Technology.* Portland Cement Inst., Johannesburg, 1964.
- Hayden, H. W., Moffatt, W. G. & Wulff, J. *The Structure and Properties of Materials.* Vol. III: *Mech. Behaviour.* Wiley, 1967.
- Murdock, L. J., & Blackledge, G. F. *Concrete Materials and Practice.* 4th ed. Arnold.
- Neville, A. M. *Properties of Concrete.* Pitman, 1963.
- S.A.A. Specifications* (current editions) *A64 Ready Mixed Concrete*;  
*A77 Aggregates for Concrete*; *A100-A111 Methods of Testing Portland Cement Concrete.* Stand. Assoc. of Aust.
- S.A.A. Code CA2 Concrete in Buildings.* Stand. Assoc. of Aust.

Short, A. & Kinniborh, K. *Lightweight Concrete*. Contractors Record. London, 1963.

Taylor, W. H. *Concrete Technology and Practice*. A. & R., 1965.

Wangarrd, F. F. *The Mechanical Properties of Wood*. Wiley.

### Part II — Soil Engineering

Foundation engineering; bearing capacity theory; allowable settlement, shallow and deep foundations; rafts; pile groups; site investigation as applicable to foundation design. Earth and rockfill dams, types, materials, stability analysis and design, construction problems. True shear strength of saturated soils, modern failure theories, yield criteria and yield surface theories applied to soil behaviour. Non-saturation; mechanics of unsaturated flow, soil suction, shear strength of unsaturated soils, drainage process.

*Laboratory*. Consolidation and shear strength testing of cohesive and granular soils. Evaluation of simple earth pressure, foundation engineering and earth dam theory.

### TEXTBOOKS

Lambe, T. W., & Whitman, R. V. *Soil Mechanics*. Wiley, 1969.

Terzaghi, K., & Peck, R. B. *Soil Mechanics in Engineering Practice*. 2nd ed. Wiley, 1967.

### REFERENCE BOOKS

Bishop, A. W., & Henkel, D. J. *The Measurement of Soil Properties in the Triaxial Test*, Arnold.

Lee, I. K. ed. *Soil Mechanics—Selected Topics*. Butterworth, 1968.

Terzaghi, K. *Theoretical Soil Mechanics*. Wiley.

Troxell, G. E., & Davis, H. E. *Composition and Properties of Concrete*. 2nd ed. McGraw-Hill, 1968.

## 8.254 Civil Engineering Materials

*Part I — Concrete: mechanical properties*. Multi-phase theory of elastic behaviour, effect on deflection of structural members. Bond with reinforcement. Volume change. Special requirements in design and construction methods. Durability. Permeability, extensibility and crack resistance. Thermal effects, residual stresses. Physical and chemical deterioration. Concrete manufacture, field control and acceptance.

*Laboratory*. Examination of concrete and concrete materials; aggregate testing, mix design, mechanical properties of concrete.

### Part II — Soil Engineering

Foundation engineering; bearing capacity theory; allowable settlement, shallow and deep foundations; rafts; pile groups; site investigation as applicable to foundation design. Earth and rockfill dams, types, materials, stability analysis and design, construction problems.

*Laboratory*. Consolidation and shear strength testing of cohesive and granular soils. Evaluation of simple earth pressure, foundation engineering and earth dam theory.

### TEXT AND REFERENCE BOOKS

As for 8.253.

## 8.259 Properties of Materials

8.250—Properties of Materials, *plus* the structure and properties of binary alloys; control of structure and properties, commercial alloys, materials selection.

## TEXT AND REFERENCE BOOKS

As for 8.250.

**8.271 Introduction to Materials**

(This subject forms part of 5.010 Engineering A and 5.020 Engineering B.)

Traditional and new materials. Structure of crystalline and amorphous solids. Phase diagrams. Transformations at constant temperature and constant cooling rate. Mechanical properties of materials. Ductile and brittle fracture. Creep. Fatigue. Experimental techniques. Effect of temperature on properties of materials. Polymers. Elastomers. Ceramics.

## TEXTBOOKS

Gordon, J. E. *The New Science of Strong Materials*. Pelican.

Wulff, J. et al. *The Structure and Properties of Materials*, Vols I, II & III. Wiley.

**8.272 Civil Engineering Materials I**

Crystal structures, planes and directions. Examinations of crystals by X-ray, electron and neutron diffraction techniques. Defects. Properties of metals and metallic alloys in terms of modern theories. Development of alloys for specific engineering applications. Structure and chemistry of polymers including wood. Structure of silicates. Clays. Cement. Chemistry of cements. Formation, structure and classification of rocks and soils. Geotechnics and structural geology. Structural characteristics, and mapping. Use of petrological microscope. Interpretation of mechanical properties on basis of structure of materials.

## TEXTBOOK

Polakowski, N. H. & Ribling, E. J. *Strength and Structure of Engineering Materials*. Prentice-Hall, 1966.

**8.273 Civil Engineering Materials II**

Failure theories for ductile and brittle materials. Rheological models of stress-strain-time behaviour. Statistical concepts applied to interpretation and prediction of material behaviour. Welding processes. Equipment. Welding metallurgy. Shrinkage and distortion. Residual stresses. Weld specifications. Stability analysis of foundation, rigid and flexible retaining walls, earth and rock slopes. Settlement studies of isolated footings, piles and raft foundations. Earth and rock fill dams. Site investigations. Application of statistics to geotechnical engineering. Types of components. Reinforcement. Mechanical properties. Developments in components.

### 8.274 Civil Engineering Materials III

Fracture mechanics, specification of materials, field control. Corrosion of metallic and non-metallic materials. Fatigue. Properties of concrete. Structure and composition. Rheological models of fresh concrete. Mix design. Additives. Multi-phase theory of elastic behaviour. Bond. Creep. Shrinkage. Physical and chemical deterioration. Permeability. Non-destructive testing. Mechanical and physical properties of reinforced polymers. Principles of adhesives. Bond. Properties of timber.

### 8.280 Civil Engineering Materials

Interatomic and interparticle forces. Chemistry of silicates and polymers. Elements of crystallography. Ceramics. Deformation of crystalline materials. Liquid solid transformations. Equilibrium phase diagrams. Application of equilibrium phase diagrams. Examination of structure of materials by X-ray diffraction, optical and electron microscopy. Differential thermal analysis. Corrosion. Relationship of structure to mechanical behaviour of materials. Characteristics of materials under tensile, compressive and shear stresses. Creep and relaxation. Behaviour under dynamic loading. Fatigue. Brittle fracture. Hardness.

*Laboratory:* Approximately 51 hours of laboratory/tutorial studies with emphasis on the study of structure and the relationship of structure to mechanical properties of a range of materials.

#### TEXTBOOKS

Guy, A. G. *Elements of Physical Metallurgy*. Addison-Wesley.  
Hanks, R. W. *Materials Engineering Science*. Harcourt, Brace & World.  
Polakowski, N. H. & Ripling, E. J. *Strength and Structure of Engineering Materials*. Prentice-Hall, 1966.

#### REFERENCE BOOKS

Alexander, W. & Street, A. *Metals in the Service of Man*. Pelican.  
Davis, H. E., Troxell, G. E. & Wiskocil G. T. *Testing and Inspection of Engineering Materials*. McGraw-Hill.  
Mann J. Y. *Fatigue of Materials*. M.U.P.  
Marin, J. *Mechanical Behaviour of Engineering Materials*. Prentice-Hall, 1962.  
Wulff, J. ed. *Structure and Properties of Materials*. Vols. I & II. Wiley.

### 8.301 Systems Engineering

Covers the following topics: Systems approach. Basic systems concepts. State space analysis. Concepts of linearity, non-linearity, equilibrium, stability. Modelling and simulation. Deterministic and stochastic system models. Decision theory. Optimization techniques. Linear programming. Dynamic programming. Applications.

#### TEXTBOOK

Meredith, D. D., Wong, K. W., Woodhead, R. W. & Wortman R. H. *Design & Planning of Engineering Systems*. Prentice-Hall, 1973.

## REFERENCE BOOKS

- de Neufville, R., & Stafford, J. *Systems Analysis for Engineers and Managers*. McGraw-Hill, 1971.  
Wagner, H. M. *Principles of Operations Research*. Prentice-Hall.

**8.351—Engineering Mathematics**

As for 8.161 Engineering Mathematics.

**8.510 Hydraulics**

Fluid properties; hydrostatics, stability of floating bodies; fluid acceleration; flow patterns, continuity; Euler, Bernoulli, energy and momentum equations. Laboratory experiments.

## TEXTBOOKS

- Giles, R. V. *Fluid Mechanics and Hydraulics*. Schaum's Outline Series. Schaum, N.Y.  
Vennard, J. K. *Elementary Fluid Mechanics*. 4th ed. Wiley, 1961.

## REFERENCE BOOK

- Vallentine, H. R. *Water in the Service of Man*. Penguin, 1967.

**8.531 Water Engineering**

*Hydrology* — The hydrologic cycle, the runoff cycle, water balance, energy balance, circulation of atmosphere, dynamic cooling, condensation and precipitation, probability analysis of precipitation and floods, infiltration, soil water and groundwater hydrology, streamgauging, hydrograph analysis, flood estimation, yield and storage determination, evaporation, evapotranspiration.

*Hydraulics* — Dimensional analysis, hydraulic model theory, scale effect. Fluid turbulence, velocity distribution, surface resistance in flow past plane boundaries and in pipes and channels. Pipe flow, pipe networks, water-hammer. Channel flow, steady non-uniform flow, backwater curves, hydraulic jump, unsteady flow, waves, flood routing. Flow measurement. Hydraulic machinery, radial and axial flow, characteristic curves, cavitation.

*Public Health Engineering* — Elements of organic chemistry, elements of biology, process of decomposition and decay, colloids and colloidal solutions, adsorption, ionic theory and dissociation, chemical and biochemical measurement of degree of pollution, rate of biochemical oxidation, principles of water treatment, principles of sewage treatment.

## TEXTBOOKS

- Giles, R. V. *Fluid Mechanics and Hydraulics*. Schaum's Outline Series. Schaum, N.Y.  
Nemec, J. *Engineering Hydrology*. McGraw-Hill, 1972.  
Tebbutt, T. H. Y. *Principles of Water Quality Control*. Pergamon, 1971.  
Vennard, J. K. *Elementary Fluid Mechanics*. 4th ed. Wiley, 1961.

## REFERENCE BOOKS

- Behr, L. C., Fuson, R. C. & Snyder, H. A. *Brief Course in Organic Chemistry*. Wiley, 1959.  
Bruce, J. P. & Clark, R. H. *Introduction to Hydrometeorology*. Pergamon, 1966.

- Chow, V. T. ed. *Handbook of Applied Hydrology*. McGraw-Hill, 1964.
- Hardenbergh, W. A. & Rodie, E. R. *Water Supply and Waste Disposal*. Internat. Textbook Co., Pa., 1961.
- Henderson, F. M. *Open Channel Flow*. Macmillan.
- Johnstone, D. & Cross, W. P. *Elements of Applied Hydrology*. Ronald, 1949.
- Linsley, R. K. & Franzini, J. B. *Water Resources Engineering*. 2nd ed. McGraw-Hill-Kogahuska, 1972.
- Linsley, R. K., Kohler, M. A. & Paulhus, J. L. *Hydrology for Engineers*. McGraw-Hill, 1958.
- Murray, P. D. F. *Biology*. Macmillan, 1954.
- Stepanoff, A. J. *Axial and Centrifugal Pumps*. Wiley.
- Vallentine, H. R. *Applied Hydrodynamics*. Butterworths, 1967.
- Wisler, C. O. & Brater, E. F. *Hydrology*. 2nd ed. Wiley, 1959.

### 8.532 Water Engineering

*Part I — Hydraulics: Unsteady Flow:* pendulation and surge tanks, water hammer in branching lines, waves in frictionless channels, solitary, periodic and shallow water waves, surges and flood waves, flood routing. *Sediment Theory:* introduction to critical tractive stress and regime theories, design of stable channels in alluvium. *Hydrodynamics:* equations of continuity, motion and vorticity,  $\phi$  and  $\psi$  functions, Laplace equation, standard flow patterns, introduction to method of solution of Laplace equation. Applications to groundwater hydraulics. *Advanced Hydraulics Computations:* solution to selected hydraulic problems including backwater calculations, unsteady flow with friction, pipe networks, surge tanks, water hammer, two-dimensional networks.

*Part II — Applied Water Engineering:* water resources problems and solutions, the systems approach. General principles of regulation and utilisation of water; reservoirs and storage, distribution and transmission, treatment, collection and disposal. Examples of applied water engineering selected from the following fields: water supply, sewerage, irrigation, land drainage, urban drainage, flood control, hydro-electric generation, multi-purpose projects, river channel control, coastal engineering.

#### TEXTBOOK

Vennard, J. K. *Elementary Fluid Mechanics*. 4th ed. Wiley, 1961.

#### REFERENCE BOOKS

- Charts for the Design of Channels*. Hydraulics Research Paper No. 2. H.M.S.O.
- Chow, V. T. ed. *Handbook of Applied Hydrology*. McGraw-Hill.
- Chow, V. T. *Open Channel Hydraulics*. McGraw-Hill.
- Henderson, F. M. *Open Channel Flow*. Macmillan.
- Linsley, R. K. & Franzini, J. B. *Water Resources Engineering*. McGraw-Hill, 1964.
- Raudkivi, A. J. *Loose Boundary Hydraulics*. Pergamon.
- Resistance of Fluids in Channel Pipes*. Hydraulics Research Paper No. 1. H.M.S.O.
- Robertson, J. M. *Hydrodynamics*. Prentice-Hall.
- Rouse, H. ed. *Engineering Hydraulics*. Wiley.
- Streeter, V. L. & Wylie, E. B. *Hydraulic Transients*. McGraw-Hill.
- Vallentine, H. R. *Applied Hydrodynamics*. Butterworths, 1967.

**8.571 Hydraulics I**

Fluid properties; hydrostatics, stability of floating bodies; fluid acceleration; flow patterns, continuity; Euler, Bernoulli, energy and momentum equations.

**8.572 Hydraulics II**

Dimensional analysis, hydraulic model theory, scale effect. Fluid turbulence, velocity distribution, surface resistance in flow past plane boundaries and in pipes and channels. Pipe flow, pipe networks, steady flow in uniform channels.

**8.573 Hydraulics III**

Channel flow, steady non-uniform flow, backwater curves, hydraulic jump. Flow measurement. Unsteady flow in pipes and channels. Hydraulic machinery, radial and axial flow, characteristic curves, cavitation .

**8.581 Water Resources I**

Water pollution and water quality criteria. Sources of supply, collection, transmission and distribution. Quality requirements and treatment processes. Waste water collection: reticulation and pumping stations; effluent quality requirements; outline of treatment processes. Outfall structures and ocean disposal. Water reclamation.

**8.582 Water Resources II**

The hydrologic cycle, water and energy balances, climatology, atmospheric moisture, precipitation, runoff cycle, infiltration, stream gauging, hydrograph analysis, storm runoff and loss rates, design storms, flood estimation, yield and storage determination, groundwater.

**8.583 Water Resources III**

Hydraulics of groundwater systems, application to regional problems. Water resources planning, systems approach, applied aspects of water engineering.

**8.621 Engineering Construction**

Construction plant and equipment; compressed air services, drilling, earth-moving, tunnelling and blasting, hoisting and conveying, pile-driving, etc.; aggregate and concrete plant. Principles of construction administration; evolution of management; objectives of management; principles of organisation; motivation and communication; project management. The role of government and local government authorities. An introduction to construction planning and scheduling; cost control and cost accounting; tenders and the preparation of estimates; scheduling of operations; linear programming, critical path and PERT techniques; contracts and specifications.

**TEXTBOOKS**

Antill, J. M. & Ryan, P. W. S. *Civil Engineering Construction*. 3rd ed. A. & R.

Peurifoy, R. L. *Construction, Planning, Equipment and Methods*. 2nd ed. McGraw-Hill.

## REFERENCE BOOKS

- Allen, L. *Management and Organisation*. McGraw-Hill, 1958.
- Antill, J. M. *Civil Engineering Management*. A. & R.
- Antill, J. M. & Woodhead, R. *Critical Path Methods in Construction Practice*. McGraw-Hill.
- Linsley, R. K. & Franzini, J. B. *Water Resources Engineering*. McGraw-Hill.
- O'Neill, L. V. *Fundamentals of Estimating and Construction Cost Control*. Tait.

**8.631 Civil Engineering**

*Part I: Regional and Urban Planning.* The planning process with particular regard for the improvement of urban environment. The unified approach and the role of the civil engineer. Socio-economic and physical elements. Historical background to the urbanisation process. Regional planning: principles of regionalism, regional survey techniques, case studies. Urban planning: urban form and growth patterns, communication networks. Principles of site planning and civic design. Outline of town planning law and administration in New South Wales.

*Part II: Transport Planning and Operations.* Definition of a land use/transport system — land use potential, traffic generation, intensity of traffic generation, transport system capacity. Stability and steady state performance — output, specific output. Land use, generation, desire line and assignment models. The transport planning process — systems versus programming approach. Evaluation of operational performance of transport systems — travel time and flow relationships (the queueing model), level of service, network characteristics, transfer terminals. Economic evaluation of transport schemes and plans — criteria, benefits, costs, time streams, discounting, present worth, rates of return, benefit/cost and cost/effectiveness ratios.

*Part III: Road Engineering.* Route analysis and road location in the rural and urban environment including the location of bridges. Road geometrics and design, its influence on the behaviour of drivers. Landscape aspects of road design. Some examples of road design policies and their application. Types of roads and expressways and their applications, advantages and disadvantages. Types of intersections and interchanges, and some problems in their design. Pavement requirements, thickness design, pavement materials, gravels, stabilisation, cement and bituminous concrete. Function of wearing courses. Road drainage requirements and examples of design, road construction methods and plant. Uses of electronic computation in Highway Engineering.

*Part IV: Project Planning and Evaluation.* Management principles: historical development; scientific management; the managerial process, communication and control. Management practice: the role of design, research and development; management functions. Organisation: span control, divisionalisation, responsibility, authority and accountability. Engineering economics: interest, rates of return, minimum attractive rate of return, comparison, benefit-cost ratio. Project planning: organisational pattern, cost control, procurement, personnel management, resources scheduling and planning, critical path, project evaluation and review. Project evaluation: cost estimation, benefit estimation, economic comparison.

**8.632 Civil Engineering**

Comprises Parts I and III, being respectively Regional and Urban Planning and Road Engineering of 8.631 Civil Engineering.



### 8.671 Engineering Construction

Role of the construction engineer; site services and site works; plant and equipment; clearing, earthmoving, drilling, blasting, quarrying, tunneling, pile-driving, hoisting, conveying; setting out, quantity surveys; scheduling of operations, estimating, costing, practical examples of construction of dams, bridges, tunnels, buildings and roadworks.

### 8.672 Planning and Management I

Elements of engineering economics, project costs and benefits; interest, present worth, annual cost, rates of return, economic comparisons, benefit-cost analysis, project evaluation.

Principles of management; management techniques, linear programming, critical path methods, inventory management. Project objectives, feasibility studies, investigation, design alternatives, environmental impact assessment; estimation of construction costs.

### 8.673 Planning and Management II

Construction contracts; drawings, specification and quantities; project organization, financial control and costing, construction management; personnel management, industrial relations; professional responsibilities. Technical communication. Engineering planning aspects of regional and urban developmental works, transportation and traffic and highway engineering.

### 8.711 Engineering for Surveyors I

*Aspects of Hydraulics:* fluid properties, hydrostatics, motion of fluids, continuity, energy and momentum aspects, closed conduit flow and open channel flow. *Aspects of Hydrology:* Scope and applications. Hydrologic measurements, rainfall analysis, storm rainfall-runoff relations, flood estimation. Urban drainage design.

#### TEXTBOOK

Vennard, J. K. *Elementary Fluid Mechanics*. 4th ed. Wiley, 1961.

#### REFERENCE BOOKS

Bass, W. Revised Skurlow, J. *Introduction to Hydraulics*. Institution of Surveyors, N.S.W. Div.

Bruce, J. P. & Clark, R. H. *Introduction to Hydrometeorology*. Pergamon, 1966.

Linsley, R. K., Kohler, M. A. & Paulhus, J. L. H. *Hydrology for Engineers*. McGraw-Hill, 1958.

Nemec, J. *Engineering Hydrology*. McGraw-Hill, 1972.

Stormwater Standards Committee. *Australian Rainfall and Runoff*. Inst. of Engineers, Australia.

### 8.712 Engineering for Surveyors II

*Municipal Engineering. Soil Mechanics:* Soil forming processes; pedological classification; engineering classification of soils; pavement design based on engineering classification; effective stress concept for saturated

and unsaturated soils, sheer strength, flow of water through soils; consolidation; slope stability and earth pressures. *Public Utilities: Relationship between urban development and each of water supply, wastewater and stormwater drainage, transport.*

#### TEXTBOOKS

Lambe, T. W. & Whitman, R. V. *Soil Mechanics*. Wiley.

Lepper, G. W. *Introduction to Soil Sciences*. M.U.P., 1967.

#### REFERENCE BOOKS

Asher, S. J. *Water Supply and Main Drainage*. Crosby Lockwood, 1961.

Capper, P. L., Cassie, W. F. & Geddes, J. D. *Problems in Engineering Soils*. Barnes & Noble, 1966.

Scott, R. F. *Principles of Soil Mechanics*. Addison-Wesley, 1963.

Stace, H. C. T. *Handbook of Australian Soils*. Rellim Tech. Pubs., 1968.

Taylor, D. W. *Fundamentals of Soil Mechanics*. Wiley, 1960.

Tebbutt, T. H. Y. *Principles of Water Quality Control*. Pergamon, 1971.

## DEPARTMENT OF INDUSTRIAL ENGINEERING

### 18.011 Industrial Engineering IA

*Prerequisite:* 10.022. *Co- or prerequisites:* 5.071, 5.111.

*Manufacturing Properties of Materials:* Stress-strain curves to high strains, effects of strain-rate and temperature. Combined stresses, yield criteria, introduction to plasticity theory. *Metal Cutting Theory:* Mechanics of the process, effect of work-hardening, prediction of shear angle and cutting force. *Metal Cutting Tools:* Tool materials: plain carbon, alloy steel and sintered materials, hardening and heat treatment, T.T.T. curves. Tool wear, life and failure, tool performance. Surface finish. Machinability. Economics of machining. *Other Metal Removal Processes:* Electric-discharge machining, electrochemical machining. *Aspects of Machine Tool Design and Utilization:* Structural stiffness, drive-trains, slideways. Causes of chatter. Factors affecting the selection and use of machine tools.

#### TEXTBOOK

Alexander, J. M. & Brewer, R. C. *Manufacturing Properties of Materials*. Van Nostrand, 1963.

#### REFERENCE BOOKS

Armarego, E. J. A., & Brown, R. H. *The Machining of Metals*. Prentice-Hall, 1969.

Boothroyd, G. *Fundamentals of Metal Machining*. Arnold, 1965.

Cook, N. H. *Manufacturing Analysis*. Addison-Wesley, 1966.

Dieter, G. D. *Mechanical Metallurgy*. Int. ed. McGraw-Hill, 1961.

Rowe, G. W. *The Principles of Metalworking*. Arnold, 1968.

Thomas, G. G. *Production Technology*. O.U.P., 1970.

### 18.012 Industrial Engineering IIA

*Prerequisites:* 5.112, 18.011.

*Technology of Manufacturing:* Basic plasticity theory. Theories of deformation processes, extrusion, tube making, forming and deep drawing. *Design for Production:* Interchangeable manufacture; standardisation; design communication; pre-production planning; introduction to design analysis. *Metrology:* Principles of measurement and measuring systems; basic design concepts of mechanical, optical, pneumatic and electrical systems, linear and angular measurements; straightness and flatness; screw thread measurements; machine tool testing.

#### TEXTBOOKS

A.S. CZ-1. 1973. *Engineering Drawing Practice*.

BS 4500-1969. *ISO Limits & Fits*.

Gladman, C. A. *Geometric Analysis of Engineering Designs*. Aust. Trade Pub., 1966.

Johnson, W. & Mellor, P. B. *Plasticity for Mechanical Engineers*. Van Nostrand, 1966.

Scarr, A. J. T. *Metrology and Precision Engineering*. McGraw-Hill, 1967.

## REFERENCE BOOKS

- Alexander, J. M. & Brewer, R. C. *Manufacturing Properties of Materials*. Van Nostrand, 1963.  
Hoffman, O. & Sachs, G. *Introduction to the Theory of Plasticity for Engineers*. McGraw-Hill, 1953.  
Hume, K. J. *Engineering Metrology*. 2nd ed. Macdonald.  
Rowe, G. W. *An Introduction to the Principles of Metalworking*. Arnold, 1968.

**18.021 Industrial Engineering IB**

*Prerequisite: 10.022. Co- or prerequisite: 5.071.*

*Engineering Economy*: Price-output decisions under various competitive conditions. The time-value of money, nett present worth and DCF rate of return, and their applications in the selection and replacement of processes and equipment. Construction and optimization of particular models, e.g. replacement, capital rationing. Measures of profitability. *Industrial Applications of Probability*—Tutorial problems from the fields of sampling inspection, quality control, control charts—simple economic models, e.g. newsboy problem, length of steel bars.

## TEXTBOOKS

- Burr, I. W. *Engineering Statistics and Quality Control*. McGraw-Hill, 1953.  
Smith, G. W. *Engineering Economy*. Iowa State U.P., 1968.

## REFERENCE BOOKS

- Duncan, A. J. *Quality Control and Industrial Statistics*. Irwin, 1959.  
Grant, E. L. *Statistical Quality Control*. Int. ed. McGraw-Hill, 1964.  
Moroney, M. J. *Facts from Figures*. Penguin, 1965.  
Paradine, C. G. & Rivett, B. H. P. *Statistical Methods for Technologists*. English U.P., 1966.  
Samuelson, P. A., Hancock, K. & Wallace, R. *Economics*. Aust. ed. McGraw-Hill, 1970.

**18.022 Industrial Engineering IIB**

*Prerequisites: 5.071, 18.021.*

*Design of manufacturing facilities*—Product and objectives, equipment selection. Charting and systematic improvement of methods, workplace layout, the factory environment.

*The use of human and physical resources*—Motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection, predetermined motion-time systems.

*Production Control*—The detailed mechanics of control of jobbing production, and its extension to batch and continuous production. Manufacturing organisations, functions, inter-relationships and information flow. Application of data processing and control systems. Introduction to inventory control. Analysis of some engineering planning decisions. Sampling techniques in quality control. Control charts. Further quantitative work.

## TEXTBOOKS

- Buffa, E. S. *Modern Production Management*. 3rd ed. Wiley, 1969.  
Niebel, B. W. *Motion and Time Study*. 4th ed. Irwin, 1967.

## REFERENCE BOOKS

- Carson, G. B. ed. *Production Handbook*. 2nd ed. Ronald, 1958.  
Greene, J. H. *Production Control Systems and Decisions*. Irwin, 1965.

- Maynard, H. B. ed. *Industrial Engineering Handbook*. 2nd ed. McGraw-Hill, 1963.
- Moore, F. G. *Production Control*. Int. ed. McGraw-Hill, 1959.
- Moore, J. M. *Plant Layout and Design*. Macmillan, 1962.
- Murrell, K. F. H. *Ergonomics*. Chapman and Hall, 1965.

### 18.121 Production Management

*Prerequisites: 10.031, 10.331.*

*Engineering Economics*—The structure of the Australian economy. The theory of the firm, pricing, fluctuations in demand. The economics of selection and replacement of processes and equipment.

*The Use of Human and Physical Resources*—Methods engineering, ergonomics, motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection. Plant location, factory layout.

*Production and Quality Control*—Control of jobbing, repetitive batch and continuous production. Manufacturing organizations, functions, inter relationships and information flow. Sampling techniques in quality control, control charts. Introduction to inventory control. Analysis of some engineering planning decisions.

*Introduction to Operations Research*—The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, e.g. mathematical programming, queuing theory, inventory models, simulation.

#### TEXTBOOKS

- Buffa, E. S. *Modern Production Management*. 3rd ed. Wiley, 1969.
- Lu, F. P. S. *Economic Decision-making for Engineers and Managers*. Whitcomb & Tombs, 1969.
- Moore, P. G. *Basic Operational Research*. Pitman, 1968.

#### REFERENCE BOOKS

- Barnes, R. M. *Motion and Time Study*. 6th ed. Wiley, 1968.
- Greene, J. H. *Production Control Systems and Decisions*. Irwin, 1965.
- Hillier, F. S., & Lieberman, G. J. *Introduction to Operations Research*. Holden-Day, 1968.
- Smith, G. W. *Engineering Economy*. Iowa State U.P., 1968.

### 18.431 Design for Production

*Prerequisites: 18.011, 5.112. Co- or prerequisite: 18.012.*

Interchangeable manufacture; standardisation; unit and selective assembly; preferred sizes. Presentation and interpretation of geometric tolerances; grouping; analysis of non-linear loop equations, economic allocation of tolerances; application of probability theory to tolerance allocation. Gauge design: effect of gauge tolerances on interchangeability.

#### TEXTBOOKS

- A.S. CZ-1. 1973. *Engineering Drawing Practice*.
- B.S. 4500: 1969. *Limits and Fits*.
- Gladman, C. A. *Geometric Analysis of Engineering Designs*. Aust. Trade Pub., 1966.

## REFERENCE BOOK

Parker, S. *Drawings and Dimensions*. Pitman, 1956.

**18.551 Operations Research**

*Prerequisites: Either 5.071 and 18.021 or 10.031, 10.331 and 18.121.*

The formulating and optimisation of mathematical models. The development of decision rules. Some techniques of operations research such as mathematical programming, queueing theory, inventory models, replacement and reliability models, and simulation will be introduced. These techniques will be applied to situations drawn from industrial fields, e.g. production planning and inventory control. Practical problems of data collection, problem formulation and analysis will be included.

## TEXTBOOK

Taha, H. A. *Operations Research: An Introduction*. Macmillan, 1971.

## REFERENCE BOOKS

Gass, S. I. *Linear Programming*. 2nd ed. McGraw-Hill, 1964.

Hadley, G. *Linear Programming*. Addison-Wesley, 1969.

Hanssmann, F. *Operations Research in Production and Inventory Control*. Wiley, 1962.

Hillier, F. S. & Lieberman, G. J. *Introduction to Operations Research*. Holden-Day, 1967.

Houlden, B. T. ed. *Some Techniques of Operational Research*. E.U.P., 1962.

Moder, J. J. & Phillips, C. R. *Project Management with CPM and PERT*. Van Nostrand, 1964.

Simmons, D. M. *Linear Programming for Operations Research*. Holden-Day, 1972.

## SCHOOL OF SURVEYING

### 29.081 Thesis

### 29.101 Surveying I

Introduction to surveying instruments. The theory and use of optical square, clinometer, cloth tape, steel tape, plane table, level and theodolite. Theory and practice of data reduction.

Introduction to surveying methods. History of surveying methods. Definition of classes of surveying. Practical applications. Traversing by stadia and steel band, levelling, contouring.

#### TEXTBOOKS

*Seven Figure Mathematical Tables*. Full ed. Chambers, 1958.

Whyte, W. S. *Revision Notes on Plane Surveying*. Newnes-Butterworth.

#### REFERENCE BOOKS

Clark, D. *Plane and Geodetic Surveying*. Vol. I. 6th ed. Constable, 1969.

Mitchell, H. C. *Definition of Terms used in Geodetic and other Surveys*. U.S. Coast and Geodetic Survey Sp. Pub. 242, 1948.

### 29.102 Surveying II

*Control Surveys*: plane triangulation with ten second theodolites, precise traversing, contour surveys including optical distance measurement, calculation of areas, volumes, calculating and setting out curves.

Barometric and trigonometrical levelling. Hydrographic surveying. Introduction to use of one second theodolites.

#### TEXTBOOKS

Allan, A. L., Hollwey, J. R. & Maynes, J. H. B. *Practical Field Surveying and Computations*. Heinemann.

Burnside, C. D. *Electromagnetic Distance Measurement*. Crosby Lockwood, 1971.

Clark, D. *Plane and Geodetic Surveying*. Vol I. 6th ed. Constable, 1969.

Cooper, M. A. R. *Modern Theodolites and Levels*. Crosby Lockwood, 1971.

Smith, J. R. *Optical Distance Measurement*. Crosby Lockwood, 1971.

#### REFERENCE BOOKS

*Admiralty Manual of Hydrographic Surveying*. Vol. 1. *Surveying on Shore*. Hydrographic Dept. of the Navy, London, 1965.

Clark, D. *Plane and Geodetic Surveying*. Vol. II. 5th ed. Constable, 1963.

Mitchell, H. C. *Definitions of Terms used in Geodetic and other Surveys*.

U.S. Coast and Geodetic Survey Sp. Pub. 242, 1948.

Sandover, J. A. *Plane Surveying*. Arnold, 1961.

### 29.103 Surveying III

Electronic distance measurement, gyrotheodolites, compensators in levels and theodolites. Optical plumbing, deflection and settlement measurements, survey methods in industry, mine surveying. Gauss collimation technique. map reproduction, methods of preparation and reproduction of line maps. Other types of maps. Tape standardization, laboratory testing of instruments, error analysis in survey methods. Precision of formulae. Integrated surveys in general. Relocation of lost marks, special problems.

#### TEXTBOOKS

- Burnside, C. D. *Electromagnetic Distance Measurement*. Crosby Lockwood, London, 1971.  
 Clark, D. *Plane and Geodetic Surveying*. Vol. I. 6th ed. Constable, 1969.  
 Cooper, M. A. R. *Modern Theodolites and Levels*. Crosby Lockwood, London, 1971.  
 Smith, J. R. *Optical Distance Measurement*. Crosby Lockwood, London, 1971.

#### REFERENCE BOOKS

- Clendinning, J., & Olliver, J. G. *Principle and Use of Surveying Instruments*. 3rd ed. Blackie, 1969.  
 Hardy, A. C. & Perrin, F. H. *The Principles of Optics*. McGraw-Hill, 1956.  
 International Association for Geodesy. *Symposium on Electromagnetic Distance Measurement*. Hilgar & Watts, Oxford, 1965.  
 Laurila, S. H. *Electronic Surveying and Mapping*. 2nd ed. Farrar, 1967.  
 Mitchell, H. C. *Definitions of Terms used in Geodetic and other Surveys*. U.S. Coast and Geodetic Survey Sp. Pub. 242, 1948.  
 Richardus, P. *Project Surveying*. North Holland, 1966.  
 Saastamoinen, J. J. ed. *Surveyors Guide to Electromagnetic Distance Measurement*. Univ. of Toronto, 1967.

### 29.151 Survey Computations I

Use of tables. Plane trigonometrical formulae. Calculation of triangles, areas, roadways, sub-divisions and curves. The use of calculating machines. Traverse computations including offsets and missing data problems. Areas from co-ordinates. Transformations. Spherical trigonometry and its application to survey problems. Resections and intersections: mathematical and semigraphic methods. Elementary programming for electronic computers.

#### TEXTBOOKS

- Allan, A. L., Hollway, J. R. & Maynes, J. H. B. *Practical Field Surveying and Computations*. Heinemann.  
*Seven Figure Mathematical Tables*. Chambers, 1958.  
*Tables of Natural Sines, Tangents, etc. to every Ten Seconds*. D.M.R., 1949, or  
*Natural Trigonometrical Tables. Six Figures*. Govt. Printer, Pretoria.

#### REFERENCE BOOK

- Richardus, P. *Project Surveying*. North Holland, 1966.

### 29.152 Survey Computations II

Revision of basic error theory. Adjustment by least squares (a) parametric method; (b) method of correlatives. Solution of Normal Equations by elimination methods (a) Gauss-Doolittle; (b) Cholesky. Error ellipse calculations.



**TEXTBOOKS**

As for 29.151 Survey Computations I.

**REFERENCE BOOKS**

Rainsford, H. F. *Survey Adjustments and Least Squares*. Constable.

Richardus, P. *Project Surveying*. North Holland, 1966.

Shortrede, R. *Logarithms of Sines and Tangents for Every Second*. Layton.

Vega, G. *Seven Figure Logarithmic Tables*. Hafner Pub. Co., N.Y.

**29.181 Cartography**

Cartographic drawing, plotting and plan drawing. Applications in boundary and engineering surveys.

**TEXTBOOK**

Greenhood, D. *Mapping*. Phoenix Science Series. Chicago U.P. PSS 521, 1965.

**29.192 Survey Camp**

A two-week field camp, including the preparation of a report and plans.

**29.193 Professional Training**

A five-month period of practical experience including the submission of a report.

**29.194 Survey Camp**

A four-week field camp followed by two weeks on campus for completion of computations.

**29.211 Geodesy I**

Historical development of geodesy. Differential geometry, the spheroid; curves on the spheroid, Legendres Theorem, computation of geographical co-ordinates. Geodetic surveying (types of horizontal control surveys). Procedures for angular observation. Surveyors projections. Applications to integrated surveys.

**TEXTBOOK**

Mather, R. S. *The Theory and Geodetic Use of some Common Projections*. School of Surveying, U.N.S.W.

**REFERENCE BOOKS**

Bomford, G. *Geodesy*. 3rd ed. O.U.P., 1971.

Clark, D. *Plane and Geodetic Surveying*. Vol. II. 5th ed. Constable, 1963.

*Geodetic Triangulation*. USC & GS. Special Publication.

Richardus, P. *Project Surveying*. North Holland, 1966.

*The Australian Map Grid*. Technical Manual. 2nd ed. National Mapping Council, Canberra, 1971.

**29.212 Geodesy II**

A. Adjustment of control surveys using the condition and parametric methods of least square adjustment for measured angular and linear quantities. Variance/covariance matrix; variance factor; weight coefficient matrix. Elementary statistical testing of observations and adjusted values. High precision levelling.

- B. Relationship between geoid and ellipsoid; astro geodetic levelling; ellipsoidal elevations; mean sea level and the geoid. Methods for establishing a world geodetic system. Gravity and its use in geodesy.

### REFERENCE BOOKS

- Bomford, G. *Geodesy*. O.U.P., 1962.  
 Clark, D. *Plane and Geodetic Surveying*. Vol. II. 5th ed. Constable, 1963.  
 Jordan, W. & Eggert, O. *Handbook of Geodesy*. Carta, M. W. trans. Vols. I & III. U.S. Army Map Service, 1962.  
 Mather, R. S. *The Theory and Geodetic Use of some Common Projections*. School of Surveying, U.N.S.W.  
 Mueller, I. & Rockie, J. D. *Gravimetric and Celestial Geodesy—A Glossary of Terms*. Ungar, N.Y., 1966.  
 Rainsford, H. F. *Survey Adjustments and Least Squares*. Constable.  
 Reynolds, W. F. *Manual of Triangulation Computation and Adjustment*. U.S. Coast & Geodetic Survey Sp. Pub. 138, 1955.  
 Richardus, P. *Project Surveying*. North Holland, 1966.  
 Thomas, P. D. *Conformal Projections in Geodesy and Cartography*. U.S. Coast & Geodetic Survey Sp. Pub. 251, 1952.

### 29.213 Geodesy III

Calculations on the ellipsoid. The conformal projection of an ellipsoid. Atmospheric refraction and its effect on survey measurements. Adjustment of control surveys, precision of adjustment measurements, error ellipses of adjusted coordinates. The permanence of geodetic position. Long range goals of geodesy. Seminar.

### REFERENCE BOOKS

As for 29.212 Geodesy II.

### 29.311 Astronomy I

The celestial sphere and the astronomical triangle. Definitions, conventions and time. Latitude by circum-meridian and longitude by extra meridian methods. Best position, balancing. Introduction to azimuth determination.

### TEXTBOOKS

Mackie, J. B. *The Elements of Astronomy for Surveyors*. 6th ed. Griffin, 1964.

or

*Textbook of Field Astronomy*. H.M.S.O., 1960.

*Star Almanac for Land Surveyors for Current Year*. H.M.S.O.

### 29.312 Astronomy II

Azimuth by circum-elongation, circum-polar and sun observations. Optimum position of observation, balancing of observations. Position line methods.

### TEXTBOOK

*Star Almanac for Land Surveyors for Current Year*. H.M.S.O.

### REFERENCE BOOKS

- Hoskinson, A. J. & Duerksen, J. A. *Manual of Geodetic Astronomy*. U.S. Coast & Geodetic Survey Sp. Pub. 237, 1952.  
 Roelofs, R. *Astronomy Applied to Land Surveying*. Ahrend, 1950.

**29.313 Astronomy III**

A study of topics selected from the following: Corrections to observations and calculations; star coordinates; meridian methods; equal altitude methods; precise timing.

**TEXT AND REFERENCE BOOKS**

As for 29.312 Astronomy II.

**29.411 Surveying for Architects**

Introduction. Chaining, methods of measurement, corrections, chain surveys. Level, differential levelling, booking. Contours, volumes of earthworks. Theodolite, methods of reading angles, applications in building. Traversing, setting out.

**REFERENCE BOOKS**

Foxall, H. G. *Handbook for Practising Land and Engineering Surveyors*. 2nd ed. Institution of Surveyors, N.S.W. Division, Sydney.

Whyte, W. S. *Basic Metric Surveying*. Butterworth, 1969.

Wright Perrott, S. *Surveying for Young Engineers*. A. L. Allan. rev. 3rd ed. Chapman & Hall, 1970.

**29.431 Surveying and Cartography**

History of surveying and its relationship with town planning. Types of survey, methods of measurement, corrections, chain surveys. Level, differential levelling. Contours, volumes of earthworks. Theodolite, applications in building. Traversing, setting out. Basic concepts of land tenure, land registration and cadastral surveying. Outline of photogrammetry. Plotting. Preparation of plans, methods of enlargement and reduction, plan registration. Measurement of areas by planimeter.

**REFERENCE BOOKS**

As for 29.411 Surveying for Architects.

**29.441 Engineering Surveying**

*Part A.* Ordinary levelling. Angle measurement. Linear measurement (bands). Theodolite traversing. Tacheometry. Contour and detail surveys. Areas and volumes.

*Part B.* Levelling (other methods). Linear measurement (electronic). Applications of survey techniques: control surveys, provision of information for design, setting out engineering works, etc. Outline of photogrammetry.

**TEXTBOOKS**

Bannister, A. & Raymond, S. *Surveying*. Pitman, 1972. Paperback.  
*Seven Figure Mathematical Tables*. Chambers, 1958.

**REFERENCE BOOKS**

*Admiralty Manual of Hydrographic Surveying. Vol. I. Surveying on Shore*. Hydrographic Department of the Navy, London, 1965.

Birchal, H. F. *Modern Surveying for Civil Engineers*. 2nd ed. Chapman & Hall, 1955.

Brinker, R. C. & Taylor, W. C. *Elementary Surveying*. 4th ed. International Textbook Co., 1964.

- Clark, D. *Plane and Geodetic Surveying*. Vol. I. 6th ed. Constable, 1969.  
Clark, D. *Plane and Geodetic Surveying*. Vol. II. 5th ed. Constable, 1963.  
Hickerson, T. F. *Route Location and Design*. 5th ed. McGraw-Hill, 1967.  
Sandover, J. A. *Plane Surveying*. Arnold, 1961.  
Whyte, W. S. *Basic Metric Surveying*. Butterworth, 1969.

### **29.491 Survey Camp**

A one-week field camp for students studying 29.441 Engineering Surveying.

### **29.511 Photogrammetry I**

Stereoscopic vision. Geometry of single air photograph and stereoscopic pairs. Fundamental mathematical relationships. Radial triangulation. Inner, relative and absolute orientation with respect to direct optical projection. Cameras, physical properties of photographs.

#### **TEXTBOOK**

Moffit, F. H. *Photogrammetry*. 2nd ed. International Textbook Co., 1968.

#### **REFERENCE BOOKS**

- Crone, D. R. *Elementary Photogrammetry*. Arnold, 1963.  
Hallert, B. *Photogrammetry*. McGraw-Hill, 1960.  
*Manual of Photogrammetry*. 3rd ed. Am. Soc. Photogram., 1966.  
Zeller, M. *Textbook of Photogrammetry*. Lewis, 1952.

### **29.512 Photogrammetry II**

Photogrammetric orientation. Design principles and practical application of exact and approximate restitution instruments. Flight and project planning. Aerial mapping. Aerial triangulation of strips.

#### **TEXTBOOK**

Moffit, F. H. *Photogrammetry*. 2nd ed. International Textbook Co., 1968.

#### **REFERENCE BOOKS**

- Hallert, B. *Photogrammetry*. McGraw-Hill, 1960.  
*Manual of Photogrammetry*. 3rd ed. Am. Soc. Photogram., 1966.  
Zeller, M. *Textbook of Photogrammetry*. Lewis, 1952.

### **29.513 Photogrammetry III**

Propagation of errors in aerial triangulation, and strip adjustment. Camera calibration. Rectification, Mosaics, Orthophotography.

#### **TEXT AND REFERENCE BOOKS**

As for 29.512 Photogrammetry II.

### **29.611 Land Studies I**

A. *Physical Geography for Surveyors*: Physical determinants of land character; climate, geology, landforms, soils and vegetation. Emphasis on Australian land types. Inherited land characters. Principles and techniques

of land classification with special reference to work in Australia. Classification for land potential. Laboratory classes will support the study of physical factors determining land character, and will also illustrate the use of air-photos in the identification and mapping of land types. There will be a one-day field tutorial in the Sydney region.

*B. Economics:* Fundamentals of economic theory; national income and its distribution; employment, housing, economics of location. Financial planning and budgeting; cost benefit analysis of planning; compensation and betterment; investment criteria. Economics of transition from rural to urban land use.

### TEXTBOOKS

Corbett, J. R. *The Living Soil*. Martindale.

CSIRO. *The Australian Environment*. M.U.P.

### REFERENCE BOOKS

American Society of Photogrammetry. *Manual of Photographic Interpretation*. George Banker.

Branagan, D. F. & Packham, C. H. *Field Geology of New South Wales*. Science Press.

Freeman, A. M., Haveman, R. H. & Kreese, A. V. *The Economics of Environmental Policy*. Wiley, 1973.

Griffiths, J. F. *Applied Climatology*. O.U.P.

Gunn, R. H. et al. *Lands of the Queanbeyan-Shoalhaven Area. A.C.T. and N.S.W.* CSIRO Land Research Series No. 24.

Longwell, C. R., Flint, R. F. & Sanders, J. E. *Physical Geology*. Wiley. Paperback.

Stace, H. C. T. et al. *A Handbook of Australian Soils*. Rellim.

Stewart, G. A. ed. *Land Evaluation*. McMillan.

Storey, R. et al. *General Report on the Lands of the Hunter Valley*. CSIRO Land Research Series No. 8.

U.S. Dept. of Agriculture. *Soil Survey Manual*. U.S. Govt. Printer.

## 29.612 Land Studies II

*A. Land Valuation:* General principles of urban and rural land valuation. Unimproved and improved capital values. Valuation of leasehold and freehold land. Subdivisional value of land. Valuation of buildings. Relevant Acts and Regulations. N.S.W. Land and Valuation Court proceedings and decisions.

*B. Land Utilization:* A broad study of biological, political, social and economic factors establishing a concept of ecological relationships and the place of man therein. Primary industries and urbanization. Conservation of resources.

*C. Introducing Property Law:* The legal system, forms and sources of law; land tenure and property law.

### TEXTBOOKS

Collins, H. G. *Rural Land Utilization*. Commonwealth Institute of Valuers, 1968.

Costin, A. B. & Frith, H. J. *Conservation*. Penguin, 1971.

Murray, J. F. N. *Principles and Practice of Valuation*. C'wealth Inst. of Valuers, 1966.

or

Rost, R. O. & Collins, H. G. *Land Valuation and Compensation in Australia*. C'wealth Inst. of Valuers, 1971.

### **29.613 Land Studies III**

*Land Titles and Survey Law*: General study of land title systems; land tenure and title; the law of boundaries and of easements and other estates. The N.S.W. Real Property Act and other acts regulating the conduct of surveys and recording; field records, plans, title searches; surveyor's powers and duties. Cadastral Survey Systems. The N.S.W. Integrated Survey System.

#### **TEXTBOOK**

Willis, R. W. *Survey Investigation*. Registrar-General's Dept.

#### **REFERENCE BOOKS**

Dowson, E. M. & Sheppard, V. L. O. *Land Registration*. H.M.S.O., 1956.

Hallman, F. M. *Legal Aspects of Boundary Surveyings as apply in N.S.W.* Institution of Surveyors, Sydney, 1973.

### **29.614 Land Studies Project**

A project involving the preliminary survey, analysis and all aspects of design for a development.

### **29.615 Land Studies**

Advanced studies in residential and industrial subdivisional design and presentation. Conflict of demand for land use; environmental control. Integrated survey applications. Data banks.

#### **Management**

Introduction to management and principles. Administrative and contract law; specifications and contracts; accounting principles and taxation; business and office management; personnel relationships, labour awards, public relations, professional practice.

## NON-ENGINEERING SUBJECTS

(For General Studies subjects see the  
Department of General Studies Handbook.)

### 1.001 Physics I

Aims and nature of physics and the study of motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Concepts of force, inertia, mass, energy, momentum, charge, potential, fields. Application of the conservation principles to solution of problems involving charge, energy and momentum. Electrical circuit theory, application of Kirchhoff's Laws to AC and DC circuits. Uniform circular motion, Kepler's Laws and Rotational mechanics.

The application of wave and particle theories in physics. A review of the atomic theory of matter and the structure and properties of atomic nuclei. A molecular approach to energy transfer, kinetic theory, gas laws and calorimetry. The wave theories of physics, transfer of energy by waves, properties of waves. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarization. Interaction of radiation with matter, photoelectric effect, Compton effect, spectroscopy. Resolution of the wave—particle paradox by means of wave mechanics and the uncertainty of principle.

#### TEXTBOOK

Bueche, F. *Introduction to Physics for Scientists and Engineers*. McGraw-Hill.

#### REFERENCE BOOKS

Ference, M., Lemon, H., & Stephenson, R. J. *Analytical Experimental Physics*. Chicago U.P.

Halliday, D., & Resnick, R. *Physics for Students of Science and Engineering*. Vols. I & II. Wiley.

Wiedner, R. T. V., & Sells, R. L. *Elementary Classical Physics*. Vols. I and II. Allyn & Bacon.

### 1.011 Higher Physics I

Kinematics—Non-uniformly accelerated systems. Centripetal acceleration. Laws of motion. Momentum. Impulse. Potential and kinetic energy. Power. Conditions of equilibrium. Elasticity. Young's bulk and shear moduli. Poisson's ratio. Strain energy. Hydrodynamics. Bernoulli's equation. Motion in resistive medium. Moments of inertia. Rotational dynamics. Simple harmonic motion. Pendulums. Motion about free axis. Progressive and stationary waves. Energy current. Superposition of waves. Doppler effect. Resonance. Huygen's principle. Reflection, refraction, interference and diffraction of waves. Electromagnetic spectrum. Polarization.

Electrostatics—Gauss' theorem. Electric intensity. Capacitance. Electromagnetism. Biot-Savart and Ampere's circuital laws. Force on moving charge and on conductor. Torque on coil. D.C. instruments. Electromagnetic induction. Faraday's and Lenz's laws. Self and mutual inductance. D.C.

circuits. Kirchhoff's rules and Thevenin's theorem. Growth and decay of current. A.C. circuits. Resonance. Diode. Triode. Amplifiers and oscillators. Electronic measuring instruments.

### TEXTBOOKS

Halliday, D. & Resnick, R. *Physics for Students of Science and Engineering*. Vols. I and II, or combined volume. Wiley, 1960.

Russell, G. J. & Mann, K. *Alternating Current Circuit Theory*. N.S.W. Univ. Press.

Spiegel, M. R. *Theory and Problems of Theoretical Mechanics*. Schaum.

### REFERENCE BOOKS

Brophy, J. J. *Basic Electronics for Scientists*. McGraw-Hill. Paperback.

Feynman, R. P., Leighton, R. B. & Sands, M. *The Feynman Lectures on Physics*. Vols. I and II. Addison-Wesley.

Tomboulia, D. H. *Electric and Magnetic Fields*. Harcourt, Brace & World, N.Y., 1965.

## PHYSICS LEVEL II UNITS

The units are at two levels, an ordinary level, prefix 1.112, and a higher level, prefix 1.122:

### 1.112A Electromagnetism

Electrostatics in vacuum and in dielectrics. Magnetostatics in vacuum and in magnetic materials. Maxwell's equations and simple applications.

#### TEXTBOOK

Reitz, J. R. & Milford, F. J. *Foundation of Electromagnetic Theory*. 2nd ed. Addison-Wesley.

### 1.112B Modern Physics

Special theory of relativity, Lorentz transformation, relativistic mass, momentum and energy; quantum theory, photoelectric effect, Compton effect; wave-particle duality, Schrodinger wave equation, infinitely deep square well, H atom; spectra, magnetic moment, exclusion principle; Rutherford scattering, nuclear properties, mass spectrograph, binding energy, radioactivity, alpha, beta and gamma radiation, nuclear reactions.

#### TEXTBOOK

Beiser, A. *Perspectives of Modern Physics*. Rev. ed. McGraw-Hill, 1969.

### 1.112C Waves in Continuous Media and Thermodynamics

*Continuum Mechanics*: Free oscillations in simple systems: one degree of freedom, linearity, superposition, two degrees of freedom, beats, modulation. Oscillations with many degrees of freedom: continuous string, non continuous systems, Fourier analysis. Forced oscillations: harmonic oscillator, filters, many degrees of freedom. Travelling waves: refraction, dispersion, impedance, energy flux. Reflections: termination matching, transmission. Modulation, pulses, wave packets.

*Thermodynamics*: Kinetic theory of gases. Equipartition of energy. Maxwell-Boltzmann distribution law. First and second laws of thermodynamics. Statistical foundations of thermodynamics. Entropy and the entropy principle. Thermodynamic functions. Phase changes. Joule-Kelvin effect.



## TEXTBOOKS

*Continuum Mechanics*

French, A. P. *Vibrations and Waves*. Nelson, 1971.

*Thermodynamics*

Mandl, F. *Statistical Physics*. Wiley, 1971.

**1.122A Electromagnetism**

Electrostatics, Gauss' theorem. Dipoles. Dielectrics. Electric displacement. Poisson's and Laplace's equations. Electrical images. Classical theory of conduction. Magnetic effects of currents. Magnetic shells. Magnetic scalar potential. Magnetostatics. B and H. Ferromagnetism. Maxwell's equations of e.m. field. Poynting vector. Plane waves in isotropic dielectric and conducting media. Reflection, refraction at the boundary of two dielectrics. Reflection from surface of metal.

## TEXTBOOK

Corson, D. & Lorrain, P. *Introduction to Electromagnetic Fields and Waves*. Freeman, 1962.

**1.122B Quantum Physics**

Introductory relativity theory, kinematics and mechanics. Electrons and quanta, the photoelectric effect, Compton effect. The nuclear atom. Atomic stability. Atomic spectra. Bohr theory. Particles and waves and Schrodinger's equation. The free particle. Step potentials. The one electron atom. The exclusion principle. X-rays, origin and spectra. Electron energy levels in solids.

## TEXTBOOK

Eisberg, R. M. *Fundamentals of Modern Physics*. Wiley, 1961.

**1.122C Thermodynamics and Mechanics**

First and second laws of thermodynamics. Thermodynamic equilibrium, and reversibility. Kelvin temperature scale. Entropy. Thermodynamic functions and Maxwell's relationships. Application of thermodynamics to different systems. Maxwell-Boltzmann velocity distribution law. Oscillators. Vibrating strings. Motion of system of particles. Lagrange's equations. Variational principles. Hamilton's equations of motion. Transport properties of a gas.

## TEXTBOOKS

Reif, F. *Fundamentals of Statistical and Thermal Physics*. McGraw-Hill, 1965.

Symon, K. R. *Mechanics*. 2nd ed. Addison-Wesley, 1965.

**2.001 Chemistry I**

Classification of matter and theories of the structure of matter. Atomic structure, the periodic table and chemical behaviour. Chemical bonds and molecular structure. Equilibrium and change in chemical systems. The structure, nomenclature and properties of organic compounds. Reactions of organic compounds.

## TEXTBOOKS

Aylward, G. H., & Findlay, T. J. V. *SI Chemical Data*. Wiley, Sydney, 1971.  
*Chemistry I—Laboratory Manual*. Univ. of N.S.W., 1974.

Kneen, W. R., Rogers, M. J. W. & Simpson, P. *Chemistry: Facts, Patterns and Principles*. Addison-Wesley, 1972.

Schaum Outline Series. *Theory and Problems of College Chemistry*. SI (metric) ed. McGraw-Hill.

## REFERENCE BOOKS

Barrow, G. M., Kenney, M. E., Lassila, J. D., Litle, R. L. & Thompson, W. E. *Understanding Chemistry*. Benjamin, 1969.

Brown, G. I. *A New Guide to Modern Valency Theory*. Longman, 1967.

Eastwood, F. W., Swan, J. M. & Yonatt, J. B. *Organic Chemistry. A First University Course in Twelve Programs*. Science Press, 1967.

Gray, H. B. & Haight, G. P. *Basic Principles of Chemistry*. Benjamin, 1967.

Pauling, L. *College Chemistry*. 3rd ed. Freeman, N.Y., 1964.

Runquist, O., Cresswell, C. J. & Head, J. T. *Chemical Principles. A Programmed Text*. Burgess Pub. Co., 1968.

Sisler, H. H., Van der Werf, C. A. & Davidson, A. W. *College Chemistry*. 3rd ed. Collier-Macmillan, 1967.

Vogel, A. I. *Macro and Semimicro Qualitative Analysis*. 4th ed. Longman, 1954.

## 2.021 Chemistry IE

A terminating subject for students in the Aeronautical, Civil, Industrial and Mechanical Engineering, Naval Architecture, and Applied Geography courses.

Classification of matter and theories of the structure of matter. Atomic structure, the periodic table and chemical behaviour. Chemical bonding and the nature and properties of chemical substances. Equilibrium and change in chemical systems.

## TEXTBOOKS

Aylward, G. H. & Findlay, T. J. V. *SI Chemical Data*. Wiley, 1971.

Barrow, G. M., Kenney, M. E., Lassila, J. D., Litle, R. L. & Thompson, W. E. *Understanding Chemistry*. Benjamin, 1969.

*Chemistry IE. Laboratory Manual*. Univ. of N.S.W., 1974.

Turk, A., Meislich, H., Brescia, F. & Arents, J. *Introduction to Chemistry*. Academic, 1968.

## REFERENCE BOOK

Munro, L. A. *Chemistry in Engineering*. Prentice-Hall, 1964.

## 4.913 Materials Science

The structure and properties of crystalline substances. Crystal structures, crystal planes and directions. Examination of crystals by X-ray, electron and neutron diffraction techniques. The properties of crystalline solids. Defect structure of crystals. Influence of defects on the behaviour of crystals. The

properties of metals and metallic alloys in terms of modern theories. The development of alloys for specific engineering applications. The elastic and plastic properties of solids. The mechanisms of fracture in crystalline solids. Ductile and brittle fracture. Creep. Fatigue. Design of materials.

Polymer materials. The structure and properties of polymers. Mechanisms for the modification of properties.

Ceramic materials. The structure and properties of ceramics. Similarities and differences with other crystalline solids. Ceramic-metal composites.

#### 4.921 Materials Science

The atomic structure of metals. The crystalline nature of metals and its significance. The solidification of metals. Plastic deformation of crystalline materials and its effect on properties. Phase equilibria in metallic alloys. The heat treatment of some ferrous and non-ferrous alloys. Corrosion. The electron theory of metals. Conductors, semi-conductors and insulators. Magnetic materials—structure and properties.

##### TEXTBOOK

Wulff, J. ed. *Structure and Properties of Materials*. Vols. I, III & IV. Wiley.

##### REFERENCE BOOKS

Azaroff, L. V. & Brophy, J. J. *Electronic Processes in Materials*. McGraw-Hill.

Guy, A. G. *Elements of Physical Metallurgy*. Addison-Wesley.

Pfann, W G. *Zone Melting*. Wiley.

#### 4.931 Metallurgy

For students of Civil Engineering. Part of 8.280 Civil Engineering Materials I.

The atomic structure of metals. The grain structure of metals; origin; effects of manufacturing processes. Structure of alloys—theory. Structure, properties and heat treatment of commercially important alloys. The selection and properties of structural steels. Corrosion.

##### TEXTBOOKS

Guy, A. G. *Elements of Physical Metallurgy*. Addison-Wesley.

Wulff, J. ed. *Structure and Properties of Materials*. Vols. I & III. Wiley.

#### 4.941 Metallurgy for Engineers

The structure and properties of solids, with special reference to metals and metallic alloys which are of use to the engineer.

##### TEXTBOOKS

Guy, A. G. *Elements of Physical Metallurgy*. Addison-Wesley.

or

Hanks, R. W. *Materials Engineering Science*. Harcourt, Brace & World.

**10.001 Mathematics I**

Calculus, analysis, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

**TEXTBOOKS**

- Blatt, J. M. *Introduction to Fortran IV Programming*. Prentice-Hall.  
 Shields, P. C. *Elementary Linear Algebra*. Worth.  
 Thomas, G. B. *Calculus and Analytic Geometry*. 4th ed. Addison-Wesley.

**REFERENCE BOOKS**

- Blatt, J. M. *Basic Fortran IV Programming (IBM/360 Version)*. Computer Systems (Aust.).  
 Campbell, H. F. *Matrices with Applications*. Appleton-Century-Crofts.  
 Kaplan, W., & Lewis, D. J. *Calculus and Linear Algebra*. Vols. 1 & 2. Wiley.  
 Kelly, G. M. *Introduction to Linear Algebra and Vector Geometry*. Reed Education, Sydney, 1971.  
 Lange, I. H. *Elementary Linear Algebra*. Wiley.  
 Pedoe, D. *A Geometric Introduction to Linear Algebra*. Wiley.  
 Purcell, E. J. *Calculus with Analytic Geometry*. Appleton-Century-Crofts.  
 Smith, W. K. *Limits and Continuity*. Collier-Macmillan.  
 Tetra, B. C. *Basic Linear Algebra*. Harper & Row.  
 Zelinsky, D. *A First Course in Linear Algebra*. Academic.

**PRELIMINARY READING LIST**

- Allendoerfer, C. B. & Oakley, C. O. *Principles of Mathematics*. McGraw-Hill.  
 Bell, E. T. *Men of Mathematics*. 2 Vols. Pelican.  
 Courant, R. & Robbins, H. *What is Mathematics?* O.U.P.  
 Polya, G. *How to Solve It*. Doubleday Anchor.  
 Sawyer, W. W. *A Concrete Approach to Abstract Algebra*. Freeman.  
 Sawyer, W. W. *Prelude to Mathematics*. Pelican.

**10.011 Higher Mathematics I**

Calculus, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

**TEXTBOOKS**

- Blatt, J. M. *Introduction to Fortran IV Programming*. Prentice-Hall.  
 Fagg, S. V. *Differential Equations*. E.U.P.  
 Shields, P. C. *Elementary Linear Algebra*. Worth.  
 Spivak, M. *Calculus*. Benjamin.

**REFERENCE BOOKS**

As for 10.001 Mathematics I plus:

- Abraham, R. *Linear and Multilinear Algebra*. Benjamin.  
 Brauer, F. & Nohel, J. *Ordinary Differential Equations*. Benjamin.  
 Burkhill, J. C. *A First Course in Mathematical Analysis*. C.U.P.  
 Crowell, R. H., & Williamson, R. E. *Calculus of Vector Functions*. Prentice-Hall.  
 Hochstadt, H. *Differential Equations*. Holt, Rinehart & Winston.  
 Lang, S. *Linear Algebra*. Addison-Wesley.  
 Murdoch, D. C. *Linear Algebra for Undergraduates*. Wiley.  
 Spivak, M. *Calculus on Manifolds*. Benjamin.

## PRELIMINARY READING LIST

As for 10.001 Mathematics I plus:

- Arnold, B. H. *Intuitive Concepts in Elementary Topology*. Prentice-Hall.  
David, F. N. *Games, Gods and Gambling*. Griffin.  
Felix, L. *The Modern Aspect of Mathematics*. Science Editions.  
Huff, D. *How to Lie with Statistics*. Gollancz.  
Reid, C. *From Zero to Infinity*. Routledge & Kegan Paul.

## 10.021 Mathematics IT

Calculus, analysis, analytic geometry, algebra, probability theory, elementary computing.

## TEXTBOOKS

- Blatt, J. M. *Introduction to Fortran IV Programming*. Prentice-Hall.  
Greening, M. G. *First Year General Mathematics*. N.S.W.U.P.  
Youse, B. K. & Stalnaker, A. W. *Calculus for the Social and Natural Sciences*. International Textbook Co.

## REFERENCE BOOKS

- Allendoerfer, C. B. & Oakley, C. O. *Fundamentals of College Algebra*. McGraw-Hill.  
Bates, G. E. *Probability*. Addison-Wesley.  
Burford, R. L. *Introduction to Finite Probability*. Merrill.  
Christian, R. C. *Logic and Sets*. Blaisdell.  
Fine, N. J. *Introduction to Modern Mathematics*. Rand, McNally & Co.  
Hoyt, J. P. *A Brief Introduction to Probability Theory*. International Text Book Co.  
Johnson, W. G. & Zaccaro, L. N. *Modern Introductory Mathematics*. McGraw-Hill.

## 10.022 Engineering Mathematics II

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; introduction to numerical methods; matrices and their application to theory of linear equations, eigenvalues and their numerical evaluation; vector algebra and solid geometry; multiple integrals; introduction to vector field theory.

## TEXTBOOK

- Keane, A. & Senior, S. A. *Mathematical Methods*. Science.

## REFERENCE BOOKS

- Hildebrand, F. B. *Advanced Calculus for Applications*. Prentice-Hall.  
Kreyszig, E. *Advanced Engineering Mathematics*. Wiley.  
Pipes, L. A., & Harvill, L. R. *Applied Mathematics for Engineers and Physicists*. 3rd ed. McGraw-Hill.  
Spiegel, M. R. *Advanced Mathematics for Engineers and Scientists*. McGraw-Hill.

**10.033 Electrical Engineering Mathematics III**

Selections from the following topics:—Inversion theorem for Laplace transforms. Step and pulse functions and their transforms. Fourier transforms. Transmission line problems. Potential theory. Electromagnetic theory. Wave equations, orthonormal functions. Calculus of variations. Lagrangian and Hamiltonian mechanics.

**TEXTBOOK**

Groden, C. M., McKeegan, D. J. & Kirkpatrick, C. B. *Mathematics for Electrical Engineers*. Notes issued by the School of Mathematics.

**REFERENCE BOOKS**

Carslaw, H. S. & Jaeger, J. C. *Operational Methods in Applied Mathematics*. Dover.

Churchill, R. V. *Fourier Series and Boundary Value Problems*. 2nd ed. McGraw-Hill.

Danese, A. E. *Advanced Calculus*. Vol. I. Allyn & Bacon.

Hague, B. *An Introduction to Vector Analysis*. Methuen.

Pipes, L. A. *Applied Mathematics for Engineers and Physicists*. 2nd ed. McGraw-Hill.

Slater, J. C. & Frank, N. H. *Electromagnetism*. McGraw-Hill.

Tralli, N. *Classical Electromagnetic Theory*. McGraw-Hill.

Tranter, C. J. *Integral Transforms*. Methuen.

**10.111A Pure Mathematics II—Linear Algebra**

Vector Spaces: inner products, linear operators, spectral theory, quadratic forms. Linear Programming: convex sets and polyhedra, feasible solutions, optimality, duality.

**TEXTBOOKS****SESSION 1**

Tropper, A. M. *Linear Algebra*. Nelson.

**SESSION 2**

Gass, H. *Linear Programming*. ISE. McGraw-Hill.

**REFERENCE BOOKS**

Lang, S. *Linear Algebra*. Addison-Wesley.

Hoffman, K. & Kunze, R. *Linear Algebra*. Prentice-Hall.

**10.111B Pure Mathematics II—Analysis**

Complex variables: analytic functions, elementary functions, Taylor and Laurent series, integrals, Cauchy's theorem, residues, evaluation of certain real integrals, maximum modulus principles. Linear differential equations of the second order: equations with constant coefficients, power series solutions, Laplace transforms, Bessel functions.

**TEXTBOOKS****SESSION 1**

Kolman, B. & Trench, W. F. *Elementary Multivariable Calculus*. Academic.

## SESSION 2

Churchill, R. V. *Complex Variables and Applications*. ISE. McGraw-Hill.

## REFERENCE BOOKS

Hilton, P. J. *Partial Derivatives*. Routledge.

Thomas, G. B. *Calculus and Analytic Geometry*. 4th ed. Addison-Wesley.

**10.211A Applied Mathematics II—Mathematical Methods**

Review of functions of two and three variables, divergence, gradient, curl; line, surface, and volume integrals; Green's and Stokes' theorems. Special functions, including gamma and Bessel functions. Differential equations and boundary value problems, including vibrating string and vibrating circular membrane; Fourier series.

## TEXTBOOKS

Blatt, J. M. *Introduction to Fortran IV Programming*. Prentice-Hall.

Sneddon, I. N. *Fourier Series*. Routledge.

Spiegel, M. R. *Advanced Mathematics for Scientists and Engineers*. Schaum.

Spiegel, M. R. *Theory and Problems of Vector Analysis*. Schaum.

## REFERENCE BOOKS

Betz, H., Burcham, P. B. & Ewing, G. M. *Differential Equations with Applications*. I.S.R. Harper.

Blatt, J. M. *Basic Fortran IV Programming*. Computer Systems (Aust.).

Dettman, J. W. *Mathematical Methods in Physics and Engineering*. McGraw-Hill.

Smith, G. D. *Vector Analysis Including the Dynamics of a Rigid Body*. O.U.P.

**10.341 Statistics SU**

An introduction to probability theory. Random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of  $\chi^2$ ,  $t$  and  $F$ . Estimation by moments and maximum likelihood; confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to linear regression. Least squares adjustment of data.

**10.351 Statistics SM**

For students in Aeronautical, Industrial and Mechanical Engineering and Naval Architecture as part of 5.071 Engineering Analysis.

An introduction to probability theory, with finite, discrete and continuous sample spaces. Random variables: the standard elementary distributions including the binomial, Poisson and normal distributions. Sampling distributions, with emphasis on those derived from the normal distribution:  $t$ ,  $\chi^2$  and  $F$ . Estimation of parameters: the methods of moments and maximum likelihood, and confidence interval estimation. The standard tests of statistical hypotheses, and, where appropriate, the powers of such tests. An introduction to regression and the bivariate normal distribution.

## TEXTBOOKS (for 10.341 and 10.351.)

Freund, J. E. *Mathematical Statistics*. 2nd ed. Prentice-Hall.

*Statistical Tables*.

## REFERENCE BOOKS

Derman, C. & Klein, M. *Probability and Statistics Inference for Engineers*. O.U.P.

Freeman, H. *Introduction to Statistical Inference*. Addison-Wesley.

Hald, A. *Statistical Theory with Engineering Applications*. Wiley.

**10.361 Statistics SE**

For students in Electrical Engineering.

As for 10.351 Statistics SM, with the addition of auto-correlation.

## TEXTBOOKS

As for 10.351 Statistics SM.

**14.001 Introduction to Accounting**

An introduction for non-commerce students to the nature, purpose and conceptual foundation of accounting. Information systems including accounting applications. Analysis and use of accounting reports. Relevance of accounting to managerial and technological functions including planning, decision-making and control.

## PRELIMINARY READING

Anthony, R. N. *Essentials of Accounting*. Addison-Wesley, 1964.

## TEXTBOOK

Fertig, P. E., Istvan, D. F., & Mottice, H. J. *Using Accounting Information*. 2nd ed. Harcourt, Brace & World, 1971.

**31.212 Geometrical Optics**

The concept of the ray of light and the point image. Reflection. Fresnel's laws. Refraction. The thin lens. The thick lens and lens systems. Instruments and their aberrations. Trigonometrical ray tracing. Photometry.

## REFERENCE BOOKS

Conrady, A. E. *Applied Optics and Optical Design*. Dover.

Emsley, H. H. *Aberrations of Thin Lenses*. Hatton.

Fincham, W. *Optics*. Hatton.

Hardy, A. C. and Perrin, P. H. *Principles of Optics*. McGraw-Hill.

Morgan, J. *Introduction of Geometrical and Physical Optics*. McGraw-Hill.

**36.411 Town Planning**

The study of factors influencing the direction of the development and use of land in the public interest. Objectives of town and regional planning; urban land process; patterns and processes of urbanization; the industrial and urban revolution; housing and neighbourhood planning; planning law and administration; the Sydney Region Outline Plan; transportation planning; industrial location and decentralisation; "Tomorrow's Canberra"; the future city.

## REFERENCE BOOKS

Abercrombie, P. *Town and Country Planning*. 3rd ed. O.U.P., 1959.

Brown, A. J. & Sherrard, H. M. *Town and Country Planning*. 2nd ed. A. & R., 1969.

Colman, J. *Planning and People*. A. & R.

Mumford, L. *The City in History*. Secker & Warburg.

Stretton, H. *Ideas for Australian Cities*. Griffin Press.



# HELP IMPROVE YOUR HANDBOOK

It is important to the University and to yourself that you understand its conventions and regulations. The University Calendar and faculty handbooks are means by which the University attempts to convey, amongst other things, information regarding the facilities it has to offer, and the rules and regulations which govern the conduct and progress of students. You can help us assess the efficacy of the handbooks by completing this questionnaire, and thereby help yourself and your fellow students in the years to come.

1. Name of faculty.....Course.....Yr./Stage.....

## A. CONTENTS

2. What information in your handbook did you find most useful?.....

3. (a) What information did you find least useful?.....

(b) Why was the information of so little use to you?.....

4. How would you rate the following information areas for inclusion in the handbook?

(Tick appropriate square)  
**ESSENTIAL    INTERESTED    UNNECESSARY**  
**TO HAVE**  
**THEM**

Calendar of dates .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
List of academic staff .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Course outlines or rules governing course .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Descriptions of subjects .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Textbook lists .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reference book lists .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Requirements for admission .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Admission and enrolment procedures .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Course fees .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rules relating to students .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Student services .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scholarships .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Student activities .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Examination procedures .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Timetables .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Please comment on any aspect of the information areas listed in Question 4 and particularly, if you think necessary, on the form of presentation i.e., its content, layout, position.....

6. If there is any section which you feel might be expanded, please list and state why you feel it should be expanded .....
7. Would you like any of the following included in the handbook?
- |   | YES                      | NO                       |
|---|--------------------------|--------------------------|
| Photographs of senior academic and administrative personnel ..... | <input type="checkbox"/> | <input type="checkbox"/> |
| Prices of textbooks .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Names of lecturers listed alongside subject descriptions          | <input type="checkbox"/> | <input type="checkbox"/> |
| Timetables .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Map of the Campus .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other items .....   | <input type="checkbox"/> | <input type="checkbox"/> |
8. Do you use the textbook lists in your handbook when buying your books? .....
- If 'NO', please state where you obtained a list of the required textbooks .....
9. Do you use your handbook when selecting reference books? .....
- If 'NO', please state where you obtained your list of reference books .....
10. The handbooks are generally available at the latest by mid-December. Is this date early enough for your purposes? .....
- If 'NO', please nominate a month when you feel they should be on sale .....
11. Have you ever sought information from the University Calendar because it was not available in the handbook? .....
- If 'YES', please indicate which information .....
12. If you had any difficulty in obtaining a copy of your handbook, please outline problem .....

## B. FORMAT

13. Is the handbook a convenient size? .....
14. Would you prefer some of the information to be presented differently, e.g., in tabular form, or expressed in a less complex manner or perhaps communicated in some other way? .....
- If 'YES', please give examples of what you would like changed, and how you would change it .....
15. Have you any comments which you would like to make on either the contents or format? .....

*When you have completed this form, please either return it personally to Marianne Devin, Publications Officer, Room 307, The Chancellery, or post it via the internal mail system. Thank you for your co-operation.*

### STUDENT'S TIMETABLE

[illegible]

PLEASE RETURN TO:

RELATIONS OFFICER

THE UNIVERSITY OF NEW SOUTH WALES

ROBERTS, THE CANTONMENT

P.O. BOX 1, RENSHAWTON