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University of Newcastle Act, 1964 — 1970
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FACULTY OF ENGINEERING

FOREWORD

Once again it is my pleasant duty to welcome to the University students of this Faculty. To new students particularly, I advise the adoption of a balanced approach to University life in order that your transition from school to University will be both enjoyable and fruitful. This Faculty has worked hard to make your engineering courses as interesting and enjoyable as possible and with a flexibility that will allow you to concentrate on studies of greatest interest to you.

This year substantial changes have been made in the Faculty educational programme. In the first instance the Departments of Civil, Electrical and Mechanical Engineering have ceased to take new students into the Bachelor of Science (Engineering) part-time degree courses. Instead, these Departments now offer a Bachelor of Engineering course on a full-time basis, a part-time basis, or some combination of these. Furthermore, students formerly enrolled in the B.Sc. (Engineering) course may simply transfer to the B.E. course, should they desire this change.

In the postgraduate area, a complete revision of offerings in the Master of Engineering Science course has been made, and postgraduate students may now opt to work completely in areas such as Applied Mechanics/Structures, Computer Science, Engineering Materials, Environmental Studies/Environmental Engineering, Fluid Mechanics/Water Resources Engineering, Furnace Engineering, Operations Research/Management Science, Mineral Process Engineering, and Systems. However, the previous arrangement will still remain, which is that a postgraduate student may opt to take an approved compatible combination of subjects.

Of particular interest in the undergraduate courses is the subject unitization of most of the courses and, for part-time students, the introduction of industrial experience elective units. These developments are seen as positive measures for the improvement of educational performance at the University and professional expertise upon completion of the course.

The development of the Departments which comprise the Faculty continues steadily, and improved facilities will be available this year. It is hoped that students will again participate in the various committees and activities of the Faculty and the University, as such activities bring about a better understanding between staff and students. Our staff/student relationships have always been of a high standard and it is certainly the intention of the staff to continue these good relationships.

Finally, I would urge all students to take advantage of the opportunities provided to talk to members of the academic staff and to discuss with them their various problems. I would be grateful for any feedback of a constructive nature from the student body.

A. J. Carmichael
Dean
Faculty of Engineering
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PRINCIPAL DATES
1974

JANUARY

1 Tuesday
Public Holiday — New Year's Day
4 Friday
Last day for lodgement of Re-Enrolment Forms — Continuing Students
14 Monday
Deferred Examinations begin
18 Friday
Last day for lodgement of Applications for Admission from persons resident in Australia who were enrolled in another Australian University in 1973 or who are seeking admission on the basis of examination results which were not available by Ist November, 1973 or who applied to attempt The University of Sydney Matriculation Examination in February 1974.
25 Friday
Deferred Examinations end
28 Monday
Public Holiday — Australia Day

FEBRUARY

8 Friday
Last day for lodgement of applications for residence in Edwards Hall.
22 Friday and
25 Monday
New students required to attend the University in person to have their enrolment approved. Charges applicable may be paid immediately after the enrolment form is approved.
26 Tuesday
Last day for lodgement of enrolment approvals with the Cashier together with appropriate charges, scholarship vouchers, or warrants.

MARCH

4 Monday
FIRST TERM begins
15 Friday
Graduation Day
### PRINCIPAL DATES

#### APRIL

- **22 Monday**
  - Last day for withdrawal without academic penalty from Type A subjects in the Faculty of Engineering.
- **12 Friday**
  - Public Holiday — Good Friday
- **13 Saturday to 16 Tuesday**
  - Easter Recess
- **25 Thursday**
  - Public Holiday — Anzac Day

#### MAY

- **18 Saturday**
  - FIRST TERM ends

#### JUNE

- **10 Monday**
  - SECOND TERM begins
- **14 Friday**
  - Last day for acceptance of applications for examinations.
- **17 Monday**
  - Public Holiday — Queen’s Birthday

#### JULY

- **15 Monday**
  - Last day for withdrawal without academic penalty from courses in all faculties, except half year subjects in the Faculty of Engineering.

#### AUGUST

- **17 Saturday**
  - SECOND TERM ends

#### SEPTEMBER

- **9 Monday**
- **16 Monday**
  - Last day for withdrawal without academic penalty from Type B subjects in the Faculty of Engineering.

#### OCTOBER

- **7 Monday**
  - Public Holiday — Eight Hour Day

#### NOVEMBER

- **1 Friday**
- **9 Saturday**
  - Third Term Lectures and other classes cease.
- **30 Saturday**
  - Annual Examinations begin
- **1975**
  - Annual Examinations end

#### JANUARY

- **20 Monday**
  - Deferred Examinations begin
- **31 Friday**
  - Deferred Examinations end

#### MARCH

- **3 Monday**
  - FIRST TERM begins
FACULTY OF ENGINEERING

Dean
Professor A. J. Carmichael

Sub-Dean
Mr. K. R. Bridger

CHEMICAL ENGINEERING

Professor

Senior Lecturers
K. L. Smith, B.E.(Sydney), M.Sc.(New South Wales), Ph.D.

Lecturer

Honorary Associate

STUDENT ADVISOR
Dr. W. G. Kirchner

CIVIL ENGINEERING

Professor

Associate Professor
A. Herzog, Dipl.Eng.(Budapest), Ph.D.(New South Wales), F.I.E.Aust., M.ASCE.

Senior Lecturers
N. O. Betts, B.Sc.(South Africa), B.Sc.(Eng.) (Capetown), M.Eng.Sc.(New South Wales), M.I.C.E., M.I.E.Aust., A.M.(South Africa) I.C.E.
F. L. Clarke, B.Surv.(New South Wales), L.S., M.I.S.Aust. (Surveying)
P. W. Kleeman, B.E.(Adelaide), F.S.A.S.M.

Lecturers
R. J. Wilson, B.E.(New South Wales), M.E., M.I.E.Aust., A.M.ASCE.

Senior Tutor
G. W. Nichols, B.E.

Professional Officers
R. G. Hanson, B.E.(Canterbury), M.I.E.Aust., Grad.I.N.Z.E.
M. G. Van Santen, M.T.S.Dip.(Utrecht)
ELECTRICAL ENGINEERING

Professors
J. B. Moore, B.E., M.Eng.Sc.(Queensland), Ph.D.(Santa Clara), M.I.E.E.E.

Senior Lecturers

Lecturers
A. Cantoni, B.E., Ph.D.(Western Australia)
B. J. Cook, Ph.D.(Bristol)
G. C. Goodwin, B.Sc., B.E., Ph.D.(New South Wales), M.I.E.E.
F. J. Lidgey, B.Sc.(Borough Polytechnic)
K. K. Saluja, B.E.(Roorkee), M.S.(Iowa)

Professional Officers

MECHANICAL ENGINEERING

Professors
A. W. Roberts, B.E., Ph.D.(New South Wales), A.S.T.C. (Industrial Engineering)

Associate Professors
A. K. Johnston, B.E.(Sydney), M.S.(Iowa), Ph.D. (New South Wales)

Senior Lecturers

Lecturers
L. W. B. Browne, B.E.(Sydney)
D. Budney, M.Sc.(Alberta), Ph.D.(New South Wales)
M. J. Hallinan, A.S.T.C.

Senior Tutors
R. D. Parbery, B.E., B.Sc.

Honorary Associate

Professional Officers
J. A. Lewis, B.Sc., A.S.T.C., A.I.M.Aust.I.M.M., A.C.A.
R. J. Scobie, A.S.T.C.
O. J. Scott, B.E.
ADMINISTRATIVE STAFF

Vice-Chancellor and Principal

Vice-Principal and Deputy Vice-Chancellor
Professor B. Newton-John, M.A.(Cambridge), F.R.S.A.
(To 5 March 1974)
Professor A. D. Tweedie, M.A.(New Zealand)
(From 6 March 1974)

Deputy Vice-Chancellor

Personal Assistant to Vice-Chancellor
A. Nell Emanuel, B.A.(New South Wales)

BURSAR’S DIVISION

Bursar
L. W. Harris, A.A.S.A.(Senior), A.B.I.A.

Deputy Bursar
L. F. Norberry, A.A.S.A.

Accountant
G. W. Walker, A.A.S.A.

Assistant Bursar — Staff
R. J. Goodbody

SECRETARY’S DIVISION

Secretary
P. D. Alexander, B.A., Dip. Ed.(Sydney)

Student Administration
P. H. Beckett, B.A.(Sydney)

Examinations
Glennie Jones, B.A.(New South Wales)
R. Weir, B.A.

Faculty Secretariat
J. S. Boydell, M.A.(Cambridge)
P. C. Hawkins, B.Com.
Christine Samojuuk, B.A.(Sydney)

Publications and Publicity
J. W. Armstrong, B.A.
E. Joan Bale, B.A.(New South Wales)

Statistics and Systems
D. L. Farmer, B.Sc., Dip.Ed.(Sydney)
D. S. Dunlop

PLANNER’S DIVISION

University Planner
Associate Professor E. C. Parker, A.S.T.C., F.R.A.I.A.

Deputy Planner

Staff Architect
W. J. Crook, B.Arch.(New South Wales), A.R.A.I.A.

Assistant Staff Architect
A. Lee, A.S.T.C.

Staff Engineer

Assistant to Staff Engineer
J. D. O’Donohue
ADMINISTRATIVE STAFF

UNIVERSITY COUNSELLING SERVICE

Senior Student Counsellor
A. P. T. Loftus, B.A.(Melbourne), M.A., M.A.Ps.S.

Student Counsellors
B. E. Hazell, M.A.(Sydney), M.A.Ps.S.
(Seconded to the University of the South Pacific)
(Temporary Appointment)

OVERSEAS STUDENT ADVISOR

Overseas Student Advisor
Robin Loftus, B.A.(Adelaide)

AMENITIES OFFICE

Amenities Officer
H. Bradford

CAREERS AND STUDENT EMPLOYMENT OFFICE

Careers Officer
H. Floyer, B.Ec.(Sydney)

ADMINISTRATIVE STAFF

COMPUTER CENTRE

Director
J. A. Lambert, B.Sc.(Sydney), M.Sc.(New South Wales), M.B.C.S.

Programmers
M. Capek
F. C. P. Huang, B.Sc.(National University, Taiwan), Ph.D.(Australian National), A.A.I.P.
A. Loo Jansen, B.App.Sc.(Adelaide)
M. Wiseman, B.Sc., Ph.D.(Adelaide)

EDWARDS HALL

Warden
THE UNIVERSITY OF NEWCASTLE

The University of Newcastle began its existence as the Newcastle University College of the University of New South Wales, then known as the New South Wales University of Technology. The College was formally opened on 3rd December, 1951, and the first students were enrolled in the 1952 academic year. By the University of Newcastle Act of 1964 it became an autonomous institution on 1st January, 1965.

Enrolments in the first year of the College's existence totalled 370 of whom only five were starting degree courses — the others were seeking a diploma or were converting their diplomas into degrees. In 1954 courses in the Faculty of Arts were offered for the first time. As the New South Wales University of Technology, whose courses were given in the College, had no Faculty of Arts, supervision of these courses was entrusted to the University of New England. This relationship continued until 1959 by which time the New South Wales University of Technology had become the University of New South Wales and was empowered to offer courses in the Faculty of Arts. Enrolments have steadily increased, reaching 1000 in 1960 and 3871 in 1973.

The Newcastle University College was established on the site of the Newcastle Technical College at Tighe’s Hill. In 1960 an area of some 200 acres was acquired at Shortland and building commenced in 1964. The transfer of the University began at the end of 1965. Courses in all faculties are now given on the Shortland Campus.

The University is governed by a Council of twenty-four members. The Chancellor, who acts as chairman, is chosen either within the twenty-four members or from outside, the size of the Council being increased to twenty-five in the latter instance. The Council comprises representatives of the University staff, Convocation, the students, the Legislative Council and the Legislative Assembly; nominees of the Governor; and the Vice-Chancellor, who is the chief executive officer of the University.

The principal academic body in the University is the Senate comprising the Vice-Chancellor, Professors, a representative of each of the Faculty Boards, representatives of the students and certain other ex officio members. Teaching and research in each Faculty are supervised by a Faculty Board consisting principally of the permanent academic and teaching staff of the Departments in the Faculty and representatives of the students. A number of Boards of Studies have also been established, each board having the task of integrating or supervising activities in a particular area of interest.

The University is financed by grants from the Australian Government.

MATRICULATION

The By-laws governing matriculation and admission to courses are set out below. The University does not conduct its own matriculation examination but recognises the New South Wales Higher School Certificate Examination and the University of Sydney Matriculation Examination for this purpose.

By-law 5.1 — Matriculation

1. (1) Except as provided in By-law 5.3.3, a candidate, before being admitted to matriculation, shall:—

(a) have passed in the New South Wales Higher School Certificate Examination or the University of Sydney Matriculation Examination in at least five recognised matriculation subjects, one of which shall be English and any three of which shall be passed at least at second level; and

(b) have attained in that examination the aggregate of marks prescribed by the Senate from time to time and calculated in the manner determined by the Senate.

(2) The recognised matriculation subjects shall be:—

<table>
<thead>
<tr>
<th>Subject</th>
<th>Language</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Greek</td>
<td>Chinese</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Latin</td>
<td>Japanese</td>
</tr>
<tr>
<td>Science</td>
<td>French</td>
<td>Hebrew</td>
</tr>
<tr>
<td>Agriculture</td>
<td>German</td>
<td>Dutch</td>
</tr>
<tr>
<td>Modern History</td>
<td>Italian</td>
<td>Art</td>
</tr>
<tr>
<td>Ancient History</td>
<td>Bahasa Indonesia</td>
<td>Music</td>
</tr>
<tr>
<td>Geography</td>
<td>Spanish</td>
<td>Industrial Art</td>
</tr>
<tr>
<td>Economics</td>
<td>Russian</td>
<td>Arts</td>
</tr>
</tbody>
</table>

(3) Mathematics and Science, both passed as full courses, together shall, for the purpose of sub-section (1) (a) of this section, be counted as three subjects, but otherwise, each shall count as one subject.

(4) The qualification for matriculation must be obtained at one examination.

2. A person who has applied to undertake a course of study as a matriculated student shall upon —

(a) the approval of his admission to a Faculty and the payment of such fees as may from time to time be determined by the Council; and
(b) signing the Matriculation Register of the University become a matriculated student of the University and shall be deemed to have accepted the privileges and obligations of membership of the University.

By-law 5.2 — Courses and Degrees
1. The Council may by resolution determine —
   (a) the requirements for courses of study in the University; and
   (b) the requirements for fellowships, scholarships, prizes, exhibitions, degrees and diplomas and the granting thereof.

By-law 5.3 — Admission to Courses
1. (1) A candidate for any first degree of the University shall satisfy the conditions for admission to matriculation set out in By-law 5.1.1 or shall have been admitted to matriculation under section 3 of this By-law before entering on any course for such degree. Compliance with the conditions for admission to matriculation shall not in itself entitle a person to enter upon a course.
   (2) A person who has satisfied the conditions for admission to matriculation may on the payment of such fees as may be determined by the Council from time to time be provided with a statement to that effect.

2. A candidate for any degree shall before entering on the course for that degree have satisfied any special conditions prescribed under By-law 5.2.

3. The Council may, with the advice of the Senate, admit as a matriculated student, under such conditions and with such standing as it may determine, any person who has satisfied the Council that he has reached a standard of education sufficient to enable him to pursue his proposed course.

4. The Council may, with advice of the Dean of the Faculty concerned, permit any person to enrol in a subject or subjects on payment of such fees as may be determined from time to time by the Council: Such a person, not being a matriculated student, shall not have the privileges of a matriculated student and shall not be eligible to proceed to a degree.

PREREQUISITES

Although prerequisites are not prescribed, lectures in the following faculties, courses or subjects will be given on the assumption that students will have studied for the New South Wales Higher School Certificate the subjects listed below to the level indicated:

<table>
<thead>
<tr>
<th>FACULTY</th>
<th>ASSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLIED SCIENCE</td>
<td>Second level Short Course Mathematics and Science including Physics and Chemistry options.</td>
</tr>
<tr>
<td>ARCHITECTURE</td>
<td>Second level Short Course Mathematics and Science.</td>
</tr>
<tr>
<td>ARTS</td>
<td>Economics I — Second level Short Course Mathematics.</td>
</tr>
<tr>
<td></td>
<td>English I — Second level English.</td>
</tr>
<tr>
<td></td>
<td>French I — Second level French.</td>
</tr>
<tr>
<td></td>
<td>German IN — Second level German.</td>
</tr>
<tr>
<td>ECONOMICS AND COMMERCE</td>
<td>Second level Short Course Mathematics.</td>
</tr>
<tr>
<td>ENGINEERING</td>
<td>Second level Short Course Mathematics and Science including Physics and Chemistry options.</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>Second level Short Course Mathematics.</td>
</tr>
<tr>
<td>SCIENCE</td>
<td>Second level Short Course Mathematics and Science.</td>
</tr>
</tbody>
</table>
PROCEDURES

ENROLMENT

All forms relating to enrolment are obtainable from the Student Administration Office, Room G.63, Building “A”.

PERSONS SEEKING ADMISSION TO AN UNDERGRADUATE COURSE

Students seeking admission in the 1974 academic year will be required to lodge an “Application for Admission — 1974” with the Student Administration Office not later than

(a) 5.00 p.m. on Thursday, 1 November, 1973 in the case of:

— PERSONS RESIDENT IN AUSTRALIA who are seeking admission on the basis of qualifications which they already hold at 30 September, 1973;

— PERSONS RESIDENT OUTSIDE AUSTRALIA provided they already possess the results of the examination on which they are relying for admission in 1974.

Persons resident outside Australia whose examination results will not be available by 1 November, 1973 will not be considered for admission in 1974. They may inquire in September, 1974 for admission in 1975.

(b) 5.00 p.m. on Friday, 18 January, 1974 in the case of:

— PERSONS RESIDENT IN AUSTRALIA who

(i) are seeking admission on the basis of the results of examinations taken after 30 September, 1973;

(ii) in 1973 have been enrolled in another Australian University;

or

(iii) have applied to attempt the University of Sydney Matriculation Examination February, 1974.

No guarantee can be given that applications received after the prescribed dates will be considered.

Applications sent by post should be addressed to The Secretary, The University of Newcastle, N.S.W. 2308.

Students proposing to attempt the University of Sydney Matriculation Examination in February, 1974 should indicate on the application for admission the subjects and levels proposed to be offered for examination, and must advise the Secretary of their results as soon as they are known.

Documentary evidence must accompany each application where studies have been carried out at secondary educational institutions outside New South Wales or where previous University studies have been undertaken.

Each student will be advised by letter of the outcome of his application and those accepted will be informed of the procedures to be followed for the completion of enrolment. However, it should be noted that new students will be required to attend the University in person to have their enrolment approved and to pay the charges applicable. The days Friday 22 and Monday 25 February, 1974 have been set aside for this purpose.

PERSONS RE-ENROLLING IN AN UNDERGRADUATE COURSE

Undergraduates re-enrolling will be required to complete a re-enrolment form and lodge it with the Student Administration Office on or before Friday, 4 January, 1974. Students enrolled in 1973 will be sent a re-enrolment form with the advice of their examination results in December.
PROCEDURES

A student who has taken a deferred examination or special examination will be required to lodge a re-enrolment form with the Student Administration Office within one week from the day of publication of the examination results.

Approval of Re-Enrolment

When a student's re-enrolment programme has been approved the authorised re-enrolment form will be posted to the student at his home address unless he indicates that it should be posted to any other address.

PERSONS SEEKING READMISSION TO AN UNDERGRADUATE COURSE

Any student not enrolled in 1973 who wishes to re-enrol in 1974 should apply to the Student Administration Office for an Application for Readmission form.

DESIGNATION OF STUDENTS

FULL-TIME STUDENTS

A Full-Time Student is a student who enrols in more than half the subjects of a normal first year course and such a student remains classified as a full-time student until the written approval of the Dean of the Faculty is given that he be re-classified as a part-time student. This re-classification would be exceptional.

PART-TIME STUDENTS

A Part-Time Student is either one who enrols in half or less than half of the subjects of a normal first year course or one who enrols in a part-time course. In subsequent years, the enrolment as a part-time student requires the approval of the Dean of the Faculty.

NON-DEGREE STUDENTS

A Non-Degree Student is a student who is permitted to enrol in one or more subjects of a first degree course. Such a person is not eligible to proceed to a degree and cannot enjoy the privileges of a matriculated student. A student enrolled in the Professional Accounting Studies course in the Faculty of Economics and Commerce is classified as a Non-Degree student taking one subject.

PROCEDURES

CANDIDATES FOR POSTGRADUATE DIPLOMA COURSES

Intending candidates for the Postgraduate Diploma courses in Business Studies, Computer Science, Education and Industrial Engineering will be required to complete an Application To Register Form and lodge it with the Student Administration Office on or before Friday, 18 January, 1974.

Applicants for admission to the Diploma in Psychology are selected biennially. No new candidates will be accepted in 1974.

Each student whose undergraduate studies were undertaken in another University, will be required to provide a full transcript of his academic record with his application.

For further information, intending candidates should consult the entry for the appropriate Diploma course.

CANDIDATES FOR HIGHER DEGREES (DOCTOR OF PHILOSOPHY OR MASTER DEGREES)

Candidates Re-Enrolling

A letter will be sent by the University to each candidate whose re-registration is approved. A higher degree enrolment form will be enclosed with the letter and the candidate will be required to complete the form and return it to the Student Administration Office on or before Friday, 4 January, 1974.

Candidates Registering for the First Time

Doctor of Philosophy or Research Master's Candidate

Candidates wishing to register for the degree of Doctor of Philosophy or a Research Master's degree must lodge an Application to Register Form no later than one month prior to the commencement of the term in which registration is sought.

Dates by which Applications to Register must be Lodged

- Friday, 1 February, 1974
- Friday, 10 May, 1974
- Friday, 9 August, 1974

Course Work Master's Candidates

Candidates wishing to register for a Course Work Master's degree must lodge an Application to Register Form no later than Friday, 18 January, 1974.
PROCEDURES

NON-ACCEPTANCE
A student whose enrolment is not accepted will be notified in writing.

LATE ENROLMENTS
(i) Students who are unable to lodge their Re-Enrolment Form by the prescribed date, shall make written application to the Secretary for an extension of time. This application must be received by the Secretary on or before Friday, 4 January, 1974, otherwise the University reserves the right not to accept the student's enrolment.

(ii) No enrolments will be accepted after 31 March of each academic year without the approval of the Secretary which shall be given only in exceptional circumstances.

(iii) Deferred Examinations
A student who has taken a deferred examination or special examination will be required to lodge an Enrolment Form with the Student Administration Office within one week from the day of publication of the examination results.

SHOW CAUSE STUDENTS
Students who, after failure at the annual examinations, are required to "show cause" why they should be allowed to continue in a course will be informed of this fact in writing after notification of examination results in December. Such a student will be provided with a form on which he must state his "show cause" case.

A student who wishes to re-enrol in any subject which he has failed more than once shall be required to show cause why he should be allowed to re-enrol in the subject and must submit a "show-cause" statement with his re-enrolment form.

The student's "show cause" statement and completed re-enrolment form must be lodged with the Student Administration Office on or before Friday, 4 January, 1974.

UNIVERSITY SKILLS ASSESSMENT
As part of its service to students, the University Counselling Service holds a voluntary half day session in which a variety of skills relevant to university work, such as Reading Speed, Note-Taking, Study Skills etc. are tested. Attendance is voluntary and the results are held in confidence in the Counselling Service. This year it is intended to hold the University Skills Assessment on 15 March (Graduation Day). An evening session will be held for Part-Time students on the same date. Many students derive benefit from later discussing their results with a counsellor. Some students are later invited (on the basis of a weak result) to participate in a course designed to overcome their particular difficulty.

ENROLMENT IN CORRECT SUBJECTS
Considerable inconvenience is caused to the University and to the student if he attends classes in a subject in which he has not enrolled. It is essential that the student consider carefully the subjects he is required, or wishes, to enrol in before submitting his Enrolment Form.

WITHDRAWAL FROM COURSE OR SUBJECT REGARDED AS FAILURE
Approval to withdraw from a course or a subject is not automatic. It should be noted that a student is regarded as having failed in a course if he enrols in it and does not pass the annual examinations — i.e. not sitting for the examination is regarded as not passing the examination (unless withdrawal without penalty has been approved).

A student is required to notify the Secretary to the University in writing of his withdrawal and the withdrawal shall take effect from the date of receipt of such notification in writing. Unless the Dean of his Faculty grants him permission to withdraw without penalty, a student who withdraws after the date shown below will be deemed to have failed in the subject or subjects from which he withdraws.

All Faculties except the Faculty of Engineering
Sixth Monday in Second Term

Faculty of Engineering
Type A Subjects
Eighth Monday in First Term
Type AB Subjects
Sixth Monday in Second Term
Type B Subjects
Second Monday in Third Term.
PROCEDURES

AMENDMENTS

Any action taken by a student which involves an amendment to or a variation in his course programme or enrolment status is required to be documented.

A student must formally apply for permission to do any of the following:

(a) completely withdraw from course
(b) withdraw from a subject or subjects
(c) substitute one subject for another
(d) add a subject to existing programme
(e) transfer from F/T to P/T within degree course
(f) transfer from P/T to F/T within degree course
(g) transfer from one degree course to another
(h) transfer from a degree course in one Faculty to a degree course in another Faculty

If the variation sought is not listed above, a brief indication of the nature of the change sought is required.

Notes

1. Exemption in a subject unit or units, the substitution of a unit or units within a subject and exemption from practical work, is the responsibility of the Head of the Department concerned who will authorise such exemption or substitution.

2. Students are reminded that compliance with the degree or Diploma Requirements governing their courses is their responsibility. Approval of a Variation Application does not of itself entitle the applicant to any rights or privileges to which the completion of his previous programme might have entitled him.

HOW TO DOCUMENT WITHDRAWALS AND AMENDMENTS

All withdrawals and amendments should be recorded on a Variation Application Form.

It is essential that students notify the Student Administration of variations in their courses promptly. Automatic approval is not given; the student must have valid and sufficient reasons for making the change and these reasons should be stated on the Variation Form.

Variation Forms are available from the Student Administration Office.

PROCEDURES

CHANGE OF ADDRESS

Students are responsible for notifying the Student Administration Office in writing of any change in their address as soon as possible. A Notification of Change of Address Form should be used. It is available from the Student Administration Office.

Failure to do this could lead to important correspondence or course information not reaching the student. The University cannot accept responsibility if official communications fail to reach a student who has not notified the Student Administration Office of a change of address.

It is essential that all students inform the University of an address for all correspondence from the end of the examination period to the end of the long vacation.

This is particularly important for students intending to travel overseas during this period.

A special form for this purpose will be available in October of each year.

IDENTITY CARDS

Each student wishing to obtain a travel concession, to borrow a book from the Library or to confirm his membership of the Newcastle University Union is required to produce on demand his identity card.

Identity cards will be issued to students at the Student Administration Office and should be available for collection soon after the commencement of First Term. The student will be required to produce his enrolment receipt issued by the cashier before an identity card will be issued to him.

A notice will be displayed on notice boards and inserted in “University News” advising students when identity cards are available for collection.

Loss of Identity Card

If a student loses his identity card he should pay to the University Cashier the sum of 50 cents and present the receipt to the Student Administration Office for the purpose of obtaining a replacement card.

Return of Identity Card

Each student who during the academic year withdraws completely from his course will be required to hand his Identity Card to the Student Administration Office before leaving the University.
PROCEDURES

TRAVEL CONCESSIONS

The various transport authorities provide fare concessions for certain classes of students.

Application forms for these concessions may be obtained at the Student Administration Office.

The Student's Identity Card has to be produced each time a concession is required.

OMNIBUS — Concessions are available to:

(a) students under 18 years of age irrespective of whether they are employed or receive income or remuneration.

(b) students who are 18 but under 30 years of age and who are not in employment nor in receipt of any income or remuneration. Note: Income or remuneration includes allowances paid to Colombo Plan students, Public Service trainees, etc. but does not include allowances paid under the Tertiary Allowances Scheme, or to holders of Teacher Education Scholarships or Bursaries granted by the State Bursary Endowment Board.

(c) Concessions are not available to students who are 30 years of age or over; or to married women or ordained clergymen.

TRAIN —

(a) Periodical tickets are available during term to full-time students not in employment nor in receipt of any remuneration.

(b) Daily concession fare tickets are available to part-time students, whether employed or otherwise, for the purpose of travelling to and from classes held in connection with their course of instruction.

(c) Vacation travel concessions are available to students qualifying under (a) above.

AIRCRAFT —

Concession fares for travel overseas, inter-state and intra-state are available under the conditions ruling for the various operating companies.

LOST PROPERTY

Inquiries regarding lost property should be directed to the Attendant (Patrol) between 9 a.m. and 5 p.m. Monday to Friday at the Attendants' Office. This office is located in the north-eastern corner of the lowest floor of the Library building and may be reached from the pathway leading from the lower plaza to the footbridge.

CHARGES

GENERAL INFORMATION

COMPLETION OF ENROLMENT

Charges are determined by the University Council and are subject to alteration without notice. The due date for payment of charges for 1974 is 26 February, 1974.

Enrolment is not effective until appropriate charges have been paid. Enrolments will not be accepted after 31 March, 1974 without the Secretary's special written approval. This will be given only in exceptional circumstances.

PAYMENT OF CHARGES

The Entrance fee and General Services fee must be paid in full at the time of enrolment.

Payment by mail is encouraged. Money Orders should be made payable at the Newcastle University Post Office, New South Wales 2308. The Cashier's Office is located on the first floor of the Administration Building. A continuous service will apply from 9.00 a.m. to 4.30 p.m. Monday to Friday throughout the year with the exception of vacation periods when the Cashier's Office will be closed between 12.30 p.m. and 1.30 p.m.

Any alterations to the Cashier's hours during enrolment periods will be published in the press and displayed on selected University notice boards.

SCHOLARSHIP HOLDERS AND SPONSORED STUDENTS

Students holding scholarships or receiving other forms of financial assistance must attach to their authorised enrolment forms submitted to the Cashier, warrants or other forms of documentary evidence that charges will be paid by sponsors. The University looks to sponsors to provide a separate voucher, warrant or letter for each student sponsored.

HIGHER DEGREE CHARGES

General Services Fee

Higher Degree candidates are required to pay the General Services fee, and Entrance fee if applicable. Where the enrolment for a Higher Degree candidate is effective from first or second term, the General Services fee covers a period of registration from the first day of the term to the Friday immediately preceding the first day of first term in the following academic year. Where a Higher Degree candidate
CHARGES

enrols on or after the first day of third term, the General Services fee paid will cover liability in respect of this fee to the end of the long vacation following the next academic year.

CHARGES

1. General Services

(a) Students Proceeding to a Degree or Diploma
All registered students must pay a General Services fee of $52.00 per annum. In addition, students joining Newcastle University Union for the first time, are required to pay an amount of $12.00. These charges must be paid by the prescribed date.

(b) Non-Degree Students
Non-degree students must pay a Union annual fee of $32.00. This fee must be paid by the prescribed date. Non-degree students are not required to pay the General Services fee or the Union Entrance fee.

2. Late Enrolment and Re-enrolment Payments

(a) Late re-enrolment charge where a continuing student fails to lodge an enrolment form with the Student Administration office by the date approved by the Vice-Chancellor $14

(b) Late enrolment charge where a student does not lodge the approved section of the enrolment form with the Cashier by the time approved by the Vice-Chancellor $14

(c) Late payment charge where an application to sit for examination is accepted after closing date $6

(d) Late payment charge if relevant fees under (1) above are not paid within stipulated times approved by the Vice-Chancellor $8

(e) Additional amount payable if relevant fees under (1) above are not paid within an extended time approved by the Vice-Chancellor $6

3. Other

(a) Examination under special supervision, per paper $10

(b) Review of examination results, per subject $8

(c) Statement of matriculation status for non-members of the University $8

(d) Academic statements in excess of six per annum 15c a copy

(e) Replacement of student identity cards 50c each

GENERAL REQUIREMENTS

The University tries to function with a minimum of formal regulations. It is obvious, however, that there must be standard practice throughout the University in such diverse matters as examination procedures and car parking and an acceptance of certain requirements which are described in the following pages.

GENERAL CONDUCT

In accepting membership of the University the student undertakes to observe the by-laws and other requirements of the University. 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 forbidden.

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

ACADEMIC REQUIREMENTS

The student is responsible for informing himself as to, and for complying with, University requirements, especially the requirements relating to admission and to the award of the degree to which he is proceeding.

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.

NOTICE BOARDS

EXAMINATIONS

A notice board has been placed on the wall opposite the entrance to the Main Lecture Theatre (B01) for the specific purpose of displaying examination timetables and notices concerning all procedural matters pertaining to examinations. Students are specifically requested to be acquainted with the notices periodically displayed thereon.

STUDENT MATTERS GENERALLY

The main notice board is the display point for notices concerning enrolment matters, scholarships, University rules and travel concessions, etc. This notice board is located on the first floor at the top of the main staircase in Building “A”.
GENERAL REQUIREMENTS

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 Head of the appropriate Department. If term examinations have been missed this fact should be noted in the application.
In the case of illness or of absence for some other unavoidable cause a student may be excused by the Head of the appropriate Department for non-attendance at classes.
Applications for exemption from re-attendance at classes, either for lectures or practical work, may only be approved on the recommendation of the Head of the appropriate Department. The granting of an exemption from attendance does not carry with it exemption from payment of fees. Where a student has attended less than 80 per cent. of the possible classes, he may be refused permission to sit for the annual examination in that subject.

OWNERSHIP OF STUDENTS WORK
Unless other arrangements have been agreed upon the University reserves the right to retain at its own discretion the original or one copy of any drawings, models, designs, plans and specifications, essays, theses, or other work executed by students as part of their courses, or submitted for any award or competition conducted by the University.

PARKING OF CARS
TRAFFIC REGULATIONS
1. “Authorised Person” means a person authorised in writing by the Vice-Chancellor for the purposes of these Regulations.
“Notice” means a written advice signed by an authorised person on behalf of the Vice-Chancellor.
2. Any student, a member of staff of the University, or other person employed on the University site who wishes to bring a motor vehicle on to the Shortland site shall obtain a University parking permit. Upon receipt of a parking permit sticker the driver will fix this to the top left hand corner of the windscreen or in the case of a motorcycle in a prominent location on the cycle. Vehicles without this sticker may be refused entry to the campus.
3. No person shall park or leave any vehicle on the Shortland site except in places set aside from time to time for parking.
4. A person in charge of a vehicle entering or upon any part of the site shall:
(a) Stop his vehicle at any manned control point or any other part of the site when signalled to do so by a Patrol Attendant.
(b) Give to any such officer such information as he may reasonably require.
(c) Obey any direction a Patrol Attendant may reasonably give in relation to the driving or parking of such vehicle.
(d) Not drive at a speed greater than 20 m.p.h. or such speed limit as may be indicated by an appropriate sign for that section of road or part of the site.
(e) Not commit or do any act which would be a breach of any Act or regulation of the State of New South Wales if he were driving or in charge of a vehicle upon a public road.
(f) Not drive or park a vehicle on any lawn, grassed area, oval, garden, builders access road or undeveloped area of the site.
(g) Comply with all other directions related to traffic indicated by appropriate signs installed on the site.
5. Any person who contravenes or fails to observe any of the above regulations may be advised in writing by a notice which may be posted or handed to the person or affixed to his vehicle by an authorised person.
6. Any person who contravenes or fails to observe any of these regulations shall be deemed guilty of a breach of regulations and may be dealt with accordingly.
7. The maximum penalty for the time being which may be applied under these regulations shall be the banning from the University site for a period of three months of any vehicle driven by the person concerned.

Note
Application forms for permits may be obtained from the Senior Attendant (Patrol) at the Attendants’ Office. This office is located in the north-eastern corner of the lowest floor of the Library building and may be reached from the pathway leading from the lower plaza to the footbridge.
EXAMINATIONS

Examinations and other exercises may be held in any subject and at any time. In the assessment of a student's progress in a University course, consideration will be given to laboratory work and class exercises and to any term or other tests conducted throughout the year. The results of such examinations and class work may be incorporated with those of the annual examinations.

ANNUAL EXAMINATIONS

(Students in the Faculty of Economics and Commerce are referred to material in the Faculty of Economics and Commerce Handbook.)

A student desiring to sit for an annual examination must lodge an application with the Secretary on the appropriate form by the prescribed date, 14 June, 1974.

A student who, because of religious convictions, would prefer not to sit for an examination on a particular day or particular day of the week should indicate this in writing when lodging his application to sit for examinations. While the University cannot guarantee to meet such requests it will be willing to co-operate where possible.

The cashier is authorised to receive application forms during the three weeks immediately following the prescribed closing date if they are accompanied by a late payment charge of $6.00. Applications submitted more than three weeks after the closing date will not be accepted except with the approval of the Secretary. Where an application is not accepted, the student concerned is not eligible to sit for the examination.

No student is eligible to attend the annual examination in any subject if any portion of fees or other charges due by him is outstanding by the end of the third week of third term.

The annual examinations take place in November-December. Timetables showing the time and place at which individual examinations will be held will be posted on the examinations notice board near the Main Lecture Theatre. Misreading of the timetable will not under any circumstances be an acceptable excuse for failure to attend an examination.

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

(a) Candidates are required to obey any instruction given by a Supervisor for the proper conduct of the examination.

(b) Candidates are expected to be in their places in the examination room not less than ten minutes before the time for commencement of the examination.

(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 for the commencement of the examination.

(e) No candidate shall be permitted to leave the examination room before the expiry of thirty minutes from the commencement of the examination.

(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 an examination.

(i) A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination and if detected at the time, to immediate expulsion from the examination room, and is liable to such further penalty as may be determined.

FURTHER EXAMINATIONS

After completion of the written annual examination papers, a student may be called upon by an examiner to complete further written, practical or oral tests as part of the annual examination. It is therefore important that the Examinations Section be advised of any change in address from that given on the Application for Admission to Examinations.

EXAMINATION RESULTS

Each student will be advised by mail of his examination results. A set of examination results will be offered to the newspapers for publication. No results will be given by telephone.

Examination results may be reviewed for a charge of $8.00 per subject, which is refundable in the event of an error being discovered. Applications for review must be submitted on the appropriate form together with the prescribed review charge by the date notified in the publication of results.
EXAMINATIONS

SPECIAL EXAMINATIONS

Special examinations may be granted according to the conditions contained in By-Law 5.9.3 which states:

5. When a candidate is prevented by illness or by any other serious cause from presenting himself for the annual examination the appropriate Faculty Board may order a special examination for that candidate in the subject or subjects in which he was unable to present himself. The result of a special examination may be graded.

6. When a candidate's studies during the academic year have been gravely hampered by illness or other serious cause, the appropriate Faculty Board upon application being made to the Secretary to the University before the commencing date of the examination supported by medical or other proper evidence may direct the examiners to take the circumstances into account in determining whether or not a special examination should be provided for the candidate in any subject in which he does not pass at the annual examination.

7. When a candidate at the annual examination is to a substantial degree affected by illness during the course of an examination in any subject the appropriate Faculty Board, upon application being made to the Secretary to the University within three days after such examination or within such further period as the Vice-Chancellor may consider reasonable, upon the application being supported by medical or other proper evidence, may direct the examiners in that subject to take the circumstances into account if the candidate does not pass therein in determining whether or not a special examination or test should be provided for him: provided that no such application shall be considered unless the candidate either during or immediately after such examination reports to the supervisor in charge the circumstances relied on in the application.

DEFERRED EXAMINATIONS

Deferred examinations may be granted in the Faculties of Applied Science, Architecture, Engineering, and Mathematics. The examinations will be held in January-February and results will be published in the same manner as for the annual examinations.

ACADEMIC PROGRESS REQUIREMENTS

GENERAL

The University has enacted certain By-laws relating to continuation in a course. The relevant By-laws are set out below.

BY-LAWS

By-law 5.4.1 — Unsatisfactory Progress

1. The Head of a Department in any Faculty may determine that a student taking a subject or course offered by the Department shall be excluded from any examination for which the Department is responsible for any or all of the following reasons:

   (a) unsatisfactory attendance at lectures;
   (b) failure to complete laboratory work;
   (c) failure to complete written work or other assignments; or
   (d) failure to complete field work.

2. The Faculty Board may review the academic progress of any student enrolled in the Faculty concerned who fails in, or is absent from, or is excluded under section 1 of this By-law from any examination and may determine:

   (a) that the student be excluded from further study in a subject;
   (b) that the student may enrol in that Faculty only in such subject or subjects as the Faculty Board shall specify; or
   (c) that the case be referred to the Admissions Committee if, in the opinion of the Faculty Board, the student should be excluded from a degree course, from the Faculty or from the University.

3. The Admissions Committee, in considering a referral under subsection (c) of section 2 and after giving the student an opportunity to be heard, may determine:

   (a) that the student be excluded from a degree course or from the Faculty;
ACADEMIC PROGRESS REQUIREMENTS

(b) that the student shall be permitted to continue his course, subject to such conditions as the Admissions Committee may determine; or

(c) that the case be referred to the Vice-Chancellor with the recommendation that the student be excluded from the University.

4. The Vice-Chancellor may, on the recommendation of the Admissions Committee exclude from the University any student whose academic record in the opinion of the Vice-Chancellor and the Admissions Committee demonstrates the student's lack of fitness to pursue University studies.

By-law 5.4.2 — Show Cause

1. 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 the annual examination counts for the purposes of this By-law as one examination.

2. (1) A full-time student shall show cause why he should be allowed to continue a course if all subjects of the first year of his course are not completed by the end of his second year of attendance.

   (2) A part-time student shall show cause why he should be allowed to continue a course if all subjects of the first two stages of his course are not completed by the end of his fourth year of attendance.

3. (1) A student who has a record of failure at another University shall show cause why he should be admitted to the University.

   (2) A student admitted to a course at the University following a record of failure at another University shall show cause, notwithstanding any other provision in this By-law, why he should be allowed to continue in that course if he is unsuccessful in the annual examinations in his first year of attendance at the University.

4. A student required to show cause shall have his application considered by the Admissions Committee which shall determine whether the cause shown is adequate to justify the student's being permitted to continue his course or to re-enrol as the case may be.

By-law 5.4.3 — Re-Enrolment

1. Any student who has been excluded from a Faculty shall not be allowed to enrol in another Faculty without the permission of the Faculty Board concerned.

2. Any student excluded from a degree course or from a Faculty or from the University may apply after two academic years to the Admissions Committee for re-admission to any such Faculty or to the University. If the Admissions Committee is satisfied that the condition or circumstances of any such student have so changed that there is reasonable probability that he will make satisfactory progress in his studies it may authorise the re-admission of that student under such condition as it may determine.

By-law 5.4.4 — Appeal Against Exclusion

1. A student who is refused permission to enrol under the provisions of section 1 of By-law 5.4.3 may appeal to the Senate.

2. A student who has been excluded from any degree course or from a Faculty or from the University may appeal to the Council.

PROCEDURES

The onus is on a student required to “Show Cause” to take the appropriate action should he wish to re-enrol. Such a student must lodge his “Show Cause” statement and completed re-enrolment form by the date prescribed each year to ensure consideration of his case.
THE LIBRARY

The Library, totalling approximately 240,000 volumes and made up of monographs, pamphlets, serials, microform sets and audiovisual materials, exists to acquire, preserve and make available for use all research materials needed by the staff and students of the University. There is an almost complete freedom of access to the collections, and students are encouraged and aided to learn how to use, as soon as possible, the Library and its contents. On his first visit to the Library the student is provided with a brochure outlining the Library's resources, its services, such as the copying service, its special facilities, such as the microprint reading room, and its procedure for borrowing. The Library occupies the central position on the site, next to the Union.

HOURS OF OPENING

During academic year

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday-Friday</td>
<td>8.30 a.m. to 10.00 p.m. (long vacation excepted)</td>
</tr>
<tr>
<td>Saturday and Public Holidays</td>
<td>9.00 a.m. to 5.00 p.m. (all vacations excepted)</td>
</tr>
<tr>
<td>Sunday</td>
<td>1.00 p.m. to 5.00 p.m. (all vacations excepted)</td>
</tr>
</tbody>
</table>

The Library is closed for the Easter Weekend, i.e., April 12-16, 1974 inclusive.

During long vacation

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, Wednesday, Friday</td>
<td>9.00 a.m. to 5.00 p.m.</td>
</tr>
<tr>
<td>Tuesday, Thursday</td>
<td>9.00 a.m. to 7.00 p.m.</td>
</tr>
</tbody>
</table>

UNIVERSITY SERVICES

AMENITIES

The Amenities Office is located in the temporary building adjacent to the main University building. The Amenities Officer and his Staff assist students in the following fields:

SPORT

The Amenities Officer, Mr. Bradford is liaison officer for all sporting matters between the Sports Union, the University and all outside sporting organisations. The Amenities Office assists student Sporting Clubs in the arranging of Inter-varsity contests and travel as well as giving help when required at club level.

SPORTING FACILITIES

Administration of all sporting facilities on campus, which at present include four squash courts, two tennis courts and two ovals is the responsibility of the Amenities Office. An outside basketball court, two further tennis courts and a Field House should be completed during 1974.

NON-COMPETITIVE PASTIMES AND DIVERSIONS

The Amenities Office arranges recreational activities on campus on behalf of the Non-Competitive Pastimes and Diversions Committee for both students and staff. Classes in Pottery, Keep Fit, Leatherwork and Yoga have been held and further activities are planned.

ACCOMMODATION

The Amenities Office conducts a student accommodation service for students requiring housing and will deal with any accommodation problems which students may encounter while attending the University. A register is maintained of rooms, flats and private board available in Newcastle. Do not hesitate to use this service which is operated for the convenience of students.

INSURANCE

The Amenities section on behalf of the Sports Union and the Students' Representative Council is responsible for the operation of the Personal Accident Insurance Scheme.
The Careers and Student Employment Office (then the Appointments Office) was established in 1971 primarily to help students obtain information about careers and to assist graduating students to find employment.

Careers Counselling
All new students are invited to consult the Careers and Student Employment Office at some time during their first year at the University. Follow up consultations during second and third years may serve to bring the student to a state of mind where he or she feels confident that his or her chosen career is suitable and within the realms of possibility. The Careers and Student Employment Office would hope to have available or to obtain information for the student in order that by a little research in the early years, frustration and disappointment can be avoided after graduation. Students in the last year or stage of their degree, who may need help in finding suitable employment upon graduation, should consult the Careers and Student Employment Office during the July-September period prior to the final examinations.

Careers Library
1. A section of the Careers Library contains books, periodicals, articles, etc. giving general information about the various professional occupations.
2. Information is gradually being assembled about the manpower requirements of numerous employers — types of graduates needed, educational qualifications for appointment, experience gained, prospects etc.
3. Professional associations are being approached to supply information about the activities of their bodies, conditions of membership and application forms.

Employer Interviews
Some employers have representatives come to the University for the purpose of giving students first hand information about the kinds of graduates recruited, the job involvement, salaries, prospects etc. Students make appointments to interview the representatives singly or in small groups.

Employment Vacancies
Some Government Departments inform the University on a regular basis of vacancies within their organizations, other employers only as specific vacancies occur. The 'Positions Vacant' columns of a major local newspaper are always on hand.

The Sydney University Appointments Board has indicated that where a Newcastle University student proves that he is a bona-fide student, he can obtain copies of the “Notices of Vacancies” prepared by that Board, upon payment of the current nominal fee.

Casual and Part-time Employment
Unfortunately, it is a fact of life that some students do not have enough money to sustain them during University studies, and have to supplement their financial resources by part-time or casual work. Students may call at the Careers and Student Employment Office at the commencement of each year and complete a card indicating their needs. As opportunities are notified to the Careers and Student Employment Office, appropriate students are informed.

Industrial Experience and Vacation Employment
The Careers and Student Employment Office will provide administrative assistance to the Faculties seeking professional vacation employment for their students. Vacuum employment will be sought for those students seeking employment for financial reasons.

Graduate Careers Directory
The Graduate Careers Council of Australia prepares a Directory in three parts for distribution each year to graduating students. The Directory provides general background information on the types of appointments that will be available with a large number of employer organisations in the ensuing year. The Careers and Student Employment Office arranges distribution of this Directory; a few spare copies are available to undergraduates upon request.

All students are invited to consult and use the resources of the Careers and Student Employment Office; this service is free.

The Careers and Student Employment Office is located in Temporary Building, “T”.

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UNIVERSITY SERVICES

CHAPLAINCY SERVICE

A Chaplaincy Service within the University of Newcastle for the benefit of students and members of staff is provided by the Christian Churches of Newcastle.

The service offers personal counselling and guidance, and also assistance in biblical and doctrinal studies. Opportunities for liturgical worship are also provided.

The Chaplains' office is situated on the Lower Ground Floor of the Main Administration Building at Shortland.

The Chaplains are in regular attendance at the University but they may also be contacted at their private addresses.

NAMES AND ADDRESSES OF CHAPLAINS

Anglican
The Reverend Canon E. H. V. Pitcher,
M.A.(Sydney), Th.Schol.
(Acting Chaplain)
The Rectory,
MEREWETHER. Telephone 63 1388

Baptist
The Reverend T. H. Binks,
133 Kemp Street,
HAMILTON. Telephone 61 4048

Methodist
The Reverend W. D. Adams,
B.A.(Sydney), B.D.(Melbourne)
23 William Street,
HAMILTON. Telephone 61 4040

Presbyterian
The Reverend H. F. Kat, B.A., B.D.(Utrecht)
4 Gregory Parade,
KOTARA. Telephone 57 1076

Roman Catholic
The Reverend Father G. Tejón, S.T.L.(Avila),
B.Litt(Oxford)
St. Joseph’s Home,
SANDGATE. Telephone 67 1187
OR
The Presbytery,
SHORTLAND. Telephone 55 9364

UNIVERSITY SERVICES

EDWARDS HALL

Edwards Hall is situated on the University Campus near the southeastern boundary of the Sports Oval, close to the tennis and squash courts and is approximately one mile by road from the University Library. While the Hall is an integral part of the University and as such is subject to the decisions and directions of the University Council, major responsibility for the government of the Hall has been entrusted by Council to a Board of Trustees made up of three Council members, one Senate member, two senior resident students, one resident Subwarden and the Warden. Edwards Hall consists of three buildings, a central amenities building flanked by two identical residential buildings between them providing 222 residential places for students and staff of the University, including 6 positions for residential Subwardens.

The residential fees for 1974 have not been determined at the time of writing but as a guide to prospective applicants, the anticipated residential fees are as follows: Term 1 (11 weeks) $286; Term 2 (10 weeks) $260; Term 3 (12 weeks) $312. The term residential fee entitles a member to a bed/study room, the supply of all bedding and fresh linen, and maintenance of the room and 16 meals a week, being breakfast and dinner each day and lunch on Saturday and Sunday.

Application forms for residence may be obtained from and completed applications returned to the Warden, Edwards Hall, The University of Newcastle N.S.W. 2308. The closing date for applications for residence in 1974 will be February 8, 1974 and applications received after this date will not necessarily be considered.

WARDEN

M. W. Blackmore, B.Sc., Ph.D (Queen’s Belfast), A.R.I.C.,
A.R.A.C.I., A.F.C.I.A.
OVERSEAS STUDENTS

The Overseas Student Advisor is on campus solely to help overseas students with any problems which may arise. Because of her specialized knowledge, she may be able to give direct assistance, may refer the student to someone in an appropriate field, (e.g., legal, health, insurance, etc.) or she may speak at the student’s request and on his behalf with government officers, staff members or others.

Any discussion with the Overseas Student Advisor is completely confidential. She may be contacted either through the University Counselling Service or in the Temporary Building (T.10).

Overseas Student Advisor

Mrs. Robin Loftus, B.A. (Adelaide)

STUDENT LOAN FUND

The Council of the University has established a Student Loan Fund which is managed by a committee consisting of the Deputy Chairman of Senate, the Bursar and the Vice-Principal (Chairman). This loan is now supplemented by government grant.

Loans may be made to an undergraduate where the committee is of the opinion that his academic performance is of sufficient merit and his financial circumstances warrant a loan.

The total outstanding accommodation to any one undergraduate shall not normally exceed $600 at any one time and an undergraduate granted a loan is required to enter into an agreement.

Repayment must commence not later than twelve months after graduation or when the borrower fails or withdraws from his course or on demand as required by the University. No interest is charged while the borrower is an undergraduate but interest at a rate of not less than 5% per annum on the balance owing from time to time is charged from the date of graduation or the date on which an undergraduate fails or withdraws from a course.

In special circumstances the Committee may grant a loan to a student other than an undergraduate.

Any student wishing to seek assistance from the Fund may apply in person to the Vice-Principal or through the President of the Students' Representative Council or his nominee.

UNIVERSITY COUNSELLING SERVICE

The Student Counsellors assist students — past, present and future — in a wide variety of matters. Most students, whatever their academic level, at one time or another need help in dealing with difficulties which arise during the course of their University lives.

A student should not feel that he or she must have a major problem before consulting a Counsellor. Many worries take only a few minutes to clear up, and frequently the Counsellor's function is simply to direct a bewildered student to the right source of information.

Students who are worried about inadequate study methods, personal difficulties, choice of courses or career planning are invited to arrange an appointment with a Student Counsellor. All contacts with a counsellor are regarded as completely confidential.

The University Counselling Service is divided into three major divisions — Personal Counselling, Study Skills Training, and Research with some inevitable overlap between the sections. Apart from individual counselling, courses in an increasing number of areas are held for groups of students.

Counselling is now a thoroughly established and widely accepted part of University life throughout Australia, and at this University, approximately one-third of all students utilise it.

STUDY AT THE UNIVERSITY LEVEL

The University Counselling Service published a brief but comprehensive book on this subject in 1967 and although it was produced specifically for the students of this University, and reflects the attitudes of several Heads of Departments here, it is already widely used in other Universities and tertiary institutions throughout Australia. A Revised Edition was published in November, 1969 as the first printing had sold out. It may be purchased from the Cashier at 40 cents per copy.

LOCATION

The Secretary to the University Counselling Service and two Counsellors are located in the Administration Building (Room G75—entrance at the N.W. end of building). It is generally most satisfactory for students, both full-time and part-time, to make appointments through the U.C.S. Secretary. Counsellors are available for evening appointments.
UNIVERSITY SERVICES

UNIVERSITY COUNSELLING SERVICE STAFF

Senior Student Counsellor — A. P. T. Loftus, B.A. (Melbourne), M.A., M.A.Ps.S.

B. E. Hazell, M.A. (Sydney), M.A.Ps.S.
(Seconded to the University of the South Pacific)
D. R. Martin, B.A., Dip.Ed. (Sydney), M.A.Ps.S., A.B.Ps.S.
(Temporary Appointment)

Secretary — Mrs. Joy Hoesli

UNIVERSITY HEALTH SERVICE

Pending the establishment of a Health Centre, an interim service, located in the Union, functions during term time. The medical officer, Dr. John Raschke attends each Tuesday and Thursday morning and qualified nurses are on duty on the other days.

The service, which is free, is essentially diagnostic and does not undertake continuing treatments.

UNIVERSITY STUDENT LEGAL REFERRAL SERVICE

Students sometimes have problems of a legal nature. As from the beginning of Third Term, 1973, members of the Department of Legal Studies have introduced for a trial period a Student Legal Referral Service. At least one member of the Department will be available on the days and at the times indicated on the Legal Studies Notice Board, to give students, without liability, free legal advice and to explain how and where they may obtain appropriate legal aid and representation.

CONVOCATION

Convocation provides an opportunity for graduates to maintain a positive interest and influence in University affairs. It has the right to discuss and to pronounce an opinion on any matter relating to the University, and to communicate directly with the Council or Senate of its own volition or at the request of either body.

Public meetings at which topics of interest are discussed are conducted by Convocation as well as general meetings. Convocation is controlled through a Standing Committee of 14 elected members including the Chairman, who is called the Warden of Convocation, and the Immediate Past Warden, who is the Deputy Chairman.

Membership is automatic for graduates of this University, and for those graduates of the University of New England and of the University of New South Wales who spent at least three years as students of Newcastle University College; for present and past members of the University Council; and for present full time members of the academic staff and graduate permanent members of the administrative, library and technical staff.

Council may admit as members of Convocation upon payment of a fee determined by Council:—

(a) Graduates of other Universities who are resident in the Hunter Valley or North Coast areas; and

(b) such other University graduates as the Council may approve.

Five members of the University Council are elected by Convocation.

OFFICE BEARERS

Warden — Mr. W. G. Derkenne, LL.B. (Sydney), B.A.

Secretary — Mr. E. J. Buckman, B.Sc. (New South Wales), M.Eng.Sc., A.S.T.C., M.I.E.Aust.

Treasurer — Mr. R. W. Gibbins, B.Com. (Queensland), A.C.A.

Immediate Past Warden — Mr. J. P. Talty, B.D.S. (Sydney)
CONVOCATION

STANDING COMMITTEE MEMBERS

Mr. J. W. Armstrong, B.A.
Miss F. M. Burns, B.A.
Mr. R. W. Gibbins, B.Com. (Queensland), A.C.A.
Mrs. E. G. Hamilton, B.A. (New South Wales), A.L.A.A.
Mr. K. G. Hoffman, B.Arch. (New South Wales)

Miss C. Johansen, M.A.
Mr. P.A. Marquet, B.A. (Sydney), A.A.S.A., A.L.C.M., S.T.S.D.
Professor B. Newton-John, M.A. (Cambridge), F.R.S.A.
Mr. B. Relf, B.A.
Dr. P. N. Richards, B.E. (Met.), M.E., D.App.Sc. (Melbourne)

STANDING COMMITTEE AND UNIVERSITY COUNCIL MEMBERS

Mr. C. B. Belcher, M.Sc. (New South Wales), A.S.T.C., F.R.A.C.I., F.I.M. (Lond.)
Mr. K. H. White, M.B., B.S. (Sydney), B.A.

Mr. C. J. A. Cornelius, B.Com.

The objects of the Union are to provide a common meeting ground and social centre for men and women who are members of the University; to promote the education and the intellectual culture of its members by debates and otherwise and generally, to secure the cooperation of University men and women in furthering the interests of the University.

The Union maintains a fine building on the campus and major extensions during 1973 have increased facilities for members. Such facilities include a complete range of catering services (a liquor licence is anticipated), recreational and common room areas, a reading room, rooms for meetings and functions of all kinds, for 16 mm film projection, for T.V., and for music practice. A games complex on the lower level provides billiards, table tennis, chess, and music listening outlets. The Student Counsellor is on this lower level whilst a Student Health Centre with a doctor in attendance is located in the main building. The new commercial area includes the Union Shop which provides for the academic needs of members, a University Cooperative Bookshop, an A.U.S. Travel Service and A.U.S. Pharmacy together with premises operated by the Bank of New South Wales. The office of the Students' Representative Council is located within the new extensions, together with Union administrative offices.

Membership of the Union, obligatory for all registered students, is open to graduates, members of the University Council and the permanent staff of the University.

The conduct of the affairs of the Union is vested in the Board of Management comprising:

Two members appointed by the Council of the University
Ten members of the Union (at least two of whom must be graduates) elected by the members of the Union
Two members of the Union who are members of the Students' Representative Council
One member of the Union who is a committee member of the Sports Union
One representative of the staff of the Union elected by the Union Staff and
The Secretary Manager of the Union.

Elections for the Board are held in the month of April.

President — Mr. R. Robinson, B.A.
Secretary Manager — Mr. W. V. Bridgewater
THE UNIVERSITY OF NEWCASTLE COMPANY

The University of Newcastle Company is the Citizen Military Force's Unit affiliated with the University. The Company was formed in 1957 as a Sub-Unit of the University of Technology Regiment which is now called The University of New South Wales Regiment. The current strength of the Company is 100.

The function of the Company is to train graduates and undergraduates for commissioned rank in the C.M.F. and the training designed with this in view, is done on an Infantry basis and consists of:

(a) An Annual Camp for three weeks in February
(b) An optional camp of fourteen days in December
(c) Two weekend bivouacs a year
(d) Parades on Friday nights of two hours duration
(e) Weekend day parades

The training programme is designed to fit in with vacations, examinations, and deferred examinations and there is practically no commitment in third term. Leave is available from activities where a good reason exists.

Enlistment in the Company is voluntary and is open to all graduates or undergraduates who are 17 years of age or over.

Members of the University of Newcastle Company are eligible for the following benefits:

- An opportunity to reach commissioned rank in 2-3 years.
- Tax-free pay for all training undertaken.
- Refund of travelling expenses.
- Opportunities for attendance at Regular Army Courses and short time attachments to Army units in Malaysia or New Guinea.
- Free meals and accommodation at camps and bivouacs.
- Free Uniforms.

Enquiries regarding conditions of service, and enlistment procedure should be made at the Training Depot which is in King Street, Newcastle West (opposite Birdwood Park). Phone No. 61 2121.

OFFICERS AND STAFF

Officer Commanding — Capt. P. Groves
Full-time Staff — WO2 M. Grovenor
S/Sgt. P. Toohey

THE UNIVERSITY OF NEWCASTLE SPORTS UNION

The Sports Union is the student organisation responsible for the promotion and control of sporting activities within the University. All students are automatically members of the Sports Union. There are twenty-six affiliated clubs: Athletics, Australian Rules, Badminton, Men's Basketball, Women's Basketball, Cricket, Fencing, Golf, Men's and Women's Hockey, Mountaineering, Netball, Men's and Women's Rowing, Rugby Union and Rugby League, Sailing, Ski-ing, Soccer, Softball, Squash, Surfriding, Swimming, Scuba, Table Tennis, Tae Kwon-Do, Tennis, Volleyball, most of which participate in local competitions and send teams to Inter-varsity contests each year. Inter-Faculty Contests conducted throughout the year aim to stimulate friendly rivalry among the various Faculties, and to encourage a higher student participation in sport. Each club has a student representative on the Sports Union Committee, which meets monthly. The Executive consists of the President, Vice-President, Secretary, Treasurer, a representative of the University Council and the Amenities Officer. The Sports Union's annual income is derived from a portion of the General Services Fee and is used to meet such costs as equipment, affiliation fees and Inter-varsity contests.

For outstanding individual performances in sport, the University awards "Blues" each year at the Annual "Blues" Dinner.

The number of constituent clubs is increasing continually, and students interested in participating in any sport are urged to contact the Amenities Officer, Mr. Bradford, or one of the Sports Union Executive for further information. The Sports Union Amenities office is located in the temporary building adjacent to the main University building.

President — Professor R. G. Tanner, M.A.(Melbourne & Cambridge)

Secretary — Mr. P. Hunt

Amenities Officer — Mr. H. Bradford
THE UNIVERSITY OF NEWCASTLE
STUDENTS' ASSOCIATION

All students proceeding to a degree or a diploma are members of the Students' Association.

Included in the General Services fee, which you all pay or have paid for you, is $8.00 subscription to the Newcastle University Students' Association (N.U.S.A.). You are all financial members of this Association and have every right— and a duty to yourselves—to take part in the running of the Association and the administration of its collective assets.

Each year, the Students' Association elects a number of students (22 at present) to the Students' Representative Council. This Council's purpose is:

1. to give money and other aid to the various clubs and societies, including religious, political and social groupings on campus;

2. when needed, to act as the students' voice in submissions to the University administration, the mass media, and various government departments;

3. to work for student welfare. The S.R.C. provides automatic accident insurance cover for students. It is also responsible for printing various student publications such as OPUS, the student newspaper, the Orientation Handbook, Nimrod, the annual literary magazine and the weekly Bulletin;

4. to implement student association policy on matters academic, political or administrative. N.U.S.A. policy is decided at official lunchtime meetings where all students may attend and vote.

With its various committees, for example, the welfare and education committees, and its officers such as the education campaign director, the travel officer and so on, N.U.S.A. attempts to facilitate as many expressions of cultural activity as possible, as well as organizing action to effect student policy on environment, aboriginal rights, apartheid and so on.

Each year, the Association organises, with some help, Orientation week and early in July, Autonomy Day, which is the equivalent of Commem., Foundation Day, or similar activities at other universities.

As the Students' Association is a constituent member of the Australian Union of Students, students of the University may take part in the activities of this body. Some of these activities which affect students more directly are the several intervarsity cultural festivals, travel to New Zealand and many countries in Asia, village schemes in Papua/New Guinea, raising money for aboriginal scholarships and World University Service, national campaigns on education, and the national student newspaper, National 'U'.

The Association, via general student meetings, ad hoc committees, and its officers, pursues policy on a wide variety of social, political, educational and welfare activities both internal to the campus and affecting our society as a whole. Frequently, controversial issues are raised and discussed. The ultimate decision on what your Association does, and how your money is spent, depends on all of you. The executive officers of your association are not there to decide policy, but to carry out your decisions.

It is more important than ever that new students help run the association. At the moment too few students do much of the work, and as the older students leave, the new ones must fill the gap or the association will collapse as a functioning unit. How can you help? Come to the general student meetings and vote; vote also in the S.R.C. elections and stand for positions that interest you. In general, try not to be apathetic or disinterested.

President — Mr. D. Wallace
Secretary — Mr. M. Pavlovic
FACULTY OF ENGINEERING

REQUIREMENTS FOR THE DEGREES OF
BACHELOR OF ENGINEERING
AND
BACHELOR OF SCIENCE (ENGINEERING)

1. Definitions
In these Requirements, unless the contrary intention appears: “the Faculty” means the Faculty of Engineering and “the Faculty Board” means the Faculty Board of the Faculty of Engineering; “the Dean” means the Dean of the Faculty of Engineering and “the Department” means the Department responsible for the course in which the candidate is enrolled.

2. Grading of Degrees
(a) (i) The degree of Bachelor of Engineering may be conferred either as a pass degree or as a degree with honours.

(ii) There shall be two classes of Honours, namely Class I and Class II. Class II shall have two divisions, namely Division I and Division II.

(iii) In each Department of the Faculty, the most distinguished of the candidates being awarded First Class Honours may be awarded a University Medal.

(b) The degree of Bachelor of Science (Engineering) may be conferred either as a pass degree or as a degree with merit.

3. Approval of Enrolment
In any year a candidate shall enrol only in those subjects in which his enrolment has been approved by the Dean or a nominee of the Dean on the recommendation of the Head of the Department in which the candidate is enrolled.

4. Timetable Requirements
A candidate may not enrol in any year in any combination of subjects which is incompatible with the requirements of the time-table for that year.

5. A Subject
(a) To complete a subject qualifying towards a degree, hereinafter called a subject, a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written work as the Department offering the subject shall require.

(b) To pass a subject, a candidate shall satisfy the requirements of sub-clause (a) of this clause to the satisfaction of the examiners and pass such examinations as the Faculty Board shall require.

(c) Subjects for which the course of instruction extends over the first half of the academic year only; the second half of the academic year only; the whole or the substantially greater part of the academic year; shall be classified as Type A, Type B and Type AB subjects respectively.

6. Annual Examinations
The Annual Examination for each subject may be held at any time after the end of the course of instruction in that subject as the Faculty Board may determine. Such Examination may be written, oral or practical, or any combination of these, and may be supplemented by progressive assessments made during the course of instruction.

7. Special Examinations
A candidate may be granted special or deferred examinations in accordance with the provisions of By-law 5.9.3.

8. Examination Grades
(a) The results of successful candidates at Annual Examinations and Special Examinations shall be classified: Pass, Credit, Distinction, High Distinction.

(b) The result of a successful candidate at a Deferred Examination shall be classified only as a Pass.

9. Withdrawal
(a) A candidate may withdraw from a subject or course only by notifying the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification in writing.

(b) A candidate who after:

the eighth Monday in First Term, in the case of a Type A subject;
the sixth Monday in Second Term, in the case of a Type AB subject;
the second Monday in Third Term, in the case of a Type B subject;
withdraws from any subject shall be deemed to have failed in that subject, unless granted permission by the Dean to withdraw without penalty.
10. Unsatisfactory Progress
A candidate whose progress is unsatisfactory will be dealt with under the provisions of By-laws 5.4.1, 5.4.2 and 5.4.3.

11. Relaxing Clause
In order to provide for exceptional circumstances arising in particular cases, the Senate, on the recommendation of the Faculty Board, may relax any requirement.

12. Prerequisites and Corequisites
A candidate may not without the permission of the Dean acting on the recommendation of the Head of Department enrol in any subject unless he has satisfied the requirements for prerequisites and has enrolled in or has already passed, the corequisites prescribed for that subject.

13. Standing
(i) A candidate may be granted credit in subjects prescribed for the course in which he is enrolled in recognition of work completed in this University or another tertiary institution subject to the provisions of By-law 5.8.1.3.

(ii) A candidate may be granted standing in elective subjects for subjects not offered in this University.

14. To qualify for admission to the degree of Bachelor of Engineering, a candidate shall satisfy the requirements of one of the following courses, as prescribed in the Schedules appended to these Requirements and satisfy the industrial experience requirements as prescribed by the Faculty Board.

Bachelor of Engineering in Chemical Engineering — Schedule 1.1
Bachelor of Engineering in Civil Engineering — Schedule 1.2
Bachelor of Engineering in Electrical Engineering — Schedule 1.3
Bachelor of Engineering in Industrial Engineering — Schedule 1.4
Bachelor of Engineering in Mechanical Engineering — Schedule 1.5
Bachelor of Engineering in Naval Architecture — Schedule 1.6
Bachelor of Engineering in Computer Engineering — Schedule 1.7

(b) Notwithstanding the provisions of sub-clause (a) of this clause, a candidate, with the permission of the Dean, may qualify for admission to the degree of Bachelor of Engineering by satisfying the requirements of one of the following courses as prescribed in the Schedules appended to these Requirements and satisfying the industrial experience requirements as prescribed by the Faculty Board.

15. (a) To qualify for admission to the degree of Bachelor of Science (Engineering) a candidate shall satisfy normally by part-time study, the requirements of one of the following courses as prescribed in the Schedules appended to the Requirements and satisfy the industrial experience requirements prescribed by the Faculty Board.

   Bachelor of Science (Engineering) in Chemical Engineering — Schedule 3.1
   Bachelor of Science (Engineering) in Civil Engineering — Schedule 3.2
   Bachelor of Science (Engineering) in Electrical Engineering — Schedule 3.3
   Bachelor of Science (Engineering) in Industrial Engineering — Schedule 3.4
   Bachelor of Science (Engineering) in Mechanical Engineering — Schedule 3.5
   Bachelor of Science (Engineering) in Naval Architecture — Schedule 3.6

(b) The following additional requirements shall apply to the Bachelor of Science (Engineering) courses in Civil, Electrical, Mechanical and Industrial Engineering and in Naval Architecture:

   (1) No candidate shall be permitted to enrol or re-enrol in these courses unless he was enrolled in the course prior to the 1st January, 1974.

   (2) A candidate who was enrolled in the course prior to the 1st January, 1974, may either

      (a) transfer to the B.E. course with standing in accordance with the transition arrangements as set out in Appendix B to the Requirements

      OR

      (b) continue in the course for as long as he has passed sufficient subjects in the course to enable him to complete all requirements for admission to the degree before the end of the 1979 academic year.
16. Elective Requirements

The Elective subjects included in the courses shall be selected in accordance with the Elective Requirements as set out in Appendix A to these requirements.

17. (i) A candidate for the Bachelor of Science (Engineering) degree in the University may with the permission of the Dean transfer to the Bachelor of Engineering course with such standing as may be approved by the Dean.

(ii) A candidate for the Bachelor of Engineering degree in the University may with the permission of the Dean transfer to the Bachelor of Science (Engineering) course with such standing as may be approved by the Dean.

(iii) Only in exceptional circumstances will a student be permitted to transfer from one course to another more than once.

18. Progression

(i) Progression in the course shall be by subject.

(ii) Except with the permission of the Dean a candidate may not enrol for a programme having a greater work load than a normal year's programme as set out in the Schedules attached.

APPENDIX A — ELECTIVE REQUIREMENTS

Elective units must be selected in accordance with the following rules.

Where a student elects to take an Industrial Experience unit the responsibility for organising the necessary facilities shall rest entirely with the student, subject to the approval of the arrangements by the Head of Department concerned. The University can accept no responsibility for organising suitable employment.

1. DEPARTMENT OF CHEMICAL ENGINEERING

The Elective subjects required in courses offered by the Department of Chemical Engineering may consist of subjects or part subjects offered within the Faculty or by other Faculties, subject to the approval of the Head of the Department of Chemical Engineering and of any other Department(s) responsible for the subject or part-subject.

2. DEPARTMENT OF CIVIL ENGINEERING

Elective I may consist of any subject or two half subjects of satisfactory level, subject to the approval of the Head of Department and the Head(s) of the Department(s) whose department offers the chosen subject or half subject. However, Chemistry I or Chemistry IS must be taken unless the student has already completed studies in Chemistry to a level at least equivalent to 2F in the H.S.C. If Geology I is taken, the subject CE223J Engineering Geology must be replaced by a one unit subject offered by an Engineering Department.

Other Electives

Electives may consist of subjects or part subjects offered within the Faculty or by other Faculties, subject to the approval of the Heads of the Department of Civil Engineering and of any other Department responsible for the subject or part-subject and subject to the following conditions:

(i) at least one of the units must be taken within the Department of Civil Engineering; and

(ii) up to three units of Industrial Experience may be taken as Electives after completion of the First Year of the course or its equivalent. Any student wishing to receive credit for three units must complete the third unit during his final year of enrolment.
3. **DEPARTMENT OF ELECTRICAL ENGINEERING**

**BACHELOR OF ENGINEERING IN ELECTRICAL OR COMPUTER ENGINEERING**

The 16 units of electives shall be chosen in accordance with the following rules.

1. Eight elective units must be taken in the Faculty of Engineering, at least two must be from outside the Department of Electrical Engineering and at least two from within the Department.

2. Eight elective units must be taken outside the Faculty of Engineering, and must include one first-year Arts subject or the equivalent in a non-technical area. The latter will be counted as four elective units.

3. If a student elects to do a subject at one level which is required at a later level, the later requirement is to be replaced with elective units.

4. A first-year subject in another faculty taken as an elective is normally equivalent to four units. Half a first-year subject in these Faculties is normally equivalent to two units.

5. Any student enrolled in the Faculty of Engineering who is required, or who elects, to take Economics I as part of his course must take the two subjects:

   - Microeconomics
   - Economic History I

   with the exception of those students whose courses do not include Mathematics II, Topic H. Such students may replace Economic History I by Economic Statistics I. However a student taking this combination will not be allowed to take Mathematics II, Topic H at a later stage and count it towards his degree.

   Examples of two-unit Electives are:—

   - Microeconomics or Economic History I

6. Chemistry I may be taken in lieu of Chemistry IS and two non-engineering electives and Physics II in lieu of PH221 and two non-engineering electives.

7. Students enrolled in the B.E. in Computer Engineering must include EM2F Numerical Analysis as one of the Elective Units in Year II or III of the course.

8. For the B.A./B.E. degree in Electrical Engineering, the rules are as for the B.E. degree save that the eight elective units to be taken outside the Faculty of Engineering must all be applied to Arts subjects. As the student is required to take a Part III Arts subject in the Arts year, one of the subjects taken as an Elective must be a Part II subject.

9. For the B.Sc./B.E. degree in Electrical Engineering, the rules are as for the B.E. degree save that the eight elective units to be taken outside the Faculty must be applied to four units of Arts, two units towards Physics II, and two units of second year Mathematics topics.

10. In any year when a student enrols on a part-time basis, one year of industrial experience may be substituted for one elective unit up to a total of six such units, the first and third such unit being deemed a substitution for a non-engineering unit, the second and fourth for an electrical engineering unit within the eight engineering elective units, and the fifth and sixth for either class of unit. A first year Arts subject or the equivalent in a non-technical area must still be taken. To earn this substitution, the student must submit a report concerning his practical experience for the year to the department secretary by the 31st October of the year for which the substitution is being sought and such other reports as may be required.

   Grades of Satisfactory or Fail only will be given for industrial experience units.

**BACHELOR OF SCIENCE (ENGINEERING) IN ELECTRICAL ENGINEERING**

The twelve elective units in the B.Sc.(Eng.) course are to be selected by the student, with the advice and approval of his academic advisor, subject to the following requirements:

1. A minimum of four elective units are to be taken within the Faculty of Engineering, at least two of which must be from outside the Department of Electrical Engineering.

2. One first-year Arts subject or the equivalent must be taken in a non-technical area. It will be counted as four elective units.

3. If a student elects to do a subject at one level which is required at a later level, the later requirement is to be replaced with elective units.

4. The first digit in the number of a topic is not to be interpreted as the year in which the topic must be taken. In particular, students are encouraged to elect EE400 topics at any level in their programme subject to pre- and corequisite requirements.

5. A first-year subject in another faculty taken as an elective is normally equivalent to four units. Half a first-year subject in these Faculties is normally equivalent to two units.

6. Any student enrolled in the Faculty of Engineering who is required, or who elects, to take Economics I as part of his course must take the two subjects:

   - Microeconomics
   - Economic History I

   with the exception of those students whose courses do not include Mathematics II, Topic H. Such students may replace Economic History I by Economic Statistics I. However a student taking this combination will not be allowed to take Mathematics II, Topic H at a later stage and count it towards his degree.

   Students enrolling for Electives which are normally three hours per week only, may enrol in Microeconomics or Economic History I.
4. **DEPARTMENT OF MECHANICAL ENGINEERING**

1. Unless an entering student has already completed studies in Chemistry to a level at least equivalent to 2F in the Higher School Certificate, he should include Chemistry IS as two of the elective units in Year I or, alternatively, he should enrol in Chemistry I as four units.

2. At least six units must be taken within the Faculty of Engineering of which three must be selected from the list of Departmental Technical Electives.

3. At least four units must be from Faculties other than the Engineering Faculty.

4. In the case of persons in full employment proceeding as part-time students, each year of appropriate employment that is supervised and approved by the Head of the Department is credited as one unit of elective. A maximum of six such units are allowed, described as:

   - ME091 Industrial Experience 1 Unit
   - ME092 Industrial Experience 1 Unit
   - ME093 Industrial Experience 1 Unit
   - ME094 Industrial Experience 1 Unit
   - ME095 Industrial Experience 1 Unit
   - ME096 Industrial Experience 1 Unit

   These elective units may be used to meet any elective requirements in Clauses 2 and 3 above, except the Departmental Technical Elective requirements in Clause 2.

5. The three elective units in the B.A./B.E. courses and three of the seven elective units in the B.Sc./B.E. courses must be selected from the list of Departmental Technical Electives.

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APPENDIX B — TRANSITION ARRANGEMENTS 1974

(a) **DEPARTMENT OF CIVIL ENGINEERING**

Any student currently enrolled for the Degrees of Bachelor of Engineering (Civil) or Bachelor of Science (Engineering) (Civil) and who has not completed requirements for the award of those degrees by the end of 1973 shall be deemed to be enrolled thereafter for the new degree courses introduced in 1974, with credit for all subjects passed in the old courses, subject to the following condition:

Any student who has passed or has been granted standing in the subject or part subject shown in the first column shall be given standing in the subject shown in the second column:

<table>
<thead>
<tr>
<th>Old Subject</th>
<th>New Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME121 Workshop Practice</td>
<td>ME121 Workshop Practice</td>
</tr>
<tr>
<td>EE101 Introduction to Electrical Engineering</td>
<td>2 units of Elective I</td>
</tr>
<tr>
<td>EE101)</td>
<td>EE203</td>
</tr>
<tr>
<td>EE201)</td>
<td>EE204</td>
</tr>
<tr>
<td>CE350J General Studies Seminar</td>
<td>GE350 Seminar</td>
</tr>
<tr>
<td>ME481 Engineering Administration</td>
<td>CE352 Civil Engineering Systems</td>
</tr>
<tr>
<td>ME095 Industrial Experience</td>
<td>2 units of Elective I</td>
</tr>
</tbody>
</table>

(b) **DEPARTMENT OF ELECTRICAL ENGINEERING**

(I) **Students continuing in their present course**

Any student who in 1973 or any earlier year was enrolled in the B.E. or B.Sc.(Eng.) in Electrical Engineering and wishes to continue in the same course shall be granted standing for the same number of years or stages in the new course as he has completed in the old course.

Where a student has completed part of a year or stage, standing will be granted for the equivalent subjects, or, if taken as electives, for the equivalent number of elective units.

(II) **Students transferring from the B.Sc.(Eng.) in Electrical Engineering to the B.E. in Electrical Engineering**

Any student who in 1973 or any earlier year was enrolled for the B.Sc. (Eng.) in Electrical Engineering and elects to transfer to the new B.E. in Electrical Engineering, shall be granted standing on the following basis:
<table>
<thead>
<tr>
<th>Stage Completed</th>
<th>Standing to be granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Mathematics I, Engineering I</td>
</tr>
<tr>
<td>Stage 1 and 2</td>
<td>Year I plus EE203, EE204, EE231</td>
</tr>
<tr>
<td>Stages 1-3</td>
<td>Mathematics IIB Part 1, Chemistry IS</td>
</tr>
<tr>
<td>Stages 1-4</td>
<td>Year I and II</td>
</tr>
<tr>
<td>Stages 1-5</td>
<td>Year II plus EE311, EE321, EE331, EE341 and six elective units</td>
</tr>
<tr>
<td>Stages 1-6</td>
<td>Years I-III plus two electives</td>
</tr>
</tbody>
</table>

Where a student has completed part of a stage he will be granted standing for stages completed in accordance with the above table plus standing for any additional subjects passed.

In addition to the standing set out above, a student may, subject to the approval of the Head of Department, be granted standing in one elective unit for each year spent in appropriate employment.

(III) Students enrolled for the B.A./B.E. and B.Sc./B.E. degrees
Standing will be granted in the B.E. part of the course on the same basis as in (I) above.

(IV) Where a subject for which standing has been granted has been transferred to a year or stage of the course still to be completed, such subject shall be replaced by elective units.

(c) DEPARTMENT OF MECHANICAL ENGINEERING
The following transition arrangements will apply for students who are already enrolled in the Mechanical and Industrial Engineering, and Naval Architecture, B.E., B.A./B.E., B.Sc./B.E. and B.Sc.(Eng.) courses:

**Completed in 1973**

<table>
<thead>
<tr>
<th>Stage Completed</th>
<th>Standing to be granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>(d) Full-time B.Sc./B.E. Industrial</td>
<td></td>
</tr>
<tr>
<td>Year I</td>
<td>Years II, III, IV and V of the new course less ME221</td>
</tr>
<tr>
<td>Year II</td>
<td>Years III, IV and V of the new course plus ME222</td>
</tr>
<tr>
<td>Year III</td>
<td>Years IV and V of the new course less GE350</td>
</tr>
<tr>
<td>Year IV</td>
<td>Year V of the new course</td>
</tr>
<tr>
<td>(e) Full-time B.A./B.E. Mechanical</td>
<td></td>
</tr>
<tr>
<td>Year I</td>
<td>Years II, III, IV and V of the new course less ME221</td>
</tr>
<tr>
<td>Year II</td>
<td>Years III, IV and V of the new course</td>
</tr>
<tr>
<td>Year III</td>
<td>Years IV and V of the new course less ME301 plus EE204</td>
</tr>
<tr>
<td>Year IV</td>
<td>Year V of the new course</td>
</tr>
<tr>
<td>(f) Full-time B.A./B.E. Industrial</td>
<td></td>
</tr>
<tr>
<td>Year I</td>
<td>Years II, III, IV and V of the new course less ME221</td>
</tr>
<tr>
<td>Year II</td>
<td>Years III, IV and V of the new course less EE203</td>
</tr>
<tr>
<td>Year III</td>
<td>Years IV and V of the new course</td>
</tr>
<tr>
<td>Year IV</td>
<td>Year V of the new course less ME382/3/4/5 plus ME313 and ME333</td>
</tr>
</tbody>
</table>

**INDIVIDUAL SUBJECTS**
Standing will be granted for units passed in 1973 and previous years. Students who have completed ME121 and EE101 prior to 1974 will be given standing in ME221. Students who have completed EE201 prior to 1974 will be given standing in EE203 and will be required to read EE204 in lieu of EE202.

TRANSFER FROM PRESENT B.Sc.(ENG.) TO THE NEW B.E. COURSES
Students at present enrolled in the part-time B.Sc.(Eng.) courses may elect to:

(a) complete the part-time B.Sc.(Eng.) course in which they are enrolled OR

(b) transfer to the corresponding new B.E. course.

The following arrangements will apply for those who decide to continue the part-time B.Sc(Eng.) course:
<table>
<thead>
<tr>
<th>Completed</th>
<th>Subsequent Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>Standing will be given for units completed</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Standing for units completed and exemption from ME221</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Stage 4, 5 and 6 of new course</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Stage 5 and 6 of new course less EE203 plus GE350</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Stage 6 of new course</td>
</tr>
<tr>
<td><strong>Industrial Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>Standing will be given for units completed</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Standing for units completed and exemption from ME221</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Stage 4, 5 and 6 of new course</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Stage 5 and 6 of new course less EE203 plus GE350</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Stage 6 of new course</td>
</tr>
<tr>
<td><strong>Naval Architecture</strong></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>Standing will be given for units completed</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Standing for units completed and exemption from ME221</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Stages 4, 5 and 6 of new course plus NA201</td>
</tr>
</tbody>
</table>

*The following arrangements will apply for those who decide to transfer to the new B.E. course:*

<table>
<thead>
<tr>
<th>Completed</th>
<th>Subsequent Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>Standing for subject units completed</td>
</tr>
<tr>
<td>Stages 1 and 2</td>
<td>Standing for Year I and exemption from ME221</td>
</tr>
<tr>
<td>Stages 1, 2 and 3</td>
<td>Standing in Year I, exemption from ME221 and standing for other units completed</td>
</tr>
<tr>
<td>Stages 1, 2, 3 and 4</td>
<td>Standing in Years I and II and exemption from EE203</td>
</tr>
<tr>
<td>Stages 1, 2, 3, 4 and 5</td>
<td>Standing in Years I and II, exemption from EE203 and EE204 and standing for other units completed</td>
</tr>
</tbody>
</table>
| Stages 1, 2, 3, 4, 5 and 6 | Required to read the following Units:  
  - Project — 4  
  - *Electives* — 9 |

<table>
<thead>
<tr>
<th>Completed</th>
<th>Subsequent Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industrial Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>Standing for subject units completed</td>
</tr>
<tr>
<td>Stages 1 and 2</td>
<td>Standing for Year I</td>
</tr>
<tr>
<td>Stages 1, 2 and 3</td>
<td>Standing for Year I and standing for units completed</td>
</tr>
</tbody>
</table>
| Stages 1, 2, 3, 4 and 5 | Required to read the following units:  
  - Project — 4  
  - *Electives* — 9 |

<table>
<thead>
<tr>
<th>Completed</th>
<th>Subsequent Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Naval Architecture</strong></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>Standing for subject units completed</td>
</tr>
<tr>
<td>Stages 1 and 2</td>
<td>Standing for Year I</td>
</tr>
<tr>
<td>Stages 1, 2 and 3</td>
<td>Standing for Year I and standing for units completed</td>
</tr>
</tbody>
</table>

*The satisfactory discharge of requirements relating to ME091, ME092 etc. will be credited as standing in the corresponding number of electives.  

**Credit for Industrial Experience** in ME091, ME092 etc. will be granted to students in advanced stages of the course on the satisfactory discharge of requirements as specified by the Head of the Department. As a general basis, this will require the submission of a report by the student covering his industrial activities prior to 1974 and a statement from his employer certifying and setting out details of his experience.
AWARD OF HONOURS

(The following statement represents the current policy of the Faculty, but is not part of the formal Degree Requirements)

The award of Honours in the Degree of Bachelor of Engineering is based on the complete record of the candidate over the whole four years of his course, the last two years of the course being given significantly greater weight than each of the first two years of the course. Defining the average performance in terms of grades, the average performances required to reach the various classes of Honours are as follows:

<table>
<thead>
<tr>
<th>Honours Class</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honours Class I</td>
<td>Midway between Distinction and Credit Level</td>
</tr>
<tr>
<td>Honours Class II</td>
<td>Division I Credit level</td>
</tr>
<tr>
<td>Honours Class II</td>
<td>Division II Midway between Credit and Pass level</td>
</tr>
</tbody>
</table>

The standard for the Pass with Merit in the Degree of Bachelor of Science (Engineering) is to be as for Honours Class II Division I, and the average grade is to be computed in the same general manner as for the B.E. Degree.

These standards are used as a guideline only, and may be modified by Faculty in particular cases where the record of the candidate appears to warrant such action.

COMBINED DEGREE COURSE

A student may enrol in the combined courses leading to B.A./B.E. or B.Sc./B.E. degree on the successful completion of his first year course. Students wishing to transfer to a combined degree course will be expected to be above average quality and the minimum standard looked for will be credit level. Only in exceptional circumstances will a student be allowed to transfer to a combined degree course during his second year or later.

Students who are considering transferring to a combined course at the end of the first year should familiarise themselves with the requirements for both degrees and pay particular attention to the choice of elective subjects. Students are advised to consult their Student Advisor at an early stage.

Extract from the Requirements for the degree of Bachelor of Arts:

Arts/Engineering

(b) A candidate may, after completing the first year of a course for the degree of Bachelor of Engineering in the Faculty of Engineering, and with the permission of the Dean of the Faculty of Arts, enrol in a combined Arts/Engineering course approved by the Council on the recommendation of the Faculty Boards of the Faculties of Arts and Engineering. Subject to the special conditions stated below, a candidate who has enrolled in such a combined course shall qualify for admission to the ordinary degree of Bachelor of Arts if he passes, subsequently to his first enrolment for the degree of Bachelor of Engineering, nine subjects chosen from those listed in the Schedule of the subjects offered for the ordinary degree of Bachelor of Arts. The special conditions above referred to shall be these:

(i) The candidate shall comply with all the provisions of these Requirements other than Clause 12 (c);
(ii) Not more than five of the nine subjects shall be Part I subjects;
(iii) At least three of the nine subjects shall be passed after approval of the candidate's enrolment in the combined course;
(iv) A candidate whose enrolment in a combined course is withdrawn or otherwise terminated before he has passed the nine subjects required by this section shall not be eligible to qualify for admission to the ordinary degree of Bachelor of Arts under this section;
(v) A candidate enrolled in a combined course may, upon satisfying the Requirements for either the degree of Bachelor of Arts or the degree of Bachelor of Engineering, be admitted to that degree while continuing in the combined course.

Extract from the Requirements for the degree of Bachelor Science:

Science/Engineering

26. Notwithstanding the other provisions of these Requirements a candidate may:

(i) At the end of first year and with the permission of both Deans, transfer to a combined Science/Engineering course approved by the Faculty Boards of the Faculties of Science and Engineering.

(ii) Qualify for the degree of Bachelor of Science by passing nine subjects which meet the provisions of Clauses 12 and 13 of these Requirements.

(iii) Qualify for admission to the Degree of Bachelor of Science with Honours at graduation by meeting the provisions of sub-clauses (i) and (ii) above and fulfilling the conditions of Clauses 20-25 of these Requirements.
INTERPRETATION OF THE ACADEMIC PROGRESS BY-LAWS IN THE FACULTY OF ENGINEERING

By-Law 5.4.1. (2) leaves it open to each particular Faculty to decide what constitutes unsatisfactory progress calling for action under sub-headings (a), (b) or (c) of the By-Law. The Faculty Board, Faculty of Engineering, has resolved that failure to pass at least one quarter of the approved programme in the first year of enrolment as a full-time student, or the first two years of enrolment as a part-time student, shall constitute unsatisfactory progress, to be acted on under sub-heading (c) of the By-Law. "Approved programme" means the student's programme for the whole period in question, and the fraction one-quarter is to be measured by the "units" defined on page 84.

The above requirement is without prejudice to the further requirements laid down in By-Law 5.4.2.

REQUIREMENTS FOR THE POSTGRADUATE DIPLOMA IN INDUSTRIAL ENGINEERING

1. In these Requirements, unless the contrary intention appears, the "Faculty Board" means the Faculty Board of the Faculty of Engineering.

2. An applicant for registration as a candidate for the Diploma shall complete the prescribed application form and lodge it with the Secretary at least one calendar month before the commencement of first term.

3. An applicant for registration as a candidate for the Diploma shall—
   (a) have satisfied all of the Requirements for admission to a degree in the University of Newcastle; or
   (b) have satisfied all of the Requirements for admission to a degree in another University recognised for this purpose; or
   (c) hold other qualifications approved by the Faculty Board for the purpose of registration in the course.

4. Notwithstanding the provisions of clause 3 above, the Faculty Board may require an applicant to complete such other prerequisite studies as it may prescribe or a candidate to complete such other concurrent studies as it may prescribe.

5. To complete a subject qualifying towards the diploma a candidate shall attend such lectures, tutorials, seminars, laboratory classes, field work and camps and submit such written work and pass such examinations as the Department may require.

6. Withdrawal
   (a) A candidate may withdraw from a subject or course only by informing the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification.
   (b) A candidate who withdraws from any subject after the sixth Monday in second term shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty.
7. To qualify for the Diploma a candidate shall, in not less than two years of part-time study, complete the subjects as prescribed for the course by the Faculty Board.

8. A candidate may not enrol in a Stage 2 subject without having completed all of the Stage 1 subjects except with the permission of the Dean.

9. In order to provide for exceptional circumstances arising in particular cases, the Senate, on the recommendation of the Faculty Board, may relax any requirements provided that such relaxation shall be consistent with the By-laws.

HIGHER DEGREES

INTRODUCTION

(The following statement represents the current policy of the Faculty, but is not part of the formal Degree Requirements).

The Master of Engineering Science Degree has the primary aim of increasing the knowledge of the student in a specific and professional area, and therefore places most emphasis on course work; nevertheless it includes project work for its value both in the broadening and consolidation of knowledge, and as an introduction to research.

The Master of Engineering Degree has the primary aim of introducing the student to research, and bringing him to the point where he will be able to conduct research effectively under direction. Course work will normally be included in the programme with a normal minimum amount of three postgraduate "units", as defined on page 245, but the quality and standard of work required in the thesis will still be at the high level which should be expected of an Honours Bachelor of Engineering graduate.

In general, students holding an Honours Degree in Engineering will be encouraged to complete the course in the minimum time of one year.

The Doctor of Philosophy Degree has the primary aim of producing a man who can initiate, execute and supervise research. Course work will normally be included in the programme with a normal minimum amount of six postgraduate units, but the quality and standard of work required in the thesis will be at the high level appropriate to the title, "Doctor of Philosophy". Remission of up to four units of course work may be granted on account of previous postgraduate work.

The three terms remission referred to in paragraph 6 of the Requirements will normally be granted to candidates holding a research Master of Engineering degree.
1. An application to register as a candidate for the degree of Master of Engineering Science shall be made on the prescribed form which shall be lodged with the Secretary at least one full calendar month before the commencement of the term in which the candidate desires to register.

2. A person may register for the degree of Master if—
(a) he is a graduate or graduand of the University of Newcastle or other approved University; or
(b) he produces evidence of such academic and professional attainments as may be approved by the Senate, on the recommendation of the Faculty Board.

3. An applicant shall satisfy the Faculty Board that he is adequately prepared to undertake advanced studies in the Department appropriate to the field of specialisation proposed, and may be required to undertake preliminary studies and examinations before his registration as a candidate for the degree; or may be given provisional registration requiring concurrently with some of his advanced work the completion of specified preparatory studies before his registration is confirmed.

4. An applicant approved by the Faculty Board shall register in one of the following categories:
(i) Student in full-time attendance at the University.
(ii) Student in part-time attendance at the University.

5. On the recommendation of the Head of the Department concerned the Faculty Board shall appoint a programme supervisor and project supervisor to supervise the work of each candidate.

6. After registration a candidate shall complete satisfactorily a course of studies approved by the Dean of the Faculty, comprising twelve units of advanced work as may be prescribed by the Faculty Board. Not less than two nor more than four of such units shall comprise the investigation of and report on a project specified by the Head of the Department concerned.

7. To complete a unit qualifying towards the degree a candidate shall attend such lectures, tutorials, seminars, laboratory classes, field work and camps and submit such written work and pass such examinations as the Department concerned may require.

8. Where it is appropriate to the candidate’s total programme the Dean may approve advanced work, equivalent in total to not more than six units to be taken in other Faculties of the University.

9. A candidate from another university or approved tertiary institution may be granted standing by the Faculty Board in up to six units in recognition of work completed in such university or institution.

10. A candidate whose progress is unsatisfactory may be excluded from any examination, subject, or course, or may be permitted to continue his course subject to certain conditions.

11. Withdrawal
(a) A candidate may withdraw from a subject or course only by notifying the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification in writing.

(b) A candidate who after:
the eighth Monday in first term, in the case of a subject lasting only the first half-year;
the sixth Monday in second term, in the case of a subject lasting the whole year;
the second Monday in third term, in the case of a subject lasting only the second half-year;
withdraws from a subject in which he has enrolled shall be deemed to have failed in that subject, unless granted permission by the Dean of the Faculty of Engineering to withdraw without penalty.

12. A candidate shall submit three copies of his project report in a form according with the instructions of the Head of the Department, not later than three terms after the completion of the course of formal study.

13. It shall be understood that the University retains the three copies of the report and is free to allow the report to be consulted or borrowed. Subject to the provisions of the Copyright Act (1968) the University may issue the report in whole or in part in photostat or microfilm or other copying medium.

14. The Faculty Board, at the request of an examiner, may require the candidate to answer any questions concerning his work.

15. No candidate shall be considered for the award of the degree until the lapse of three complete terms but not more than six complete terms in the case of a full-time student, and six complete terms, but not more than ten complete terms in the case of a part-time student, from the date from which the registration becomes effective.

16. In exceptional circumstances the Senate, on the recommendation of the Faculty Board, may relax any of the above requirements.
REQUIREMENTS FOR THE DEGREE OF
MASTER OF ENGINEERING

1. An application to register as a candidate for the degree of Master shall be made on the prescribed form which shall be lodged with the Secretary at least one full calendar month before the commencement of the term in which the candidate desires to register.

2. A person may register for the degree of Master if—
   (a) he is a graduate or graduand of the University of Newcastle or other approved University with Honours in the subject to be studied for that degree; or
   (b) he is a graduate or graduand of the University of Newcastle or other approved University; or
   (c) in exceptional cases he produces evidence of such academic and professional attainments as may be approved by the Senate, on the recommendation of the Faculty Board.

3. In the case of applicants desiring to register under provision 2(b), and (c), the Faculty Board may require the applicants to carry out such work and sit for such examinations as the Board may determine before registration as a candidate for the degree of Master is confirmed.

4. In every case, before permitting an applicant to register as a candidate, the Faculty Board shall be satisfied that adequate supervision and facilities are available.

5. An applicant approved by the Faculty Board shall register in one of the following categories:
   (i) Student in full-time attendance at the University.
   (ii) Student in part-time attendance at the University.

6. (i) Every candidate for the degree shall be required to submit a thesis embodying the results of an investigation or design, to take such examinations and to perform such other work as may be prescribed by the Faculty Board. The candidate may submit also for examination any work he has published, whether or not such work is related to the thesis.
   (ii) The investigation or design and other work as provided in paragraph 6(i) shall be conducted under the direction of a supervisor appointed by the Faculty Board or under such conditions as the Faculty Board may determine.

7. No candidate shall be considered for the award of the degree until the lapse of six complete terms from the date from which the registration becomes effective, save that in the case of a candidate who has obtained the degree of Bachelor with Honours or a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, this period may, with the approval of the Faculty Board, be reduced by up to three terms.

8. For each candidate there shall be two examiners appointed by Senate, one of whom shall be an external examiner.

9. A candidate who fails to satisfy the examiners may be permitted to resubmit his thesis in an amended form. Such a resubmission must take place within twelve months from the date on which the candidate is advised of the result of the first examination. No further resubmission shall be permitted.
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

1. The degree of Doctor of Philosophy may be awarded by the Council on the recommendation of the Senate to a candidate who has satisfied the following requirements.

2. A candidate for registration for the degree of Doctor of Philosophy shall:—
   (i) have satisfied all of the requirements for admission to the degree of master or the degree of bachelor with first or second class honours in the University of Newcastle or a degree from another University recognised by the Senate as having equivalent standing;
   or
   (ii) have satisfied all of the requirements for admission to the degree of bachelor with third class honours or without honours in the University of Newcastle or a degree from another University recognised by the Senate as having equivalent standing, and have achieved by subsequent work and study a standard recognised by the Senate as equivalent to at least second class honours;
   or
   (iii) in exceptional cases submit such other evidence of general and professional qualifications as may be approved by the Senate.

3. The Senate may require a candidate, before he is permitted to register, to undergo such examination or carry out such work as it may prescribe.

4. A candidate for registration for a course of study leading to the degree of Ph.D. shall:—
   (i) apply on the prescribed form at least one calendar month before the commencement of the term in which he desires to register;
   and
   (ii) submit with his application a certificate from the Head of the Department in which he proposes to study stating that the candidate is a fit person to undertake a course of study or research leading to the Ph.D. degree and that the Department is willing to undertake the responsibility of supervising the work of the candidate.

5. Before being admitted to candidature, an applicant shall satisfy the Senate that he can devote sufficient time to his advanced study and research.

6. Subsequent to registration, the candidate shall pursue a course of advanced study and research for at least nine academic terms, save that any candidate who before registration was engaged upon research to the satisfaction of the Senate, may be exempted from three academic terms.

7. A candidate shall present himself for examination not later than fifteen academic terms from the date of his registration, unless special permission for an extension of time be granted by the Senate.

8. The course, other than field work, must be carried out in a Department of the University, under the direction of a supervisor appointed by the Senate, or under such conditions as the Senate may determine, save that a candidate may be granted special permission by the Senate to spend a period of not more than three academic terms in research at another institution approved by the Senate.

9. Not later than three academic terms after registration the candidate shall submit the subject of his thesis for approval by the Senate. After the subject has been approved it may not be changed except with the permission of the Senate.

10. A candidate may be required to attend a formal course of study appropriate to his work.

11. On completing his course of study every candidate shall submit a thesis which complies with the following requirements:—

   (i) The greater proportion of the work described must have been completed subsequent to registration for the Ph.D. degree.
   (ii) It must be a distinct contribution to the knowledge of the subject.
   (iii) It must be written in English or in a language approved by the Senate and reach a satisfactory standard of literary presentation.

12. The thesis shall consist of the candidate's own account of his research. In special cases work done conjointly with other persons may be accepted, provided the Senate is satisfied on the candidate's part in the joint research.

13. Every candidate shall be required to submit with his thesis a short abstract of the thesis comprising not more than 300 words.

14. A candidate may not submit as the main content of his thesis any work or material which he has previously submitted for a university degree or other similar award.

15. The candidate shall give in writing three months' notice of his intention to submit his thesis and such notice shall be accompanied by the appropriate fee.

16. Four copies of the thesis shall be submitted together with a certificate from the supervisor that the candidate has completed the course of study prescribed in his case and that the thesis is fit for examination.

17. The thesis shall be in double-spaced typescript. The original copy for deposit in the Library shall be prepared and bound in a form approved by the University. The other three copies shall be bound in such manner as allows their transmission to the examiners without possibility of disarrangement.
18. It shall be understood that the University retains four copies of the thesis and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act (1968) the University may issue the thesis in whole or in part in photostat or microfilm or other copying medium.

19. The candidate may also submit as separate supporting documents any work he has published, whether or not it bears on the subject of the thesis.

20. The Senate shall appoint three examiners of whom at least two shall not be members of the teaching staff of the University.

21. The examiners may require the candidate to answer, viva voce or in writing, any questions concerning the subject of his thesis or work.

22. The result of the examination shall be in accordance with the decision of a majority of the examiners.

23. A candidate permitted to re-submit his thesis for examination shall do so within a period of twelve months from the date on which he is advised of the result of the first examination.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF ENGINEERING

1. The degree of Doctor of Engineering may be awarded by the Council, on the recommendation of the Senate, for an original contribution or contributions of distinguished merit to the science and/or practice of engineering.

2. A candidate for the degree of Doctor of Engineering shall hold a degree of the University of Newcastle or a degree from another University recognised by the Senate as being equivalent or shall have been admitted to the status of such a degree.

3. The degree shall be awarded on published* work of the candidate although in special circumstances unpublished work may be considered provided that these circumstances are recognised as sufficient by the Senate.

4. Every candidate in submitting his published work and such unpublished work as he deems appropriate shall submit a short discourse describing the research embodied in his submission. The discourse shall make clear the extent of originality and the candidate's part in any collaborative work.

5. A candidate for the degree shall make an application in writing to the Secretary setting out a statement of his academic qualifications. With the application he shall submit:

(a) Four copies of the work referred to in clause 4 of these Requirements.

(b) Four copies of any additional work, published or unpublished, which he may desire to submit in support of his application.

(c) A Statutory Declaration indicating those sections of the work, if any, which have been accepted previously in partial fulfilment of the requirements for a degree or diploma in any University.

6. The Senate shall appoint three examiners of whom at least two shall not be members of the teaching staff of the University.

7. The University may at the request of an examiner require the candidate to answer any questions concerning his work.

8. The result of the examination shall be in accordance with the decision of a majority of the examiners.

*In these requirements, the term "published work" shall mean printed in a periodical or as a pamphlet or as a book readily available to the public. The purpose of requiring publication is to ensure that the work submitted has been available for criticism by relevant experts, and examiners are given discretion to disregard any of the work submitted if, in their opinion, the work has not been so available for criticism.
COURSE OUTLINES

INTRODUCTION

In the following sections, pp 95 to 244 details of the courses available in each of the four Engineering Departments are given.

From 1.1.74 no new enrolments will be accepted for the B.Sc.(Eng.), except in the Department of Chemical Engineering. In other departments these degrees will be phased out over the period 1974 (last year for Stage 2) to 1979. Students wishing to proceed by part-time study may enrol for the normal B.E. course and will take approximately half of the full-time programme each year. Recommended programmes for students proceeding by part-time study are given in each Departmental entry.

INDUSTRIAL EXPERIENCE

Another feature of the new arrangement is that part-time students in appropriate employment may take units to be known as Industrial Experience to count towards the degree. Students taking these units will be required to satisfy any Departmental requirements before credit is granted.

The University can accept no responsibility for finding suitable employment for students wishing to enrol for Industrial Experience units. Any student who completes the course by full-time study will be required to obtain 20 weeks of acceptable industrial experience during the course.

TRANSITION ARRANGEMENTS

All students previously enrolled for the B.Sc.(Eng.) in the Departments of Civil, Electrical and Mechanical Engineering will have to choose whether to continue in their present course or change to the B.E. course. Only in exceptional circumstances will a student who has opted for the B.E. course, be permitted to revert to the B.Sc.(Eng.) course.

Students who complete the requirements for the B.Sc.(Eng.) in 1973 may elect to:

(a) have the B.Sc.(Eng.) degree conferred

OR

(b) transfer to the new B.E. degree.

Students who elect to take the new course will be informed of the standing granted in the new course and their programme for 1974.

UNITS

In undergraduate courses, a unit is approximately one-sixteenth of a full-time year or one-eighth of a part-time year. In engineering subjects, one unit involves a total of 42 hours (1 1/2 hours per week) of lectures, laboratories, and tutorials. Where subjects from other Faculties form part of an engineering course, Part I subjects each count as four units, Part II subjects as five, and Part III subjects as eight units. Where such a subject may be taken at alternative levels, e.g., Part I or Part II, the number of units assigned to the subject is an appropriate average figure calculated from the figures given above.

In the M.Eng.Sc. Requirements a unit is defined as exactly one-twelfth of a full-time year, and in all postgraduate courses, including the M.E. and Ph.D., the unit is understood to have the same value. This "postgraduate unit" is also defined as a programme which involves a student in a total of approximately 120 hours' work. This total includes all formal course work plus assignments and study. If the "unit" is a formal instructional course the 120-hour total includes 42 hours of lectures or the equivalent.

What the two "units" — undergraduate and postgraduate — have in common is therefore the same 42 "contact-hours" per year. The postgraduate unit is a larger fraction of the year's work than the undergraduate unit because in postgraduate work the student is expected to do more work per contact-hour than he is in undergraduate work.

CLASSIFICATIONS

The classifying subject in each year is shown in Bold faced type; the classification of a student, e.g., as second year full-time or third stage part-time, is determined by enrolment in the classifying subject. If a student enrols in more than one classifying subject, then the year or stage of the lower classifying subject applies. If he enrols in no classifying subject, then he is classified in the year or stage of the highest classifying subject he has passed.
COMMON FIRST YEAR

The programme for the first year or first two stages is the same for all courses in the Faculty of Engineering, except the Surveying Course, and consists of:

- Engineering I
- Mathematics I
- Physics IA or IB
- Elective I or Electives
- ME121 Workshop Practice.

However, some students have a certain amount of choice in arranging a programme. Details of the subjects and any recommendations or requirements of particular Departments are given below.

Except as stated below, a full-time student enrols for all the subjects shown. A part-time student will normally enrol for Engineering I and Mathematics I during his first year except in the Department of Chemical Engineering where the normal programme is Chemistry I and Mathematics I.

Students are advised to discuss the full course which they propose to take with a Departmental representative before completing their enrolment form. By doing so, they should be able to avoid difficulties in arranging a programme suitable for their particular needs in the later years of the course.

NOTES

1. **ENGINEERING I** consists of four units selected from
   (a) EE101 Introduction to Electrical Engineering
   (b) CE111 Statics
   (c) ME111 Graphics
   (d) ME112 Engineering Drawing and Elementary Design
   (e) ME131 Dynamics
   (f) ChE101 Industrial Process Principles

   Departmental Requirements are
   - **Chemical Engineering** — (b), (c), (d) and (f)
   - **Civil Engineering** — (b), (c), (d) and (e)
     (including Surveying and Mining)
   - **Electrical Engineering** — (a) plus any three other units
   - **Mechanical Engineering** — (b), (c), (d) and (e)
     (including Industrial Engineering and Naval Architecture)

2. **PHYSICS IA OR IB**

   Students enrolling in all Departments except Chemical Engineering are required to enrol in Physics IA.

   Students enrolling in the Department of Chemical Engineering may select either Physics IA or Physics IB.

3. **ELECTIVE I OR ELECTIVES**

   Subject to the requirements laid down by each Department, Elective I or first year Electives consist of any subject or two half subjects of satisfactory level offered by any Faculty in the University.

   The choice of the elective is subject to the approval of the Head of the Department in which the student is enrolled and the Head(s) of the Department(s) offering the subject or two half subjects chosen.

   Students who may be considering transfer to a combined degree course at the end of first year should pay particular attention to the choice of Elective I or first year Electives.

   Departmental requirements are

   - **Chemical Engineering**
     Students must enrol in Chemistry I this being the prerequisite for Chemistry IIA which is a compulsory subject for the second year of the course.

   - **Civil Engineering**
     Unless the student has completed studies in Chemistry to a level at least equivalent to 2F in the Higher School Certificate, he must take Chemistry I or Chemistry IS.

     If the student takes Geology I he will be required to replace CE223J Engineering Geology (Year II of the course) by a one unit subject offered by an Engineering Department.

   - **Electrical Engineering**
     First year Electives must be selected in accordance with the Elective Requirements given on Page 148.

   - **Mechanical Engineering**
     Unless the student has completed studies in Chemistry to a level at least equivalent to 2F in the Higher School Certificate, he must include Chemistry IS as two elective units in Year I or enrol in Chemistry I (4 units).

     The following subjects are suggested as Elective subjects for first year students in the Faculty of Engineering:

     | Full Subjects | Half Subjects |
     |--------------|--------------|
     | Chemistry I  | Chemistry IS |
     | Biology I    | Microeconomics |
     | Psychology I | Engineering Metallurgy |
     | Geology I    | Logic and Scientific Method |
     | Philosophy I | Economic History I |
     | Geography I  | Materials Science IS |
     | Economics I  | Materials Science I |

   Students may also select the units from Engineering I not being taken as part of Engineering I.
4. ME121 WORKSHOP PRACTICE

In the Department of Chemical Engineering ME121 Workshop Practice must be taken in the first year. In the Departments of Civil and Electrical Engineering ME121 Workshop Practice may be taken either in Year I or Year II if enrolment is full-time or in Stage 1 or 2 if enrolment is part-time. In the Department of Mechanical Engineering all students must enrol for ME121 Workshop Practice in Year I or Stage 1. This is followed by a second unit of Workshop Practice (ME221) in Year II or Stage 2 for those students enrolled for the B.E. in Mechanical and Industrial Engineering.

Workshop Practice classes are held at the Technical College, Tighes Hill. Students are requested to indicate a preference for nominated class periods when enrolling. Allocation of class times will be advised early in first term.

BACHELOR OF SURVEYING COURSE

Students enrolled for the Bachelor of Surveying course should enrol in

- Mathematics I
- Engineering I
- Physics I

CE161 Land Surveying I if a full-time student.

Part-time students should enrol in

- Mathematics I
- Engineering I

The units to be taken as Engineering I are set out in Note 1 above.

DEPARTMENT OF CHEMICAL ENGINEERING

Chemical Engineering is the “engineering of processes in which materials undergo chemical or physical change.” As a discipline Chemical Engineering may claim to be among the most modern of the branches of Engineering, having developed mainly since about 1920. Chemical Engineers are now being recognised as “process engineers” in the widest sense and are engaged in the preparation and smelting of metaliferous ores, in power-production, in food-processing and ceramics and as fuel-enginers, as well as in the industries producing conventional “chemicals.” The new fields of bio-chemical and bio-medical engineering apply chemical engineering principles to bacterial processes and to research into the functions and artificial substitution for such systems as kidneys and other organs.

Currently there is a heavy demand for Chemical Engineers in the whole range of fields from research and development, through operations and administration to technical sales. A number of cadetships are available but a large proportion of firms recruit at graduate level and broad opportunities are available for students who read independently for a full-time course.

Three types of course are available:

- Bachelor of Engineering (4 years full time; or 2 years part-time and 3 years full time; or 4 years part-time and 2 years full time)*
- Combined degrees B.A./B.E. and B.Sc./B.E. for honours level students, normally 5 years full time. The combined Science degree can be taken with a major in Chemistry, Mathematics, Biology or Geology.
- B.Sc.(Eng.) normally 6 years part-time, for cadets in approved employment.

All courses are recognised as providing full academic qualifications for The Institution of Engineers, Australia and the Royal Australian Chemical Institute and have been acceptable to the Institute of Fuel. B.E. is recognised by The Institution of Engineers, Australia and the British Institution of Chemical Engineers. (The B.Sc.(Eng.) is accepted by The Institution of Engineers, Australia until 1980 and by the British Institution of Chemical Engineers as giving part exemption from their examinations).

All courses are broadly based on a foundation of Chemistry, Mathematics, Physics and general Engineering Science. In his professional subjects, the Chemical Engineer studies the application of scientific method and knowledge to the performance of chemical processes and chemical engineering equipment. Electives are available permitting students to widen their education or deepen their specialist ability by selection from subjects throughout the whole university.
All students take part in a number of inspections of selected process plants both in the Hunter Valley and in Sydney. Full-time students are required to obtain at least twenty weeks of approved industrial experience during their long vacations.

There is a considerable demand for Chemical Engineers qualified in research or in specialized fields and postgraduate courses are available for work towards Ph.D. and both research and course work Masters degrees.

* Proposals will be submitted next year for a course similar to other departments of the Faculty, offering the possibility of 5 years part-time and 1 year full time.

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**SCHEDULE 1.1**

**BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR I</td>
<td></td>
</tr>
<tr>
<td>CHEMISTRY I (as Elective I)</td>
<td>4</td>
</tr>
<tr>
<td>Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Physics IA or IB</td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

FOR DETAILS OF YEAR I PROGRAMME SEE PAGE 93

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR II</td>
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</tr>
<tr>
<td>CHEMICAL ENGINEERING I</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry IIA</td>
<td>5</td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR III</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIA</td>
<td>7</td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING IIB</td>
<td>8</td>
</tr>
<tr>
<td>*Elective II</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR IV</td>
<td></td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING III</td>
<td>12</td>
</tr>
<tr>
<td>*Elective III</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

*See Elective Requirements on page 111.

1 Mathematics IIB may be taken in two parts each of three terms duration.
## SCHEDULE 3.1

### BACHELOR OF SCIENCE (ENGINEERING) IN CHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STAGE 1</strong></td>
<td></td>
</tr>
<tr>
<td>CHEMISTRY I (as Elective I)</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td><strong>FOR DETAILS OF STAGES 1 &amp; 2 SEE PAGE 93</strong></td>
<td></td>
</tr>
<tr>
<td><strong>STAGE 2</strong></td>
<td></td>
</tr>
<tr>
<td>ENGINEERING I</td>
<td>4</td>
</tr>
<tr>
<td>Physics IA or IB</td>
<td>4</td>
</tr>
<tr>
<td><strong>STAGE 3</strong></td>
<td>8</td>
</tr>
<tr>
<td>CHEMISTRY IIA</td>
<td>5</td>
</tr>
<tr>
<td>Mathematics IIB Part I</td>
<td>2</td>
</tr>
<tr>
<td><strong>STAGE 4</strong></td>
<td>7</td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING I</td>
<td>6</td>
</tr>
<tr>
<td>Mathematics IIB Part 2</td>
<td>2</td>
</tr>
<tr>
<td><strong>STAGE 5</strong></td>
<td>8</td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING IIA PART I</td>
<td>4</td>
</tr>
<tr>
<td>Chemical Engineering IIB Part I</td>
<td>4</td>
</tr>
<tr>
<td><strong>STAGE 6</strong></td>
<td>8</td>
</tr>
<tr>
<td>Chemical Engineering IIA Part 2</td>
<td>3</td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING IIB PART 2</td>
<td>4</td>
</tr>
<tr>
<td>*Elective II</td>
<td>2</td>
</tr>
</tbody>
</table>

### Note

1. Three years approved industrial experience must be secured concurrently with the course.
2. Design Project from Year IV of the Bachelor of Engineering in Chemical Engineering course may be taken as the elective by suitably qualified students.

*See Elective Requirements on page 111.*

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## SCHEDULE 2.10

### BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

The candidate shall complete in the Faculty of Arts five subjects selected as shown below, in addition to the professional requirements for the degree of Bachelor of Engineering in Chemical Engineering (i.e. subjects Chemistry I and II, Mathematics I and IIB, Physics I (A or B), Engineering I and Chemical Engineering I, IIA, IIB and III, together with the industrial experience specified for the B.E. degree).

The five Arts subjects must include not less than one Part III and one Part II subject, and at least four of the five subjects must be selected from Group I of the Schedule of Subjects included in the Requirements for the degree of Bachelor of Arts.

A typical program for the Department of Chemical Engineering would be:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR I</strong></td>
<td></td>
</tr>
<tr>
<td>CHEMISTRY I</td>
<td></td>
</tr>
<tr>
<td>Engineering I</td>
<td></td>
</tr>
<tr>
<td>Physics IA or IB</td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
<td></td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td></td>
</tr>
<tr>
<td><strong>YEAR II</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB/1</td>
<td></td>
</tr>
<tr>
<td>Chemistry IIA</td>
<td></td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING I</td>
<td></td>
</tr>
<tr>
<td>Arts Subject I</td>
<td></td>
</tr>
<tr>
<td><strong>YEAR III</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB/2</td>
<td></td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING IIA/1</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIB/1</td>
<td></td>
</tr>
<tr>
<td>Arts Subject II</td>
<td></td>
</tr>
<tr>
<td>Arts Subject I or II</td>
<td></td>
</tr>
<tr>
<td><strong>YEAR IV</strong></td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIA/2</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIB/2</td>
<td></td>
</tr>
<tr>
<td>ARTS SUBJECT III</td>
<td></td>
</tr>
<tr>
<td><strong>YEAR V</strong></td>
<td></td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING III</td>
<td></td>
</tr>
<tr>
<td>Arts Subject I, II or III</td>
<td></td>
</tr>
</tbody>
</table>
BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

The candidate shall complete all requirements for the Bachelor of Engineering in Chemical Engineering and comply with the requirements of the Faculty of Science for the degree of Bachelor of Science with the provision that Engineering I is recognised as a Science Group I subject and Chemical Engineering I as a Science Group II subject (clause 10a of the Science degree requirements) and that a subject taken for the Science degree may be accepted as Elective III for the Engineering Degree. Normally the requirements for the Bachelor of Science degree shall be completed before the candidate enrols for the final year of the Engineering degree. The Deans of both Faculties shall certify that the work in the combined degree is no less in quantity and quality than if the two degrees were taken separately.

A typical course structure would be as follows for a candidate majoring in Chemistry:—

Subject

YEAR I
CHEMISTRY I
Engineering I
Mathematics I
Physics IA or IB
ME121 Workshop Practice

YEAR II
Chemical Engineering I

CHEMISTRY IIA
Mathematics IIB

YEAR III
CHEMISTRY IIIA
Chemical Engineering IIA/1
Chemical Engineering IIB/1

YEAR IV
Chemical Engineering IIA/2
CHEMICAL ENGINEERING IIB/2
and one of:—
Chemistry IIB, IIB, Geology I, Biology I, Physics II*

YEAR V
CHEMICAL ENGINEERING III
Elective II

[Similar programs can be made to major in Mathematics, Biology or Geology]

*A candidate must have taken Physics IA to enrol for Physics II as the Science subject.

DESCRIPTION OF SUBJECT UNITS
DEPARTMENT OF CHEMICAL ENGINEERING

FIELD EXCURSIONS
Inspections of Chemical Engineering plants of particular technical interest or relevance to course material are an integral part of the Chemical Engineering subjects. Normally students are expected to take part in several half day or full day inspections of plants in the Newcastle area for Chemical Engineering I, Chemical Engineering IIA, Chemical Engineering IIB. In addition, an excursion to the Sydney area of about four days duration is arranged in Year III (Stage 5).

ENGINEERING I
ME111 Graphics
ME112 Engineering Drawing and Elementary Design
CE111 Statics
ChE101 Industrial Process Principles

ME121 WORKSHOP PRACTICE

ChE101 INDUSTRIAL PROCESS PRINCIPLES
The preparation of process flowsheets. Engineering calculations illustrating material and energy balances, together with pressure, temperature and volume conditions involved in physical or chemical changes. Balancing chemical equations and elementary stoichiometry. Phase rule applications, graphical methods. These principles will be illustrated from such processes as water treatment, metallurgical ore smelting and steel production, cement manufacture, combustion of coal and oil, production of tonnage oxygen, ammonia and acids.

Text
Chemical Process Principles
Vol. I (2nd ed.)
Hougen, O. A., Watson, R. M.
& Ragatz, R. A.
(McGraw-Hill 1954)

CHEMICAL ENGINEERING I
Stage 4: Year II

Prerequisites
Mathematics I, Physics IA or IB

A course of about 120 hours lectures and 120 hours tutorials and laboratory covering:—
ChE211 FUELS AND COMBUSTION I
(21 hours plus laboratory)

Origin and composition of the major fossil fuels; processing of natural fuels for gaseous and liquid secondary fuels; the technical requirements of a fuel, specification and testing. Behaviour of fuels on pyrolysis; the nature of flame, flame speed and temperature, explosive mixture limits, ignition temperatures; premix and diffusion flames; excess air requirements and losses; the requirements of mixing and reaction time; burner and combustion chamber construction to meet fuel flame and heat transfer requirements. Combustion of solid fuel; grates and gas producers; pulverised fuel. Calculation of quantities; thermal efficiency.

Text
Efficient Use of Fuel (H.M.S.O. 1964)

ChE212 FLUID-STATICS AND DYNAMICS

Concept of a fluid, real fluids and ideal fluids, compressible and incompressible flow. The barometric equation, two fluid manometer, continuous decanter. Concept of streamline and streamtube, continuity, energy equation and momentum equation for fluids. Boundary layer equations for streamline flow. Flow through pipes and fittings, fluid meters.

Texts

ChE213 HEAT AND MASS TRANSFER
(35 hours lecture and tutorial plus laboratory)

Conduction of heat; Fouriers equation, steady state unidirectional and uniform radial flow, surface transfer coefficients, extended surfaces. Heat exchangers, mean convection coefficients. Convection transfer, dimensionless numbers and their significance; natural convection. Relationships between mass, momentum and heat transfer. Condensation film theory; effect of surfaces, of non-condensible gases; boiling, nucleate and film; condensers and evaporations. The nature and spectral distribution of thermal radiation; optical and total radiation pyrometry, corrections for grey emitters; exchange areas between black surfaces; simple systems with grey and adiabatic surfaces.

Text

References
ChE215 CHEMICAL PROCESS CALCULATIONS
(42 hours lectures and tutorials)
Units and Dimensions, conversion factors, problem solving tech­
niques, balancing chemical equations and stoichiometry; Material
Balances—batch and continuous operations, algebraic and direct
problem solution, tie elements, bypass, recycle and purge; Energy
Balances—system limits, heat capacity, enthalpy change calcula­
tions for liquid-solid systems; vapour pressure calculations
correlation charts of CO₂, Othmer, Henry's Law, humidification,
saturation, psychometric charts and calculations; Phase pheno­
mena of mixtures—triangular charts and their applications.

Text
Material and Energy Balance
Computations
Henley, E. J. & Rosen, E. M.
(Wiley Press 1969)

LABORATORY
A set of experiments covering measurement and character of
fluid flow, heat transfer measurements, gas and fuel properties,
gas burner characteristics, and measurement of temperature,
viscosity, refractive index, etc. This includes a minor project in
which the student is expected to take the initiative in designing
an experiment.

CHEMICAL ENGINEERING I
Recommended References
Numerical Methods and Fortran
Programming
McCracken, D. D. & Dorn, W. S.
(Wiley 1965)

Unit Operations of Chemical
Engineering (2nd ed.)
McCabe, H. L. & Smith, S. C.
(McGraw-Hill 1967)

Fuels Solid, Liquid and Gaseous
Brame & King
(Arnold 1965)

Introduction to the Study of Fuel
McCrae
(Elsevier 1965)

Radiative Transfer
Hottel, H. C. & Sarofin, A. F.
(McGraw-Hill 1968)

Describing Chemical Engineering
Systems
Ranz, W. E.
(McGraw-Hill 1970)

CHEMICAL ENGINEERING II A
Stages 5 & 6; Year III
Prerequisites
Chemical Engineering I

PART I
APPLIED THERMODYNAMICS II (approx. 30 hours)
Thermodynamics applied to the description of the properties of
gases and liquids; to expansion and compression processes leading
to power generation and cryogenics, to equilibrium processes of
mixtures leading to phase equilibria and chemical reaction equilibria.

Text
Chemical Process Principles
Vol. 2 (2nd ed.) Hugen, O. A., Watson, R. M.
& Ragatz, R. A.
(Wiley 1959)

REACTION ENGINEERING PRINCIPLES I
(approx. 30 hours)
Design and operation of chemical reactors for homogeneous and
heterogeneous reacting systems. Elementary reaction kinetics
leading to interpretation of experimental data needed to design
batch and continuous reactors. Effect of heat of reaction and
changes of temperature and pressure on design, use of catalysts
and residence time estimation.

Text
Chemical Reaction Engineering 2nd ed. Levenspiel, O.
(Wiley 1972)

SEPARATION PROCESSES
(approx. 56 hours class and 42 hours laboratory)
The concepts underlying the selection, behaviour and computa­
tion of separation processes together with the types and
behaviour of equipment requiring either stages or continuous
contacting operation. Basic processes used to illustrate concepts
are leaching, extraction, absorption and distillation. Other
separation processes are considered.
Text

Separation Processes
Judson King, C.
(McGraw-Hill 1971)

References

Chemical Engineering
Vol. II Coulson, J. M. & Richardson, J. F.
(Pergamon 1970)

Chemical Engineering
Vol. III Coulson, J. M. & Richardson, J. F.
(McGraw-Hill 1972)

Distillation
Van Winkle, M.
(McGraw-Hill 1967)

Unit Operations of Chemical Engineering
(2nd ed.) McCabe, H. L. & Smith, S. C.
(McGraw-Hill 1967)

PROCESS STATISTICS (approx. 28 hours)
Treatment and interpretation of chemical engineering data to gain the maximum amount of information. Some techniques studied are graphical representation, empirical equations for interpolation and extrapolation, variance, distribution and propagation of errors, sampling theory, experimental design. Use of calculating aids now available such as computers, remote terminals, desk and pocket calculators is encouraged and students should become registered users with the Computer centre.

Text

Statistics Manual Crowe, E., Davis, F. & Maxfield, M.
(McGraw-Hill 1972)

PART II

TRANSPORT PRINCIPLES II
(approx. 42 hours lectures and tutorials)
Heat and mass transfer in unsteady state conditions; generalized transport theory for momentum, mass and heat transfer in laminar, turbulent and simple boundary layer conditions; correlations of transfer co-efficients, mass transfer with reaction.

Text

Transport Phenomena Bird, R. B. et al
(Wiley 1960)

References

Mathematical Methods for Chemical Engineers Jensen, K. A. & Jeffries, G. U.
(Academic 1965)

Mass Transfer with Chemical Reaction Astarita, G.
(Elsevier 1967)

Boundary Layer Theory Schlichting, H.
(McGraw-Hill 1955)

(C.U.P. 1959)

Numerical Methods for Partial Differential Equations Smith, G. D.
(Oxford University Press 1965)

PARTICULATE AND THERMAL SYSTEMS
(approx. 42 hours lectures and tutorial; 42 hours laboratory)
Definition of size and shape of solid particles, laws of breakage, analytical description of size distributions, matrix description of breakage and classification operations, crushing and grinding equipment, separation of solids; partition curves; pressure and flow of granular material. Drying operations, movement of moisture in solids; drying systems, drying equipment; design methods. Furnace and kiln analysis by heat and mass balance on well-stirred and parallel flow reactors. Size and solids separations by — flocculation, hindered settling, elutriation, sludge thickening, centrifuges; Flow through fixed beds—Fluidisation—Filtration—analytical and design methods. Agitation and mixing—scale-up and shape considerations; Evaporation and crystallisation.

Text

Chemical Engineering
Vol. II Coulson, J. M. & Richardson, J. F.
(Pergamon 1970)

References

Chemical Engineers' Handbook (4th ed.) Perry, J. H.
(McGraw-Hill 1964)

Unit Operations of Chemical Engineering McCabe, H. L. & Smith, S. C.
(McGraw-Hill 1967)

Fluidization Engineering Kuni & Levenspiel
(Wiley 1968)
CHEMICAL ENGINEERING IIB
Stages 5 & 6; Year III

PART I
Prerequisites
Engineering I, Physics I A or I B, Mathematics IIB

CE202  Materials and Structures
(Dept. of Civil Engineering)

EE203  Introduction to Electrical Information

EE204  Introduction to Electrical Energy

CHEMICAL EQUIPMENT DESIGN
(approx. 21 hours lectures & 63 hours drawing office)
Introduction to the S.A.A. codes. Design of Pressure Vessels, heat exchangers, distillation and absorption towers, simple storage vessels. Preparation of process flowsheets and engineering flow-sheets, layout for instrumentation and ancillary equipment. Mechanical drives, materials handling equipment.

Texts
Plant Design and Economics for Chemical Engineers  Peters, M. S. & Timmerhaus, K.
( McGraw-Hill 1968)

S.A.A. CODES — Pressure Vessels  A.S. 1210 — 1972
Steel Structures  A.S. 1250 — 1972
Building Loads  Int. 350 — 1963

References
Process Heat Transfer  Kern, D. Q.
( McGraw-Hill 1950)

Process Plant Piping  Rase, H. R.
( Wiley 1964)

Mass Transfer Operations  Treyball, R. E.
( McGraw-Hill 1955)

CHEMICAL PROCESS CONTROL
(approx. 42 hours lectures and laboratory)
Introduction to process dynamics, the well stirred vessel, treatment of experimental data, Laplace Transform Applications. Block diagram rotation, open loop and closed loop systems, the transfer function application and limitations. Control modes. Stability of closed loop system, elementary rio locus, Bode diagram. Feed forward. Control, cascase control with applications to control of temperature, flow pressure and composition.

Text
Automatic Process Control  Johnson, E. F.
( McGraw-Hill 1967)

PROCESS ECONOMICS
(approx. 28 hours lectures and tutorials)
Estimation and analysis of process and production costs, interest and investment costs, depreciation, taxes and insurance, profitability, alternative investments and replacement, cash flow, cost and asset accountancy, economics of the plant in relationship to the total organisation.

Text
Plant Design and Economics for Chemical Engineers  Peters, M. S. & Timmerhaus, K.
( McGraw-Hill 1968)

References
Economic Analysis for Engineering and Managerial Decision Making  Barish
( McGraw-Hill 1968)

Costs and Economics of the Australian Chemical and Process Industries (2nd ed.)  Buchanan & Sinclair
( Wests 1967)

PROCESS ENGINEERING
(approx. 21 hours lectures and tutorial)
The plant as an integrative whole, requirements and specification of services (steam, air, water, gas, effluent etc.). Selection of service equipment, piping and reticulation, buildings and foundations, safety and environmental considerations, plant organisation and administration, materials selection.

Text
Project Engineering of Process Plants  Rase, H. R. & Barrow, M. H.
( Wiley 1957)
General References
Students will be expected to become familiar with general engineering practice, as illustrated in current Chemical Engineering journals.

CHEMICAL ENGINEERING III

YEAR IV

Prerequisites
Chemical Engineering IIA and Chemical Engineering IIB

The subject CHEMICAL ENGINEERING III requires the completion of course work in Advanced Topics, of a Research Project and a Design Project and participation in the Chemical Engineering Seminar.

CHEMICAL ENGINEERING SEMINAR
Regular two hour seminar sessions will be held during the year for discussion of literature reviews, chemical engineering practice and of research within the department. Each student will present not less than two half-hour papers in the course of the year.

RESEARCH PROJECT
An assigned task of experimental investigation or of design, construction and testing of experimental equipment, to be reported formally in a thesis.

DESIGN PROJECT
Preparation of a formal design report for a specified plant for chemical production, including process flow sheets, full mass and energy balances and the detailed design of one or more specified items of equipment.

ADVANCED TOPICS IN CHEMICAL ENGINEERING
A total of three units (4-5 hrs/week lectures and tutorials) in the Chemical Engineering Department comprising selected topics from the fields:

- Environmental control
- Advanced combustion
- Radiant Heat transfer
- Heat and mass transfer in packed beds
- Reaction engineering — multiple reaction systems — reaction with mass transfer in two phase systems
- Advanced transport theory
- Advanced distillation, laboratory and extraction systems
- Process evaluation and optimization
- Particle mechanics

Students should consult departmental staff for details of topics available before the beginning of first term.

For some topics students may be required to take selected portions of the corresponding Master of Engineering Science courses.

INDUSTRIAL EXPERIENCE
Students will submit reports, normally in first term of 3rd and 4th year, covering their period of approved industrial experience during long vacations or during the preceding year.

ELECTIVES

Elective I
Students enrolling in the Department of Chemical Engineering must take Chemistry I as Elective I.

Elective II and III
These Electives may be taken in any Department of the University in which suitable courses are offered, subject to the approval of the Heads of the Department concerned and of Chemical Engineering, and to time-table restrictions.

The Student Advisor of the Department of Chemical Engineering should be consulted regarding units available.
Elective I

(1) CHEMICAL ENGINEERING IIIIC
A full third year subject comprising selected range of topics of interest
to students of Applied Mathematics (for details see Mathematics
Handbook).

(2) Electives available to students from other university departments. Each
elective comprises about 42 hours contact time (lectures, tutorials and
laboratory) normally taken over half the academic year.

ChE211 Fuels and Combustion 1 unit (a)
ChE212 Fluid Mechanics I of Process Systems 1 unit (a)
ChE213 Heat Transfer I 1 unit (a)
ChE311 Particle Mechanics-fluid solid separations 1 unit (b)
ChE312 Particle Mechanics-sizing, comminution and drying;
Kiln and furnaces 1 unit (c)
ChE321 Thermodynamics of process systems 1 unit (d)
ChE331 Transport Theory II (Heat mass and momentum
analogies; boundary layer problems) 1 unit (b)
ChE341 Stages separation systems 1 unit (a)
ChE511 Radiant heat transfer 1 unit (c)
ChE512 Advanced Combustion 1 unit (c)

PREREQUISITES
(a) no prerequisite
(b) a first course in Fluid Mechanics
(c) a first course in Heat Transfer
(d) Chemistry I

DEPARTMENT OF CIVIL ENGINEERING

Civil Engineering is the application of science to the improvement of
the community's environment. It is concerned with the design and con-
struction of water supply and conservation projects, hydro-electric develop-
ment, roads, railways, bridges, tunnels, large buildings, irrigation, sewerage,
and harbour and river development. The Civil Engineer "adapts the forces
of nature for the use and convenience of mankind." His academic training
includes the study of science and engineering practice. He must combine
this with experience and judgment, and the knowledge and personality
necessary to control large organisations of workers. This profession offers
to a young man a considerable variety of types of work ranging from
specialised research and investigations, through routine design and con-
struction work to higher positions which are largely managerial and
organisational in their nature.

The Department of Civil Engineering currently offers the following first
degree courses in Civil Engineering—Bachelor of Engineering in Civil
Engineering (full-time or part-time course), Bachelor of Arts/Bachelor of
Engineering in Civil Engineering (full-time course), and Bachelor of Science/
Bachelor of Engineering in Civil Engineering (full-time course). These
courses are arranged so that all students receive training in the basic
principles of mathematics and science, and in the fundamentals of
engineering applications of such work to surveying, hydraulics, foundation
engineering, structural design, and constructional work in the field.
Ancillary subjects from other branches of engineering are also included,
such as electrical engineering and mechanical engineering. During the
course each student is required to complete at least 20 weeks of industrial
training, and to submit detailed reports on each training period. In the
final year, the full-time student completes a project covering some aspect
of supervised research, and delivers a seminar paper on some selected
topic.

The first two years full-time and the equivalent four years part-time of
the Bachelor of Surveying Degree Course of the University of New South
Wales is offered by the University of Newcastle through the Department
of Civil Engineering. After students have successfully completed the above
courses they may transfer with full standing into the third year of full-
time study in the Bachelor of Surveying Degree Course at the University
of New South Wales. The Bachelor of Surveying Course is currently a
four year full-time course at the University of New South Wales so that
Newcastle students must successfully complete the third and fourth years
of full-time study in Sydney to qualify themselves for the Degree of
Bachelor of Surveying.
The possibility of the whole Bachelor of Surveying Degree Course being offered at the University of Newcastle is now under review. It is hoped that the third year of the course will be offered for the first time in 1976 or 1977, but confirmation of these plans depends on the approval of the Australian Universities Commission.

The first two years of this University's Bachelor of Engineering Degree in Civil Engineering is accepted by the University of New South Wales as exemption from the first two year's of that University's Bachelor of Engineering Degree course in Mining Engineering.

Postgraduate study in Civil Engineering can be directed either towards the M.Eng.Sc. degree, consisting principally of course work and some project work, or towards the M.E. or Ph.D. degrees, which are essentially research degrees in which the student is required to carry out an investigation having some element of novelty and originality, and to write a thesis on the results.

### SCHEDULE 1.2

**BACHELOR OF ENGINEERING IN CIVIL ENGINEERING**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<tr>
<td>Physics IA</td>
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<td><strong>YEAR II</strong></td>
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<td>CE222 Concrete Technology</td>
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<td>CE231 Fluid Mechanics I</td>
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<td>Mathematics IIB</td>
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<td>CE221 Properties of Materials I</td>
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<td>CE212 Mechanics of Solids I</td>
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<td>CE241 Surveying I</td>
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<td><strong>CE313 STRUCTURAL ANALYSIS AND DESIGN I</strong></td>
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<td>CE351 Transportation Engineering</td>
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<td>CE343 Water Resources Engineering</td>
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<td>CE352 Civil Engineering Systems</td>
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<td>ME482 Engineering Economics</td>
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<td>ME301 Engineering Computations</td>
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<td>ME271 Thermodynamics, or</td>
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<td>ME212 Engineering Design</td>
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<td><strong>YEAR IV</strong></td>
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<td>CE425 Earth and Rock Engineering</td>
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<td>CE452 Engineering Construction</td>
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<td><strong>CE414 STRUCTURAL ANALYSIS AND DESIGN II</strong></td>
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<tr>
<td>*Electives</td>
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</table>

* See Elective Requirements on page 117.
† Plus 5-day Survey Camp
+ ME121 Workshop Practice may be taken in Year I or Year II.

1 Mathematics IIB may be taken in two parts each of three terms duration.
RECOMMENDED PROGRAMME FOR THE
BACHELOR OF ENGINEERING IN CIVIL ENGINEERING
BY PART-TIME STUDIES

<table>
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FOR DETAILS OF STAGES 1 AND 2 SEE PAGE 92

YEAR VI FULL TIME

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</table>

* See Elective Requirements below
† Plus 5-day Survey Camp.
‡ ME121 Workshop Practice to be done in Stage 1 or 2
+++ Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.

ELECTIVE REQUIREMENTS

Elective I may consist of any subject or two half subject of satisfactory level, subject to the approval of the Head of Department and the Head(s) of the Department(s) whose department offers the chosen subject or half subject. However, Chemistry I or Chemistry IS must be taken unless the student has already completed studies in Chemistry to a level at least equivalent to 2F in the H.S.C. If Geology I is taken, the subject CE223J Engineering Geology must be replaced by a one unit subject offered by an Engineering Department.

Other Electives.

Electives may consist of subject or part subjects offered within the Faculty or by other Faculties, subject to the approval of the Heads of the Department of Civil Engineering and of any other Department responsible for the subject or part-subject and subject to the following conditions:

(i) at least one of the units must be taken within the Department of Civil Engineering; and

(ii) up to three units of Industrial Experience may be taken as Electives after completion of the First Year of the course or its equivalent. Any student wishing to receive credit for three units must complete the third unit during his final year of enrolment.

For Industrial Experience requirements see under Description of Subjects.
## SCHEDULE 3.2

**BACHELOR OF SCIENCE (ENGINEERING) IN CIVIL ENGINEERING**

<table>
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<tr>
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<td><strong>MATHEMATICS I</strong></td>
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<td>(Topics D &amp; H)</td>
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<td><strong>STRUCTURAL ANALYSIS AND DESIGN I</strong></td>
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</tr>
<tr>
<td>CE324</td>
<td></td>
</tr>
<tr>
<td><strong>STAGE 6</strong></td>
<td></td>
</tr>
<tr>
<td>CE414B</td>
<td><strong>STRUCTURAL DESIGN II</strong></td>
</tr>
<tr>
<td>CE452</td>
<td>Engineering Construction</td>
</tr>
<tr>
<td>CE333</td>
<td>Water Resources Engineering</td>
</tr>
<tr>
<td>GE350</td>
<td>Seminar</td>
</tr>
<tr>
<td><strong>Select two units from—</strong></td>
<td></td>
</tr>
<tr>
<td>CE425</td>
<td>Earth and Rock Engineering (1 )</td>
</tr>
<tr>
<td>CE352</td>
<td>Civil Engineering Systems (1 )</td>
</tr>
<tr>
<td>ME482</td>
<td>Engineering Economics (1 )</td>
</tr>
<tr>
<td>CE414A</td>
<td>Structural Analysis II (2 )</td>
</tr>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td>OR any other Departmental Elective subject to satisfaction of prerequisites.</td>
<td></td>
</tr>
<tr>
<td>* See Elective Requirements on page 117.</td>
<td></td>
</tr>
<tr>
<td>† Plus 5-day Survey Camp.</td>
<td></td>
</tr>
<tr>
<td>+ ME121 Workshop Practice to be done in Stage 1 or Stage 2</td>
<td></td>
</tr>
</tbody>
</table>
BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN CIVIL ENGINEERING

In the combined course set out below the Arts subjects shall be chosen from the approved Schedule of Subjects offered for the degree of Bachelor of Arts.

Subject | Units | YEAR
---|---|---
**YEARS** | | |
**YEAR I** | | |
Engineering I | 4 | |
**MATHEMATICS I** | 4 | |
Physics I A | 4 | |
*Elective I | 4 | |
ME121 Workshop Practice | 1 | 17
**YEAR II** | | |
Arts Subject Part I | 4 | |
**MATHEMATICS II** | 5 | |
CE221 Properties of Materials I | 5 | |
CE212 Mechanics of Solids I | 3 | |
CE231 Fluid Mechanics I | 1 | |
CE222 Concrete Technology | 2 | |
EE203 Introduction to Electrical Information | 1 | |
EE204 Introduction to Electrical Energy | 1 | 17
**YEAR III** | | |
Arts Subject Part II | 5 | |
Arts Subject Part I or Part II | 4 | |
**STRUCTURAL ANALYSIS AND DESIGN I** | 4 | |
CE313 | | |
CE241 | 2 | |
ME301 Engineering Computations | 1 | 16
**YEAR IV** | | |
**ARTS SUBJECT PART III** | 8 | |
Arts Subject Part II or Part III | 6 | |
CE324 Soil Mechanics | 2 | |
ME212 Engineering Design | 1 | |
ME271 Thermodynamics | 1 | 17

If an Arts subject Part II is taken in Year IV, a unit from Year V may be transferred to Year IV.

* Select 3 units from —
CE425 Earth and Rock Engineering (1)
CE352 Civil Engineering Systems
ME482 Engineering Economics (1)
AND the list of Departmental Electives.

† Plus 5-day Survey Camp.

1 Mathematics II B may be taken in two parts each of three terms duration.
### SCHEDULE 2.2

**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN CIVIL ENGINEERING**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR I</strong></td>
<td></td>
</tr>
<tr>
<td>Engineering I</td>
<td>4</td>
</tr>
<tr>
<td><strong>MATHEMATICS I</strong></td>
<td>4</td>
</tr>
<tr>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td>*Elective I</td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td><strong>YEAR II</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MATHEMATICS IIA</strong></td>
<td>5</td>
</tr>
<tr>
<td>Mathematics IIC</td>
<td>5</td>
</tr>
<tr>
<td>CE221 Properties of Materials I</td>
<td>1</td>
</tr>
<tr>
<td>CE212 Mechanics of Solids I</td>
<td>1</td>
</tr>
<tr>
<td>CE231 Fluid Mechanics I</td>
<td>1</td>
</tr>
<tr>
<td>CE222 Concrete Technology</td>
<td>2</td>
</tr>
<tr>
<td>EE203 Introduction to Electrical Information</td>
<td>1</td>
</tr>
<tr>
<td>EE204 Introduction to Electrical Energy</td>
<td>1</td>
</tr>
<tr>
<td><strong>YEAR III</strong></td>
<td></td>
</tr>
<tr>
<td>Geology</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td>4</td>
</tr>
<tr>
<td><strong>MATHEMATICS IIIA</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>YEAR IV</strong></td>
<td>16</td>
</tr>
<tr>
<td>CE313 <strong>STRUCTURAL ANALYSIS AND DESIGN I</strong></td>
<td>4</td>
</tr>
<tr>
<td>CE324 Soil Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>CE332 Fluid Mechanics II</td>
<td>2</td>
</tr>
<tr>
<td>CE241 <em>Surveying I</em></td>
<td>2</td>
</tr>
<tr>
<td>CE333 Water Resources Engineering</td>
<td>2</td>
</tr>
<tr>
<td>GE350 Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
</tr>
<tr>
<td>CE352</td>
<td></td>
</tr>
<tr>
<td>ME482 Engineering Economics</td>
<td>1</td>
</tr>
<tr>
<td>ME212 Engineering Design</td>
<td>1</td>
</tr>
<tr>
<td>ME271 Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td><strong>YEAR V</strong></td>
<td>17</td>
</tr>
<tr>
<td>CE414 <strong>STRUCTURAL ANALYSIS AND DESIGN II</strong></td>
<td>4</td>
</tr>
<tr>
<td>CE452 Engineering Construction</td>
<td>2</td>
</tr>
<tr>
<td>CE351 Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE425 Earth and Rock Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE453 Project</td>
<td>2</td>
</tr>
<tr>
<td>*Electives</td>
<td>5</td>
</tr>
<tr>
<td><strong>University of New South Wales Subjects</strong></td>
<td></td>
</tr>
<tr>
<td><strong>YEAR III</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Semester 5</strong></td>
<td></td>
</tr>
<tr>
<td>8.712 Engineering for Surveyors</td>
<td>3</td>
</tr>
<tr>
<td>29.103 Surveying III</td>
<td>7</td>
</tr>
<tr>
<td>29.152 Surveying Computations</td>
<td>3</td>
</tr>
<tr>
<td>29.612 Land Studies II</td>
<td>5</td>
</tr>
<tr>
<td>36.411 Town Planning</td>
<td>3</td>
</tr>
<tr>
<td><strong>Semester 6</strong></td>
<td></td>
</tr>
<tr>
<td>29.211 Geodesy I</td>
<td>6</td>
</tr>
<tr>
<td>29.311 Astronomy I</td>
<td>3</td>
</tr>
<tr>
<td>29.511 Photogrammetry I</td>
<td>6</td>
</tr>
<tr>
<td>29.613 Land Studies III</td>
<td>2</td>
</tr>
<tr>
<td>29.614 Land Studies Project</td>
<td>3</td>
</tr>
<tr>
<td><strong>Average Hours per week</strong></td>
<td>20</td>
</tr>
</tbody>
</table>

* First Half year.
** Second Half year.
† A five-day survey camp must be attended as part of this subject.
†† Mathematics IIB may be taken in two parts each of three terms duration.

---

* See Elective Requirements on page 117.
† Plus 5-day survey camp
Semester 7

29.193 Professional Training
29.194 Survey Camp

Average Hours per week
5 months
(4 weeks field
(2 weeks office

Semester 8

29.212 Geodesy II
29.312 Astronomy II
29.512 Photogrammetry II
Business Management
General Studies
+Electives (2)

* First Half Year
** Second Half Year

† Electives chosen from

29.213 Geodesy III
29.313 Astronomy III
29.513 Photogrammetry III
29.615 Land Studies
29.173 Project

Average Hours per week
3
3
3
2
3
6
20

BACHELOR OF SURVEYING

Part-time Course

<table>
<thead>
<tr>
<th>Subject</th>
<th>STAGE 1</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Engineering I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Physics IA</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Land Surveying I</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STAGE 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveying Computations I</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td>4</td>
</tr>
<tr>
<td>Town Planning A</td>
<td>1.5</td>
</tr>
<tr>
<td>Land Surveying II</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Electrical Information</td>
<td>1</td>
</tr>
<tr>
<td>Electronics</td>
<td>1</td>
</tr>
</tbody>
</table>

Year III and Year IV of the University of New South Wales course is as indicated under the full-time course.

* First Half Year
** Second Half Year
† A five-day survey camp must be attended as part of this subject.

1 Mathematics IIB may be taken in two parts each of three terms duration.
DEPARTMENT OF CIVIL ENGINEERING

The subjects offered in the Faculty of Engineering course outlines may be varied from time to time both in content and hours.

Each subject has an identification number with prefixed letters indicating the Department responsible for the subject, CE for Civil Engineering, EE for Electrical Engineering, and ME for Mechanical Engineering. The first numeral generally indicates the Year of the full-time course in which the subject is normally taken; the second numeral indicates the field of study; the third numeral for undergraduate courses indicates the level, or sequence in the field. A suffix letter J indicates that the subject is a joint offering of more than one department.

The hours shown for each subject are the total attendance hours for lectures, laboratory, design and tutorial classes. As a guide to private study and preparation, students should allow, on the average about 1 hour for each hour of lectures and one hour for each hour of laboratory, design or tutorial. The note Arr. indicates that the unit is an elective for which the hours are fixed by arrangement.

CIVIL ENGINEERING

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE-0-</td>
<td>Service Courses</td>
</tr>
<tr>
<td>CE-1-</td>
<td>Structures</td>
</tr>
<tr>
<td>CE-2-</td>
<td>Materials</td>
</tr>
<tr>
<td>CE-3-</td>
<td>Fluid Mechanics, Water Resources</td>
</tr>
<tr>
<td>CE-4-</td>
<td>Surveying — general courses</td>
</tr>
<tr>
<td>CE-5-</td>
<td>Civil Engineering practice</td>
</tr>
<tr>
<td>CE-6-</td>
<td>Surveying — Specialist courses</td>
</tr>
</tbody>
</table>

CE111 STATICS

Two-dimensional force systems; equilibrium, funicular polygon; rigid bars, shear force, axial force, bending moment; pin-jointed frames, analytical and graphical treatment; equilibrium of three-dimensional force systems, cables under distributed loads.

Prescribed Text

Principles of Statics    Hall, A. S. & Archer, F.  
(University of New South Wales Students Union)

Reference Texts

Statics    Meriam, J. L.  
(Wiley 1966)

Mechanics for Engineers: Statics    Beer & Johnston  

CE161 LAND SURVEYING I

Basic measurement techniques and instruments, levelling, traversing, plane table, tacheometry; contours, areas, volumes, route surveys and associated calculations; hydrographic and underground surveys; introduction to photogrammetry; controlling and setting out small engineering projects, Cartographic drawing and instruments. Historical review of surveying methods and instruments.

Prescribed Texts

Plane and Geodetic Surveying Vol. I    Clark, D.  

Mapping    Greenhood, D.  
(Phoenix Science Series, University of Chicago, pss 521 1965)

Surveying    Bannister, A. & Raymond S.  
(Pitman 1959)

Seven-Figure Mathematical Tables    (W. & R. Chambers 1958)

Reference Texts

Definitions of terms used in Geodetic and other Surveys    (U.S. Coast & Geodetic Survey Sp. Pub. 1948)

Basic Metric Surveying    Whyte, W. S.  
(Butterworths 1969)
### CE201 ENGINEERING FOR SURVEYORS

Materials, structures and design of instruments. Aspects of hydraulics, hydrology and soil mechanics.

**Prerequisite**
Engineering I

**Prescribed Text**
To be advised.

**Reference Texts**
- Mechanics of Materials
- Fluid Mechanics
- Hydrology for Engineers
- Soil Mechanics
  Lambe, T. W. & Whitman, R. V. (Wiley 1969)

### CE202 MATERIALS AND STRUCTURES

Uniaxial loading, states of stress and strain; stress and strain relationships; internal forces, internal stresses; deflexion of beams, torsion, buckling; structure of metals, ceramics and plastics; behaviour under static and dynamic loading; deterioration of engineering materials.

**Prescribed Text**
Mechanics of Materials

**Reference Texts**
- Strength and Structure of Engineering Materials
  Polakowski, N. H. & Ripling, E. J. (Prentice-Hall 1966)
- The New Science of Strong Materials
  Gordon, J. E. (Pelican No. A920, 1968)
- Engineering Materials Science
  Richards, C. W. (Chapman & Hall 1961)
- Elements of Material Science
  Van Vlack, L. H. (Addison-Wesley 1964)
- The Testing and Inspection of Engineering Materials

### CE205 STRUCTURES II FOR ARCHITECTS

Uniaxial loading, states of stress and strain; stress and strain relationships; internal forces, internal stresses, deflexion of beams, torsion and buckling.

**Mechanics of Materials**

### CE212 MECHANICS OF SOLIDS I

Uniaxial loading, states of stress and strain, stress and strain relationships; internal forces, internal stresses, deflexion of beams, torsion, buckling.

**Prerequisite**
Engineering I, Mathematics I

### CE220 BUILDING SCIENCE IIB FOR ARCHITECTS

General materials technology; introductory course of lectures and laboratory work on the load-deformation characteristics of structural materials; concrete technology.

**Reference Texts**
- The New Science of Strong Materials
  Gordon, J. E. (Pelican)
- The Testing and Inspection of Engineering Materials
- Composition and Properties of Concrete

### CE221 PROPERTIES OF MATERIALS I

A course of lectures and laboratory work on the basic structure of metals ceramics and organic solids; behaviour of materials under static and dynamic loads; deterioration of engineering materials.

**Prescribed Texts**
- Composition and Properties of Concrete
- Engineering Materials Science
  Richards, C. W. (Chapman & Hall 1961)
CE222 CONCRETE TECHNOLOGY †
Materials in concrete; concrete mix design; properties of hardened and plastic concrete, manufacturing and field control; special concretes; lectures and laboratory work.

Prescribed Texts
Properties of Concrete Neville, A. M. (Pitman)

*Aggregates for Concretes S.A.A. Code A77

Reference Texts
The Chemistry of Cement and Concrete Lea, F. M. & Desch, C. H. (Arnold)
Concrete Technology and Practice Taylor, W. H. (Angus & Robertson)

*Codes A2 (Cement), A100-110 (Concrete), CA2 (Building) S.A.A.

CE223 ENGINEERING GEOLOGY
A course of lectures, laboratory work and field excursions on the principles of geology and their application to civil engineering problems.

*Due to conversion to S.I. units, codes will be confirmed by the lecturer concerned.

†Part I of this subject may be taken as a one unit elective in the Department of Mechanical Engineering.

CE231 FLUID MECHANICS I

Prerequisites
Engineering I, Mathematics I

Prescribed Text

Reference Text

CE241 SURVEYING †
A course of lectures, field work and a survey camp; basic measurement techniques and instruments, traversing, plane tabling, tacheometry; contours, areas, volumes, route surveys and associated calculations; hydrographic and underground surveys; introduction to photogrammetry; controlling and setting out small engineering projects.

Prerequisites
Engineering I, Mathematics I

†Part I of this subject may be taken as a one unit elective in the Department of Mechanical Engineering.
Surveying Computations I


Prerequisite
CE161 Land Surveying I

Prescribed Texts
Chamber's Seven Figure Mathematical Tables
(Chambers 1958)

Tables of Natural Sines etc. to every 10 seconds
(D.M.R. 1949)

Natural Trigonometric Tables, Six Figures
(Government Printer, Pretoria)

Reference Text
Project Surveying
Richardus P.
(North Holland 1966)
**Prescribed Texts**

*S.A.A. Loading Code Pt. I — Dead & Live Loads*
Australian Standard 1170 Pt I — 1971 Metric Units
(Standards Association of Australia)

*S.A.A. Loading Code — Pt. II, Wind Forces*
ASCA 34 Pt. II-1971
(Standards Association of Australia)

*Code for Welding in Building Part I*
A.S.C.A.8 Pt. 1-1965
(Australian Standards Association)

*Code for Concrete Buildings*
A.S.C.A.B. (Australian Standards Association)

*Reinforced Concrete Fundamentals*
Ferguson, P. M.
(Wiley)

*Design of Steel Structures*
Bresler, B., Lin, T. Y. & Scalzi, J. B.
(Wiley)

OR

*Steel Structures*
McGuire, W.
(Prentice-Hall)

*Timber Engineering Design Handbook*
Pearson, R. G., Kloot, N. H. & Boyd, J. D.
(C.S.I.R.O.)

*Hot Rolled Carbon Steel Sections and Plates*
B.H.P. — A.I.S. (B.H.P. Co. Ltd.)

*Steel Structures Code*
A.S.C.A. 1-1972
(Standards Association of Australia)

*Code for High Strength Bolts*
A.S.C.A. 45-1970
(Standards Association of Australia)

*Steel Design Course — Pt. I, Design of Beams and Columns*
Trahair, N. S.
(A.I.S.C.)

**Reference Texts**

*Steel Designer’s Manual*
Gray, C. S.
(Lockwood)

*Engineering Drawing Practice — A.S.C.ZI — 1966*
(Standards Association of Australia)

*S.A.A. Loading Code — Part I, Dead and Live Loads*
A.S.C.A.34.1-1969
(Standards Association of Australia)

*Due to conversion to S.I. Units, codes will be confirmed by the lecturer concerned.

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**CE313A STRUCTURAL ANALYSIS I**

84

(Topic in Civil Engineering II in the Faculty of Mathematics)

Analysis component of CE313
Analysis of Elastic statically determinate and indeterminate systems by classical methods; plastic analysis.

**Prerequisites**

CE212 Mechanics of Solids I, Mathematics I

**CE324 SOIL MECHANICS †**

84

Index properties, classification of soils; permeability, capillarity, seepage and flow nets; stresses in soils; settlement and consolidation; compaction, shear strength and failure criteria; stability of retaining walls.

**Prerequisite**

CE212 Mechanics of Solids I

**Pre(Co)requisite**

CE382 Fluid Mechanics II

**Prescribed Texts**

*Soil Mechanics*
Lambe, T. W. & Whitman, R. V.
(Wiley 1969)

*Soil Testing for Engineers*
Lambe, T. W.
(Wiley)

*Methods of Testing Soils for Engineering Purposes*
A.S. A89
(Standards Association of Australia)

**Reference Texts**

*Problems in Engineering Soils*
Capper, P. L., Cassie, W. F. & Geddes, J. D.
(Spon 1966)

*The Measurement of Soil Properties in the Triaxial Test*
Bishop, A. W. & Henkel, D. J.
(Edward Arnold 1964)

†Part I of this subject may be taken as a one unit elective in the Department of Mechanical Engineering.
A number of references will be made during the course to the following Journals and Proceedings which are all available in the Library:

- Journal of Soil Mechanics and Foundation Division (ASCE)
- Geotechnique (Institution of Civil Engineers, London)
- International Conferences on Soil Mechanics and Foundation Engineering (Proceedings)
- Aust.-N.Z. Conferences on Soil Mechanics and Foundation Engineering
- Norwegian Geotechnical Institute Publication
- Danish Geotechnical Institute Publication
- Special Technical Publications (A.S.T.M.)

CE332 FLUID MECHANICS II

Similitude; flow nets, boundary layers; closed conduit flow; pipe networks; unsteady flow; waterhammer, hydraulic machinery, open channel hydraulics, backwater curves.

Prerequisite

CE231 Fluid Mechanics I

Prescribed Texts

- Fluid Mechanics
  Streeter, V. L.
  (5th ed. McGraw-Hill)

- Open Channel Flow
  Henderson, F. M.
  (Collier-MacMillan 1966)

Reference Texts

- Engineering Hydraulics
  Rouse, H.
  (Wiley)

- Handbook of Fluid Dynamics
  Streeter, V.
  (McGraw-Hill)

- Handbook of Applied Hydraulics
  Davis, C. V. & Sorenson
  (3rd ed. McGraw-Hill)

- Applied Hydraulics in Engineering
  Morris, H. M.
  (Ronald Press)

- Applied Hydrodynamics
  Vallentine, H. R.
  (Butterworths)

Hours

CE333 WATER RESOURCES ENGINEERING


Prescribed Texts

- Water Resources Engineering
  Linsley, R. K. & Franzini, J. B.
  (McGraw-Hill)

- Australian Rainfall and Runoff
  Institution of Engineers, Australia, Stormwater Standards Committee

Reference Texts

- Principles of Water Quality Control
  Tebbutt, T. H. Y.
  (Pergamon 1971)

- Handbook of Applied Hydrology
  Chow, V. T.
  (McGraw-Hill)

- Engineering Management of Water Quality
  McGauchey, P. H.
  (McGraw-Hill 1968)

- Wastewater Engineering
  Metcalf & Eddy, Jun.
  (McGraw-Hill 1972)

- Water and Wastewater Engineering Vol. II
  Fair, G. M., Geyer, J. C. & Okun, D. A.
  (John Wiley 1968)

CE340 SURVEYING FOR ARCHITECTS

Introduction; linear measurements and corrections; chain surveying; levelling and booking; contours; the theodolite and its use in measuring angles; traversing; plane table methods of surveying; tacheometry.

Reference Text

- Surveying
  Bannister, A. & Raymond, S.
  (Pitman)
### CE342 SURVEYING II

| Hours | Precise levelling, precise angle measurement, short-range electromagnetic distances; controlling and setting out large engineering works, precise setting out; photogrammetric measurement. |

**Prerequisite**
CE241 Surveying I

**Prescribed Texts**
As for CE241

**Reference Texts**
- *Plane and Geodetic Surveying* Vol. 2
  Clark, D.
  (Higher Surveying) (Constable)
- *Elementary Photogrammetry*
  Crone, D. R.
  (Arnold)

### GE350 SEMINAR

| Hours | Preparation and presentation by students of lectures and discussions on a range of topics of historical, social and technological significance. |

### CE351 TRANSPORTATION ENGINEERING

| Hours | Elements of planning, design and engineering of transportation facilities; including estimates of demand, data collection, route and terminal design and control. Highway location and design and construction; pavements, drainage, economic aspects. Railway engineering; elements of flight transportation. |

**Prescribed Text**
- *Highway Engineering*
  Oglesby, C. H. & Hewes, L. I.
  (Wiley)

**Reference Texts**
- *An Introduction to Transportation Engineering*
  Hay, W. W.
  (Wiley)
- *Australian Road Practice*
  Sherrard, H. M.
  (Melbourne University Press)

### CE352 CIVIL ENGINEERING SYSTEMS

| Hours | General introduction to the systems approach. Techniques available as aids to the identification of optimal policies—mathematical modelling, computer simulation, computer mapping, various mathematical programming techniques, heuristics. Choice of Techniques, problem formulation. Example applications of the systems approach to civil engineering problems. |

**Reference Texts**
- *Systems Analysis for Engineers and Managers*
  de Neufville, R. & Stafford, J. H.
  (McGraw-Hill)
- *Principles of Operations Research*
  Wagner, H. M.
  (Prentice-Hall)
- *Economic Theory and Operations Analysis*
  Baumol, W. J.
  (Prentice-Hall)

### CE414 STRUCTURAL ANALYSIS AND DESIGN II


**Prerequisites**
CE313 Structural Analysis & Design I, Mathematics IIB

**Prescribed Texts**
As for CE313

- *Design of Prestressed Concrete Structures*
  Lin, T. Y.
  (Wiley)
- *Code for Prestressed Concrete*
  A.S.C.A.35
  (Standards Association of Australia)
- *Introduction to Matrix Methods of Structural Analysis*
  Martin, H. C.
  (McGraw-Hill 1966)
- *The Stability of Frames*
  Horne, M. R. & Merchant, W.
  (Pergamon 1965)

*Due to conversion to S.I. Units, codes will be confirmed by the lecturer concerned.*
CE414A STRUCTURAL ANALYSIS II
Analysis component of CE414.

Prerequisites
CE313 Structural Analysis & Design I, Mathematics II B

Prescribed Texts
Introduction to Matrix Methods of Structural Analysis
The Stability of Frames

Reference Texts
Matrix Methods of Structural Analysis
Livesley, R. K. (Pergamon 1964)
Plastic Design of Frames Vols. 1 & 2
Heyman, J. (Cambridge U.P. 1971)

CE414B STRUCTURAL DESIGN II
Design component of CE414.

Prerequisites
CE313 Structural Analysis & Design I

Prescribed Texts
Design of Prestressed Concrete Structures
Lin, T. Y. (Wiley)

*Code for Prestressed Concrete A.S.C.A.35
(Standards Association of Australia)

CE425 EARTH AND ROCK ENGINEERING
Site investigation, design of spread footings, strip and combined footings, raft foundations, piled foundations, design of embankments, cuttings, earth and rockfill dams, introductory rock mechanics.

*Due to conversion to S.I. Units, codes will be confirmed by the lecturer concerned.
CE453 PROJECT

Prerequisites & corequisites will depend on nature of Topic.

Literature review, analytical and/or experimental investigation, or one or more civil engineering design problems.

INDUSTRIAL EXPERIENCE

Part-time students in suitable employment may receive credit of one unit for one year's industrial experience provided approval is obtained from the Head of the Department at the commencement of the year in which credit is sought. To obtain a pass in each unit, a satisfactory report on that year's industrial experience must be submitted before October 31 of the year in question.

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**ELECTIVES**

ELECTIVE SUBJECTS WITHIN THE DEPARTMENT OF CIVIL ENGINEERING

(In all electives, prescribed and reference texts will be advised by the Lecturer unless indicated below.)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CE415A</td>
<td>STRUCTURAL ANALYSIS — Continua</td>
<td>42</td>
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<td>CE414 Structural Analysis &amp; Design II</td>
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<td>CE415B</td>
<td>STRUCTURES — Plasticity</td>
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<td>CE414 Structural Analysis &amp; Design II</td>
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<tr>
<td>CE415C</td>
<td>STRUCTURES — Advanced Design</td>
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<td></td>
<td>CE414 Structural Analysis &amp; Design II</td>
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<td>CE415D</td>
<td>STRUCTURES — Foundation Engineering</td>
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<tr>
<td></td>
<td>CE324 Soil Mechanics</td>
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<td></td>
<td>Corequisite</td>
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<tr>
<td></td>
<td>CE425 Earth &amp; Rock Engineering</td>
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<tr>
<td>CE426A</td>
<td>ADVANCED MATERIALS</td>
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<td>Prerequisites</td>
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<tr>
<td></td>
<td>CE212 Mechanics of Solids I</td>
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<td>CE221 Properties of Materials I</td>
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<td>CE426B</td>
<td>CONCRETE TECHNOLOGY</td>
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<td></td>
<td>CE222 Concrete Technology</td>
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<td>CE426C</td>
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<td>CE324 Soil Mechanics</td>
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<tr>
<td></td>
<td>Vibration of Soils and Foundations</td>
<td>Richart, Hall &amp; Woods (Prentice-Hall 1970)</td>
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<td>CE434A</td>
<td>FLUID MECHANICS — Theoretical Hydrodynamics</td>
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<td>CE332 Fluid Mechanics II</td>
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<td>CE434B</td>
<td>FLUID MECHANICS — Open Channel Flow</td>
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<td>Open Channel Flow</td>
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<tr>
<td></td>
<td></td>
<td>Reference Text</td>
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<tr>
<td></td>
<td></td>
<td>Henderson, F. M.</td>
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<tr>
<td></td>
<td></td>
<td>(Collier-MacMillan 1966)</td>
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<td>CE434C</td>
<td>FLUID MECHANICS—River and Coastal Engineering 42</td>
<td>Prerequisite: CE332 Fluid Mechanics II</td>
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<td>CE435</td>
<td>WATER RESOURCES ENGINEERING ELECTIVE 42</td>
<td>Prerequisite: CE333 Water Resources Engineering</td>
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<td>CE435</td>
<td>WATER RESOURCES ENGINEERING ELECTIVE</td>
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<tr>
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<td>Reference Text</td>
<td>Water Pollution Control Engineering</td>
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<td></td>
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<td>(H.M.S.O. London 1970)</td>
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<td></td>
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<td>(H.M.S.O. London 1970)</td>
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<tr>
<td></td>
<td></td>
<td>Disposal of Sewage and Other Waterborne Wastes</td>
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<td></td>
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<td>Imhoff, K., Muller, W. J. &amp; Thistlethwayte, D. K. B.</td>
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<td></td>
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<td>(2nd ed., Butterworth 1971)</td>
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<td>CE436</td>
<td>WATER QUALITY MANAGEMENT</td>
<td>Prerequisite: CE333 Water Resources Engineering</td>
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<tr>
<td>CE442</td>
<td>SURVEYING</td>
<td>Corequisite: CE342 Surveying II</td>
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<tr>
<td>CE454</td>
<td>HIGHWAY ENGINEERING</td>
<td>Prerequisite: CE351 Transportation Engineering</td>
</tr>
<tr>
<td>CE455</td>
<td>CIVIL ENGINEERING SYSTEMS</td>
<td>Prerequisite: CE352 Civil Engineering Systems</td>
</tr>
<tr>
<td></td>
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<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ME481 Engineering Administration</td>
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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Electrical Engineering is a rapidly expanding branch of engineering. It includes such fields as computer and information science, the theory and design of automatic control systems, electronics, and the study of electrical power generation and distribution.

In preparation for a career in any branch of Electrical Engineering, the student must acquire a knowledge of the basic sciences of Mathematics and Physics. 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 the proper understanding of the problems involved.

During the early stages of the undergraduate courses, students concentrate on acquiring a knowledge of the basic science subjects of mathematics, physics and chemistry, together with an introduction to engineering. Then students are introduced to the basic electrical engineering subjects, including electric circuit theory, electric power engineering and electronics. Advanced students study specialised subjects on power, control, computers or electronics in their final year. Final year students may also broaden their knowledge by taking courses such as Industrial Law, Production Control, Economics or Accounting.

Towards the end of his final year, the full-time undergraduate prepares a report covering some aspect of a supervised project, and delivers a seminar paper on a selected topic.

Postgraduate students are prepared for the degrees of Master of Engineering, Master of Engineering Science and Doctor of Philosophy. Their work includes formal lecture courses, seminars and research in both practical and theoretical aspects of their specialisations.
COURSE OUTLINES

DEPARTMENT OF ELECTRICAL ENGINEERING

CLASSIFICATIONS

(a) Classifying subjects are shown below (where EE400 indicates any fourth year Electrical Engineering subject).

(b) Classification is determined by enrolment in the classifying subject.

(c) If a student enrols in more than one classifying subject, then the year or stage of the lower classifying subject applies.

(d) If the student enrols in no classifying subject, then he is classified in the year or stage of the highest classifying subject he has passed.

<table>
<thead>
<tr>
<th>Year/Stage</th>
<th>B.E. IN ELECTRICAL ENGINEERING</th>
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<td>Full-time</td>
<td>Part-time</td>
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<tr>
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<td>Mathematics I</td>
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<td>EE231</td>
<td>Physics IA</td>
<td>EE231</td>
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<tr>
<td>3</td>
<td>EE311</td>
<td>EE311</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>EE480/491</td>
<td>EE341</td>
<td>EE400</td>
<td></td>
</tr>
<tr>
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<td>—</td>
<td>—</td>
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</tr>
<tr>
<td>7</td>
<td>—</td>
<td>EE480/491</td>
<td></td>
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<tr>
<td></td>
<td>B.A./B.E.</td>
<td>B.Sc./B.E.</td>
<td>B.Sc.(Eng.)</td>
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<tr>
<td>1</td>
<td>Physics IA</td>
<td>Physics IA</td>
<td>Mathematics I</td>
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<tr>
<td>2</td>
<td>EE231</td>
<td>EE231</td>
<td>Physics IA</td>
<td></td>
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<tr>
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<td>EE311</td>
<td>EE311</td>
<td>EE231</td>
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</tr>
<tr>
<td>4</td>
<td>EE480/491</td>
<td>EE480/491</td>
<td>EE331</td>
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<td>Group III</td>
<td>Science</td>
<td>Subject</td>
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<td>Part III</td>
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<td>EE400</td>
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<td>7</td>
<td>—</td>
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<td></td>
</tr>
</tbody>
</table>

| B.E. IN COMPUTER ENGINEERING | | | |
|--------------------|----------------|----------------|
| Full-time | Part-time | |
| 1          | Physics IA | Mathematics I |
| 2          | EE231 | Physics IA |
| 3          | EE361 | EE231 |
| 4          | EE463 | PH221 |
| 5          | — | EE331 |
| 6          | — | EE362 |
| 7          | — | EE480/491 |

PREPARATION OF PROGRAMME

Each student will be assigned an academic advisor from among the teaching staff. The student is expected to arrange his own programme subject to the requirements stated below and the approval of his advisor. Minor variations from the stated requirements will be considered upon application to the head of the department, provided the application has received support of the advisor. Any such variations will have to receive the approval of the Dean of the Faculty.

All choices in the various degree programmes are to be made according to prerequisite and corequisite requirements and timetable restrictions. Complete lists of pre- and corequisites appear in the description of individual subjects. Subjects offered in the first half year are indicated by *, in the second half year by **, and for the full year by ***.

DEFINITION OF UNITS

Individual subjects are given a quantitative rating by defining 1 unit to be 42 attendance hours. Thus topics which meet 3 hours a week for half a year are rated at 1 unit and those which meet 3 hours a week for a full year are rated at 2 units.
## SCHEDULE 1.3

**BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td><strong>YEAR I</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4***</td>
</tr>
<tr>
<td>Engineering I</td>
<td>4***</td>
</tr>
<tr>
<td>PHYSICS IA</td>
<td>4***</td>
</tr>
<tr>
<td>+Electives</td>
<td>4***</td>
</tr>
<tr>
<td>ME121 +Workshop Practice</td>
<td>1***</td>
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</table>

FOR DETAILS OF THE FIRST YEAR COURSE SEE PAGE 92

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>YEAR II</strong></td>
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</tr>
<tr>
<td>EE203 Introduction to Electrical Information</td>
<td>1*</td>
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<tr>
<td>EE204 Introduction to Electrical Energy</td>
<td>1**</td>
</tr>
<tr>
<td>EE231 ELECTRICAL CIRCUITS</td>
<td>1**</td>
</tr>
<tr>
<td>Mathematics IIB (Topics C, D, E, &amp; H)</td>
<td>4***</td>
</tr>
<tr>
<td>PH221 Electromagnetics and Quantum Mechanics</td>
<td>2***</td>
</tr>
<tr>
<td>Chemistry IS</td>
<td>2***</td>
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<tr>
<td>+Electives</td>
<td>4***</td>
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<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>YEAR III</strong></td>
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<tr>
<td>GE350 Seminar</td>
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<tr>
<td>All of</td>
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</tr>
<tr>
<td>EE311 ELECTRICAL MACHINERY</td>
<td>1*</td>
</tr>
<tr>
<td>EE321 Electronics</td>
<td>1*</td>
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<tr>
<td>EE331 Circuits</td>
<td>1*</td>
</tr>
<tr>
<td>EE341 Automatic Control</td>
<td>1*</td>
</tr>
<tr>
<td>EE361 Computer Structure-Machine and Assembly Languages</td>
<td>1*</td>
</tr>
<tr>
<td>Five of EE300 or EE400</td>
<td>5**</td>
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<tr>
<td>+Electives</td>
<td>4***</td>
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<table>
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<th>Subject</th>
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<tbody>
<tr>
<td><strong>YEAR IV</strong></td>
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<tr>
<td>Seven of EE300 or EE400 or EE500</td>
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<td>EE480/491 PROJECT/SEMINAR</td>
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<tr>
<td>+Electives</td>
<td>4</td>
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</table>

During the course each full-time student should complete periods of practical experience acceptable to the Faculty Board totalling 20 weeks before 31st January in the year in which the degree is to be awarded. Each student should hand in a report concerning his practical experience to the department secretary at the beginning of first term.

- First Half Year
- Second Half Year
- Full Year
- See Elective Requirements on page 157.
- The completion of this course may be delayed to second year if desired.

1 Mathematics IIB may be taken in two parts each of three terms duration.
COMMENDED PROGRAMME FOR THE
BACHELOR OF ENGINEERING IN
ELECTRICAL ENGINEERING
BY PART-TIME STUDY

Units

STAGE 1
MATHEMATICS I 4***
Engineering I 4***
+Elective (Industrial experience) 1***
9

WORKSHOP PRACTICE MAY BE TAKEN IN STAGES 1 OR 2

STAGE 2
PHYSICS IA 4***
Mathematics IIB 4***
+Elective (Industrial experience) 1***
9

STAGE 3
EE203 Introduction to Electrical Information 1*
EE204 Introduction to Electrical Energy 1**
EE231 ELECTRICAL CIRCUITS 1***
Chemistry IS 2***
PH221 Electromagnetic and Quantum Mechanics 2***
+Elective 1***
Elective (Industrial experience) 1***
9

STAGE 4
GE350 Seminar 1***
EE311 ELECTRICAL MACHINERY 1*
EE331 Circuits 1*
One of EE300 or EE400 1**
+Electives 4***
Elective (Industrial experience) 1***
9

STAGE 5
EE321 Electronics 1*
EE341 AUTOMATIC CONTROL 1*
EE361 Computer Structure 1*
Five of EE300 or EE400 5***
Elective (Industrial experience) 1***
9

Subject

++YEAR VI FULL TIME
Six of EE300 or EE400
+Electives
EE480/491 PROJECT/SEMINAR
6*** 6*** 4***

* First Half Year
** Second Half Year
*** Full Year
* See Elective Requirements on page 157.
++ Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.

1 Mathematics IIB may be taken in two parts each of three terms duration.
**SCHEDULE 3.3**

**BACHELOR OF SCIENCE (ENGINEERING) IN ELECTRICAL ENGINEERING**

<table>
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<tr>
<td><strong>MATHMATICS I</strong></td>
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<td>Engineering I</td>
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<td><strong>PHYSICS IA</strong></td>
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<td>Mathematics IIB (Topics C, D, E, &amp; H)</td>
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<td>ME121 ++Workshop Practice</td>
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FOR DETAILS OF STAGES 1 AND 2 SEE PAGE 92

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<td>EE203 Introduction to Electrical Information</td>
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<tr>
<td>EE204 Introduction to Electrical Energy</td>
<td>1**</td>
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<td>EE231 <strong>ELECTRICAL CIRCUITS</strong></td>
<td>1**</td>
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<tr>
<td>PH221 Electromagnetics and Quantum Mechanics</td>
<td>2***</td>
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<td>Chemistry IS</td>
<td>2***</td>
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<tr>
<td><strong>STAGE 4</strong></td>
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<tr>
<td>EE321 Electronics</td>
<td>1*</td>
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<tr>
<td>EE331 <strong>CIRCUITS</strong></td>
<td>1*</td>
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<tr>
<td>EE361 Computer Structure</td>
<td>1*</td>
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<tr>
<td>Two of EE300</td>
<td>2**</td>
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<td>3***</td>
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<tr>
<td>EE311 Electrical Machines</td>
<td>1*</td>
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<tr>
<td>EE341 <strong>AUTOMATIC CONTROL</strong></td>
<td>1*</td>
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<td>Two of EE300</td>
<td>2***</td>
</tr>
<tr>
<td>+Electives</td>
<td>4***</td>
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<td><strong>FOUR OF</strong> EE400 or EE500</td>
<td>4***</td>
</tr>
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<td>+Electives</td>
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</table>

During the course each part-time student should complete periods of practical experience acceptable to the Faculty Board totalling three years before 31st January in the year in which the degree is to be awarded.

* First Half Year
** Second Half Year
*** Full Year
++ The completion of this unit may be delayed to third stage if desired.

1 Mathematics IIB may be taken in two parts each of three terms duration.
SCHEDULE 1.7
BACHELOR OF ENGINEERING IN
COMPUTER ENGINEERING

<table>
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<td>YEAR I</td>
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<td>Engineering I</td>
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<td>PHYSICS IA</td>
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<tr>
<td>ME121 Workshop Practice</td>
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<tr>
<td>YEAR II</td>
<td>17</td>
</tr>
<tr>
<td>EE203 Introduction to Electrical Information</td>
<td>1*</td>
</tr>
<tr>
<td>EE204 Introduction to Electrical Energy</td>
<td>1**</td>
</tr>
<tr>
<td>EE231 ELECTRICAL CIRCUITS</td>
<td>1**</td>
</tr>
<tr>
<td>Mathematics IIB (Topics C, D, E &amp; H)</td>
<td>4***</td>
</tr>
<tr>
<td>PH221 Electromagnetics and Quantum Mechanics</td>
<td>2***</td>
</tr>
<tr>
<td>Programming and Algorithms</td>
<td>1*</td>
</tr>
<tr>
<td>Data Structures and Programming</td>
<td>1**</td>
</tr>
<tr>
<td>Electives</td>
<td>5***</td>
</tr>
<tr>
<td>YEAR III</td>
<td>16</td>
</tr>
<tr>
<td>EE321 Electronics</td>
<td>1*</td>
</tr>
<tr>
<td>EE331 Circuits</td>
<td>1*</td>
</tr>
<tr>
<td>EE341 Automatic Control (inc. Analog computers)</td>
<td>1*</td>
</tr>
<tr>
<td>EE361 COMPUTER STRUCTURE — MACHINE AND ASSEMBLY LANGUAGES</td>
<td>1*</td>
</tr>
<tr>
<td>EE322 Electronics</td>
<td>1**</td>
</tr>
<tr>
<td>EE323L Electronics Laboratory</td>
<td>1**</td>
</tr>
<tr>
<td>EE362 Logical Design and Switching Theory</td>
<td>1**</td>
</tr>
<tr>
<td>One of EE300 subjects</td>
<td>1**</td>
</tr>
<tr>
<td>Chemistry IS</td>
<td>2***</td>
</tr>
<tr>
<td>GE350 Seminar</td>
<td>1***</td>
</tr>
<tr>
<td>Electives</td>
<td>4***</td>
</tr>
<tr>
<td>YEAR IV</td>
<td>15</td>
</tr>
<tr>
<td>EE463 COMPUTER OPERATING SYSTEMS</td>
<td>1*</td>
</tr>
<tr>
<td>EE464 Compilers, Assemblers and Interpreters</td>
<td>1**</td>
</tr>
<tr>
<td>EE425 Digital Electronics</td>
<td>1**</td>
</tr>
<tr>
<td>EE480/491 Four subjects from List 1</td>
<td>4***</td>
</tr>
<tr>
<td>Project/Seminar</td>
<td>4***</td>
</tr>
<tr>
<td>Electives</td>
<td>4***</td>
</tr>
</tbody>
</table>

* First Half Year
** Second Half Year
*** Full Year

+ See Elective Requirements on page 157.

Mathematics IIB may be taken in two parts each of three terms duration.
SCHEDULE 2.7

BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

In addition to the requirements for the B.E. with the relevant elective requirements selections as shown in Appendix A, the combined degree student is required to undertake one year in the relevant non engineering faculty. This year may be taken after completion of the third or the fourth year of a B.E. program. For some, there may be advantages for taking this year after completing the four year B.E. requirements but before taking out a B.E. degree.

Additional year for B.A./B.E. (16 units)
- Arts subject Part III
- Arts subject Part I or II or III
- Arts Part II

SCHEDULE 2.3

BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

The candidate shall complete all requirements for the degrees of Bachelor of Science and Bachelor of Engineering in Electrical Engineering by completing a combined course approved by the Faculty Boards of the Faculties of Engineering and Science, provided that the Deans of both Faculties certify that the work in the combined degree is no less in quantity and quality than if the two degrees were taken separately.

Admission to the combined course shall normally be at the end of the first year and shall be subject to the approval of the Deans of the two Faculties concerned.

ELECTIVE REQUIREMENTS

B.E. IN ELECTRICAL AND COMPUTER ENGINEERING

For the B.E. degrees in Electrical and Computer Engineering, the 16 units of electives shall be chosen in accordance with the following rules.

1. Eight elective units must be taken in the Faculty of Engineering, at least two must be from outside the Department of Electrical Engineering and at least two from within the Department.

2. Eight elective units must be taken outside the Faculty of Engineering, and must include one first-year Arts subject or the equivalent in a non-technical area. The latter will be counted as four elective units.

3. If a student elects to do a subject at one level which is required at a later level, the later requirement is to be replaced with elective units.

4. A first-year subject in another faculty taken as an elective is normally equivalent to four units. Half a first-year subject in these Faculties is normally equivalent to two units.

5. Any student enrolled in the Faculty of Engineering who is required, or who elects, to take Economics I as part of his course must take the two subjects:
   - Microeconomics
   - Economic History I
   with the exception of those students whose courses do not include Mathematics II, Topic H. Such students may replace Economic History I by Economic Statistics I. However a student taking this combination will not be allowed to take Mathematics II, Topic H at a later stage and count it towards his degree.

Examples of two-unit Electives are:
- Microeconomics or Economic History I.

6. Chemistry I may be taken in lieu of Chemistry IS and two non-engineering electives and Physics II in lieu of PH221 and two non-engineering electives.

7. Students enrolled in the B.E. in Computer Engineering must include MA2F Numerical Analysis as one of the Elective Units in Year II or III of the course.

8. For the B.A./B.E. degree in Electrical Engineering, the rules are as for the B.E. degree save that the eight elective units to be taken outside the Faculty of Engineering must all be applied to Arts subjects.
   As the student is required to take a Part III Arts subject in the Arts year, one of the subjects taken as an Elective must be a Part II subject.

9. For the B.Sc./B.E. degree in Electrical Engineering, the rules are as for the B.E. degree save that the eight elective units to be taken outside the Faculty must be applied to four units of Arts, two units towards Physics II, and two units of second year Mathematics topics.
10. In any year when a student enrols on a part-time basis, one year of industrial experience may be substituted for one elective unit up to a total of six such units, the first and third such unit being deemed a substitution for a non-engineering unit, the second and fourth for an electrical engineering unit within the eight engineering elective units, and the fifth and sixth for either class of unit. A first year Arts subject or the equivalent in a nontechnical area must still be taken. To earn this substitution, the student must submit a report concerning his practical experience for the year to the department secretary by the 31st October of the year for which the substitution is being sought and such other reports as may be required.

Grades of Satisfactory or Fail only will be given for industrial experience units.

B.Sc.(Eng.) IN ELECTRICAL ENGINEERING

The 12 elective units in the B.Sc.(Eng.) course are to be selected by the student, with the advice and approval of his academic advisor, subject to the following requirements:

1. A minimum of four elective units are to be taken within the Faculty of Engineering, at least two of which must be from outside the Department of Electrical Engineering.

2. One first-year Arts subject or the equivalent must be taken in a non-technical area. It will be counted as four elective units.

3. If a student elects to do a subject at one level which is required at a later level, the later requirement is to be replaced with elective units.

4. The first digit in the number of a topic is not to be interpreted as the year in which the topic must be taken. In particular, students are encouraged to elect EE400 topics at any level in their programme subject to pre- and corequisite requirements.

5. A first-year subject in another faculty taken as an elective is normally equivalent to four units. Half a first-year subject in these Faculties is normally equivalent to two units.

6. Any student enrolled in the Faculty of Engineering who is required, or who elects, to take Economics I as part of his course must take the two subjects:

Microeconomics
Economic History I

with the exception of those students whose courses do not include Mathematics II, Topic H. Such students may replace Economic History I by Economic Statistics I. However a student taking this combination will not be allowed to take Mathematics II, Topic H at a later stage and count it towards his degree.

Students enrolling for Electives which are normally three hours per week only, may enrol in Microeconomics or Economic History I.

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PREREQUISITES AND COREQUISITES

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Corequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE203</td>
<td>Introduction to Electrical Information</td>
<td>Mathematics I, Physics IA or Physics IB</td>
</tr>
<tr>
<td>EE204</td>
<td>Introduction to Electrical Energy</td>
<td>EE203</td>
</tr>
<tr>
<td>EE231</td>
<td>Electrical Circuits</td>
<td>EE203</td>
</tr>
<tr>
<td>EE311</td>
<td>Electrical Machinery</td>
<td>EE204</td>
</tr>
<tr>
<td>EE312</td>
<td>Electrical Machinery</td>
<td>EE311 Corequisite EE313 is recommended but not mandatory</td>
</tr>
<tr>
<td>EE313</td>
<td>Power Systems</td>
<td>EE204 &amp; EE231</td>
</tr>
<tr>
<td>EE321</td>
<td>Electronics</td>
<td>PH221</td>
</tr>
<tr>
<td>EE322</td>
<td>Electronics</td>
<td>EE203</td>
</tr>
<tr>
<td>EE323L</td>
<td>Electronics Laboratory</td>
<td>Physics (PH221) corequisite EE322</td>
</tr>
<tr>
<td>EE331</td>
<td>Circuits</td>
<td>EE204 &amp; EE231</td>
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<tr>
<td>EE332</td>
<td>Circuits</td>
<td>EE204 &amp; EE231</td>
</tr>
<tr>
<td>EE341</td>
<td>Automatic Control</td>
<td>Mathematics IIB</td>
</tr>
<tr>
<td>EE342</td>
<td>Automatic Control</td>
<td>EE341</td>
</tr>
<tr>
<td>EE361</td>
<td>Computer Structure: Machine and Assembly Languages</td>
<td>Mathematics I</td>
</tr>
<tr>
<td>EE362</td>
<td>Logical Design and Switching Theory</td>
<td>EE361 recommended but not mandatory</td>
</tr>
<tr>
<td>EE411</td>
<td>Electrical Machines</td>
<td>EE312</td>
</tr>
<tr>
<td>EE412</td>
<td>Advanced Topics in Heavy Current Electrical Engineering</td>
<td>EE411</td>
</tr>
<tr>
<td>EE413</td>
<td>Electrical Machines</td>
<td>EE411</td>
</tr>
<tr>
<td>EE415</td>
<td>Power Systems</td>
<td>EE312 &amp; EE332</td>
</tr>
<tr>
<td>EE421</td>
<td>Electronics</td>
<td>EE332</td>
</tr>
<tr>
<td>EE423L</td>
<td>Electronics Laboratory</td>
<td>EE323L &amp; corequisite EE421</td>
</tr>
<tr>
<td>EE425</td>
<td>Digital Electronics</td>
<td>EE421—EE423L (or Physics III and consent of instructor); EE362 (may be corequisite in 1974)</td>
</tr>
<tr>
<td>EE441</td>
<td>Modern Control</td>
<td>EE342</td>
</tr>
<tr>
<td>EE442</td>
<td>Modern Control</td>
<td>EE342</td>
</tr>
<tr>
<td>EE443</td>
<td>Optimization Techniques</td>
<td>Mathematics II topics C, D, E</td>
</tr>
<tr>
<td>EE444</td>
<td>Communication Systems</td>
<td>EE331</td>
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<tr>
<td>EE445</td>
<td>Communication Systems</td>
<td>EE342</td>
</tr>
<tr>
<td>EE451</td>
<td>Field Theory</td>
<td>Mathematics II Topics C, D, E and PH221</td>
</tr>
<tr>
<td>EE452</td>
<td>Microwave Measurements</td>
<td>EE451 or Physics III or consent of instructor</td>
</tr>
<tr>
<td>EE463</td>
<td>Computer Operating Systems</td>
<td>EE361</td>
</tr>
<tr>
<td>EE464</td>
<td>Compilers, Assemblers and Interpreters</td>
<td>EE361</td>
</tr>
</tbody>
</table>
DESCRIPTION OF SUBJECTS

DEPARTMENT OF ELECTRICAL ENGINEERING

Subjects offered by the Department are listed below. All are 1 unit (42 hours) unless otherwise stated. The contents and units may be varied from time to time without prior notification. Topics given in the first half of the year are indicated by *, in the second half by **, and for the full year by ***.

One unit is defined as 42 hours of attendance in lecture, laboratory, design, and tutorial classes. As a guide to private study and preparation, a student should allow approximately 1½ hours of outside work for each hour of lecture, and one hour for each hour of laboratory, design or tutorial attendance.

Each topic has an identifying number whose middle digit indicates the field of study, according to the following code:

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
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</thead>
<tbody>
<tr>
<td>EE-0-</td>
<td>General Electrical Engineering</td>
</tr>
<tr>
<td>EE-1-</td>
<td>Electrical Machines or Power Systems</td>
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<tr>
<td>EE-2-</td>
<td>Electronics</td>
</tr>
<tr>
<td>EE-3-</td>
<td>Electrical Circuit Theory or Measurements</td>
</tr>
<tr>
<td>EE-4-</td>
<td>Control or Communication Systems</td>
</tr>
<tr>
<td>EE-5-</td>
<td>Field Theory</td>
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<tr>
<td>EE-6-</td>
<td>Computer Science or Automata Theory</td>
</tr>
<tr>
<td>EE-8-</td>
<td>Project/Directed Reading</td>
</tr>
<tr>
<td>EE-9-</td>
<td>Seminar</td>
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</tbody>
</table>

EE101 INTRODUCTION TO ELECTRICAL ENGINEERING***
A course of lectures, tutorials and laboratory work.
The systems concept in electrical engineering; relay communication systems, components of satellite relays, typical control systems, instrumentation systems. System building blocks, signal wave forms, signal processing for information transmission, amplitude modulation and other forms of modulation. Electromechanical devices.

Topics in computer science; Introduction to switching theory, Boolean algebra, number representation and arithmetic operations, binary arithmetic, basic computer organisation. Engineering applications of computers.

Reference Texts
Information, Computers, Machines and Humans Karbowiak & Huey
(John Wiley)
Introduction to Electronic Systems, Circuits and Devices Pederson, Studer & Whinnery
(McGraw-Hill)
Introductory Signals and Circuits Crury & Van Valkenburg
(Blaisdell)

EE203 INTRODUCTION TO ELECTRICAL INFORMATION*
A course of lectures, laboratory and tutorial work.
Prerequisite
Mathematics I, Physics IA or IB

Prescribed Text
To be determined.

Reference Texts
Basic Electrical Engineering
Fitzgerald, Higginbotham & Grabel
Electrical Engineering Principles
Lockwood & Dunstan
Basic Electrical Engineering Science
McKenzie, Smith & Hose

EE204 INTRODUCTION TO ELECTRICAL ENERGY
A course of lectures, laboratory and tutorial work.
Principles of D'Arsonval galvanometer.Voltmeters and ammeters based on D'Arsonval movement. Electrostatic, thermistor, etc. meters. Wattmeters. Sources of error in measurements. Meter corrections. Electrical measurement of position, speed, strain, etc.

Prerequisite
EE203.

Prescribed Text
To be determined.

EE231 ELECTRICAL CIRCUITS
A course of lectures, tutorial and laboratory work.
Review of basic principles of network analysis. Initial conditions.
First and second order circuits. Linear time-invariant circuits, steady-state analysis, resonance. Three-phase unbalanced circuits.
Fourier series in circuit analysis. A.C. bridges and magnetic and high-frequency measurements.

Prerequisite
EE203.

Prescribed Text
Basic Circuit Theory
Desoer & Kuh
(McGraw-Hill)

Reference Texts
Fundamentals of Electrical Measurements
Baldwin, C. T.
(G. Harrop)
Fundamentals of Circuit Theory
Balabanian, N.
(Allyn & Bacon)
Principles of Linear Networks
Friedland, Wing & Ash
(McGraw-Hill)

EE311 ELECTRICAL MACHINERY*
A course of lectures, laboratory, and tutorial work.
Introduction to the Modern Theory of Electrical Machines

Prerequisite
EE201

Prescribed Text
Electrical Machinery
Fitzgerald & Kingsley
(3rd ed. McGraw-Hill)

Reference Texts
The Performance and Design of Direct Current Machines
Clayton & Hancock
(Pitman)
The Performance and Design of Alternating Current Machines
Say
(Pitman)

EE312 ELECTRICAL MACHINERY**
A course of lectures, laboratory, and tutorial work.
Further work on the modern theory of machines and its extension to practical machines in common use.

Prerequisite
EE311

Corequisite
EE313 is recommended as a corequisite but not mandatory.

Prescribed Text
Electrical Machinery
Fitzgerald & Kingsley
(3rd ed. McGraw-Hill)

Reference Texts
Direct-Current Machinery
Siskind, Charles S.
(McGraw-Hill)
The Performance and Design of Direct Current Machines
Clayton & Hancock
(Pitman)
The Performance and Design of Alternating Current Machines
Say
(Pitman)
EE313  POWER SYSTEMS**
A course of lectures, tutorial and laboratory work.

Prerequisite
EE204 & EE231

Corequisite
EE312 is recommended but not mandatory

Prescribed Text
Elements of Power System Analysis
Stevenson (2nd ed. McGraw-Hill)

Reference Texts
Westinghouse Transmission and Distribution Reference Book
Freeman (George G. Harrap & Co. Ltd.)

EE321  ELECTRONICS*
A course of lectures and tutorial work covering physical electronics.

Prerequisite
Physics (PH221)

Prescribed Text
Integrated Electronics
Millman & Halkias (McGraw-Hill)

Reference Texts
Electronics BIT's, FET's & Microcircuits
Angelo, J. (McGraw-Hill)

Electronic Circuits
Chirlian (McGraw-Hill)

EE322  ELECTRONICS **
A course of lectures and tutorial work.
Introduction to Active Circuits. Basic electronic amplifiers; applications of feedback, negative and positive; power supplies for electronic equipment; elements of pulse circuitry.

Prerequisite
EE203

Prescribed Text
As for EE321

Reference Text

EE323L  ELECTRONICS LABORATORY **
An essentially practical course, complementing EE322. A course of laboratory exercises requiring the application of Active Circuits theory to the solution of specific problems.

Prerequisite
Physics (PH221)

Corequisite
EE322

EE331  CIRCUITS*
A course of lectures, tutorial and laboratory work.
Review of time and frequency domain analysis through Fourier series and resonant circuits; network topology; two-port networks; network functions; poles and zeros and their use in network analysis; frequency response plots; singularity functions; impulse response and its use in general network analysis; super-position integral; state-space equations of electric networks.

Prerequisite
EE204 & EE231

Prescribed Text
Basic Circuit Theory
Desoer & Kuth (McGraw-Hill)

Reference Texts
Networks and Systems
Roe, P. H. (Addison & Wesley)

Linear Networks and Systems
Kuo, B. C. (McGraw-Hill)
EE332  CIRCUITS**
A course of lectures, tutorial and laboratory work.
Terminated two-port networks; matching, attenuators and equalizers; constant-k filters.
Transmission lines: transient travelling waves; steady-state analysis of lossless and lossy transmission lines; radio-frequency and power-frequency lines; impedance charts and matching with stubs.
Prerequisite
EE204 & EE231
Prescribed Text
To be determined.
Reference Texts
Theory of Networks and Lines  Potter & Fich
(McGraw-Hill)
Travelling Wave Engineering  R. K. Moore
(McGraw-Hill)
Communication Circuits  Ware & Reed
(Wiley)
Transmission Lines and Networks  Johnson, W. C.
(McGraw-Hill)

EE341  AUTOMATIC CONTROL***(Also see ME 361)
A course of lectures, tutorial, and laboratory work.
Mathematical models of systems and components: linear differential equations, block diagrams, Laplace transforms, state-space formulation.
Prerequisite
Mathematics I, Topics C, D, E
Prescribed Text
To be determined.
Reference Texts
Automatic Control Engineering  Raven
(McGraw-Hill)
Linear Control Systems  Melsa & Schultz
(McGraw-Hill)
Fundamentals of Automatic Control  Gupta & Hasdorff
(Wiley)
Modern Control Engineering  Ogata
(Prentice-Hall)
Notes for a Second Course in Linear Systems  Desoer
(Van Nostrand Reinhold)

EE342  AUTOMATIC CONTROL**
Continuation of EE341.
Prerequisite
EE341

EE361  COMPUTER STRUCTURE: MACHINE AND ASSEMBLY LANGUAGES*
Basic computer elements and peripherals, representation and organization of information, number systems and arithmetic, logical operations. Hardware components, processor structure, addressing modes and instruction set, machine-language programming, subroutines, traps and interrupts, use of the stack. Assembly: pseudo-ops, macros, recursion and re-entrancy, relocation, linking and loading. System software: assemblers, linkers, loaders, dumpers, interpreters, simulators, compilers.
Lectures will be supplemented with practical assignments using the PDP-11 computer.
Prerequisite
Mathematics I
Prescribed Text
To be determined.
Reference Texts
Introduction to Computer Organization and Data Structures  Stone
(McGraw-Hill)
Computer Organization and Programming  Gear
(McGraw-Hill)
Systems Programming  Donovan
(McGraw-Hill)
PDP-11 Handbook
EE362 LOGICAL DESIGN AND SWITCHING THEORY**
A course of lectures, tutorial, and practical work.
Boolean algebra, combinational logic, logical circuits, minimization techniques, threshold logic. Data representation, binary arithmetic, codes, error checking and correcting. Sequential logic, flip-flops, state diagrams, state reduction, races and hazards. Logic subsystems: registers, adders, counters, converters, coders, etc. Basic architecture of digital computers.

Prerequisite
Mathematics I

Prescribed Text
Computer Logic Design
Mano
(Prentice-Hall)

Reference Texts
Introduction to Switching Theory and Logical Design
Hill & Peterson
(Wiley)

Digital Electronics with Engineering Applications
Sifferlen & Vartanian
(Prentice-Hall)

Theory and Design of Digital Computers
Lewin
(Nelson)

EE380 PROJECT/DIRECTED READING
units by arrangement
Private work of laboratory, literature search or theoretical nature requiring the preparation of a report. Taken under the direction of a supervisor with whom the topic should be negotiated.

EE412 ADVANCED TOPICS IN HEAVY CURRENT ELECTRICAL ENGINEERING (Not offered in 1974)
A course of lectures and tutorial work with some laboratory assignments.

Prerequisite
EE411

Prescribed Text
Electrical Machinery
Fitzgerald & Kingsley
(3rd ed. McGraw-Hill)

EE413 ELECTRICAL MACHINES**
A course of lectures, laboratory, and tutorial work.
Continuation of EE411. Advanced work on the design and performance of electrical machines.

Prerequisite
EE411

Prescribed Texts
Electrical Machinery
Fitzgerald & Kingsley
(3rd ed. McGraw-Hill)
The Performance and Design of Alternating Current Machines
Say
(Pitman)

EE415 POWER SYSTEMS *
A course of lectures, tutorial and laboratory work.

Prerequisite
EE312 & EE332

Prescribed Text
Elements of Power System Analysis
Stevenson
(2nd ed. McGraw-Hill)
**Reference Texts**

*Westinghouse Transmission and Distribution Reference Book
Principles of Electric Power Transmission*  
Wadcor  
(5th ed. Chapman & Hall)

**I. & P. Switchgear Book**

**EE421 ELECTRONICS * **
*A course of lectures and tutorial work taken in conjunction with EE423L.
D.C. amplifiers, stability of feedback amplifiers, modulation, noise. Microelectronics, thyristor circuitry.*

**Prerequisite**
EE322

**Prescribed Text**
To be determined.

**Reference Texts**
*S.E.E.C. Series Volumes 1 to 7.
Electronics BJT's FET's & Microelectronics*  
Angelo, J.  
(McGraw-Hill)

*Electronic Circuits*  
Chirlian  
(McGraw-Hill)

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**EE423L ELECTRONICS LABORATORY * **
*An essentially practical course, complementing EE421.
Circuit development projects individually assigned.*

**Prerequisite**
EE323L

**Corequisite**
EE421

**EE425 DIGITAL ELECTRONICS **
*A course of lectures, tutorial and laboratory work.

**Prerequisite**
EE421—EE423L (or Physics III and consent of instructor); EE362 (may be corequisite in 1974).
EE443 OPTIMIZATION TECHNIQUES (Not offered in 1974)
A course including lectures, tutorial and computer analysis. Mathematical background to optimization. Comparison of optimization methods; engineering applications — such as to problems of identification, control, pattern recognition and resource allocation.

Prerequisite
Mathematics II, Topics C, D, E.

Prescribed Text
Introduction to Optimization Techniques
Masanao Aoki
(New York, Macmillan 1971)

Fundamentals and Applications of Nonlinear Programming

Reference Text
Optimization Theory with Applications
Donald Pierre
(New York, Wiley 1969)

EE444 COMMUNICATION SYSTEMS**
This course introduces the common forms of analog modulation, as well as pulse modulation systems including pulse code modulation. Performance in the presence of noise is considered.

Prerequisite
EE331

Prescribed Text
Principles of Communication Systems
Taub, H. & Schilling, D. L.
(McGraw-Hill 1971)

EE445 COMMUNICATION SYSTEMS*
Stochastic processes including stationary gaussian processes from a time-domain viewpoint. Kalman filtering and application to AM and FM demodulation.

Prerequisite
EE342

Prescribed Text
Introduction to Stochastic Control Theory
Astrom, K. J.
(Academic Press 1970)

EE451 FIELD THEORY*
A course of lectures, tutorial and experimental work. Maxwell's equations, wave propagation in unguided and guided configuration. Elementary Antenna Theory. Experimental work on field plotting and microwave measurements.

Prerequisite
Physics (PH221) & Mathematics II, Topics C, D, E.

Prescribed Text
Electromagnetic Waves and Radiating Systems
Jordan, E. C. & Balmain K. G.
(Prentice Hall)

Reference Text
The Electromagnetic Field and its Engineering Aspects
G. W. Carter
(Longmans)

EE452 MICROWAVE MEASUREMENTS **
A primarily experimental course with some lectures and tutorial work. Generation and modulation of microwave frequencies; measurement of frequency, wavelength and attenuation; use of stubs and other forms of impedance matching.

Prerequisite
EE451 or Physics III or consent of instructor.

EE463 COMPUTER OPERATING SYSTEMS*

Prerequisite
EE361

Prescribed Text
Computer Operating Systems
Barron
(Chapman & Hall)

Reference Text
Systems Programming
Donovan
(McGraw-Hill)
EE464  COMPILERS, ASSEMBLERS AND INTERPRETERS **

Prerequisite
EE361

Prescribed Text
Compiler Construction for Digital Computers  Gries
(Wiley)

Reference Texts
Computer Organisation and Programming  Gear
(McGraw-Hill)
Systems Programming  Donovan
(McGraw-Hill)
Introduction to Computer Organisation and Data Structures  Stone
(McGraw-Hill)

EE480†  PROJECT/DIRECTED READING ***
Topics are to be arranged with individual supervising lecturers.
Full time students are normally required to undertake a project.
Students should get in touch with a staff member in their field of interest during the first term.

EE491†  SEMINAR ***
Talks on various topics of general interest in engineering.
† EE480 and EE491 are taken together and counted as three units.

DEPARTMENT OF MECHANICAL ENGINEERING

Essentially the Mechanical Engineer is concerned with the creative use of materials, motion and energy. He is usually associated with some aspect of the design, production and use of machinery. The courses in Mechanical Engineering develop from basic subjects, through those of an applied nature to reach a professional level in such areas as analysis, synthesis and design, thermodynamics, fluid mechanics, automatic control and engineering management.

Course work is organised into lectures and tutorial classes, together with laboratory work in order to introduce students to the practical problems of equipment usage.

From 1974, the Bachelor of Engineering degrees in Mechanical and Industrial Engineering and in Naval Architecture will comprise four years of full-time study or their equivalent in part-time study or a combination of full- and part-time attendance.

Courses of study currently available in the Department are:

(i) BACHELOR OF ENGINEERING DEGREE COURSE IN MECHANICAL ENGINEERING
This course is designed to give a basic training in the activities followed by professional Mechanical Engineers. It is oriented towards design, plant operation and control, manufacturing methods, material usage and energy conversion and utilisation. Students proceeding by full-time study are required to gain as much industrial experience as possible by working in industry during long vacations.

(ii) BACHELOR OF ENGINEERING DEGREE COURSE IN INDUSTRIAL ENGINEERING
Years I and II of this course are similar to the full-time degree course in mechanical engineering. In the later years the course is oriented towards the study of production techniques and their control and the application of scientific principles to administration and industrial management. The course is thus designed for those engineers who wish to make their career in the planning, supervision and administration of industrial undertakings. As in the full-time mechanical engineering course, students are required to gain industrial experience by working in an appropriate industry during long vacations.

(iii) BACHELOR OF ENGINEERING DEGREE COURSE IN NAVAL ARCHITECTURE
Year I of the course is identical with the full-time courses in Mechanical and Industrial engineering. In the remaining years the course is oriented towards a study of Naval Architecture and is designed to provide professional training for engineering students who are interested in Ship Building, and/or Off-Shore Engineering as a career. Full-time students are required to complete a total of at least twenty weeks industrial experience, by working in shipyard establishments during long vacations.
(iv) **BACHELOR OF ARTS/BACHELOR OF ENGINEERING DEGREE COURSE IN MECHANICAL ENGINEERING** comprising five years of full-time study in the Faculties of Arts and Engineering. Students are required to gain as much industrial experience as possible by working in industry during all long vacations. Students will be eligible for the award of the Degree of Bachelor of Arts after satisfying the requirements of the first four years of the course. The course has been designed for those engineers who require a broader base to their education and training programme. This broader base is considered important in present day engineering practice especially where control of people is concerned.

(v) **BACHELOR OF ARTS/BACHELOR OF ENGINEERING DEGREE COURSE IN INDUSTRIAL ENGINEERING** comprising five years of full-time study in the Faculties of Arts and Engineering. Students are required to gain as much industrial experience as possible by working in industry during long vacations. Students will be eligible for the award of the Degree of Bachelor of Arts after satisfying the requirements of the first four years of the course. The course has been designed for those engineers who require a broader base to their education and training programme. This broader base is considered important in the areas of planning, organisation and management.

(vi) **BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING DEGREE COURSE IN MECHANICAL ENGINEERING**, comprising five years of full-time study in the Faculties of Science and Engineering. Students are required to gain as much industrial experience as possible by working in industry during long vacations. Students will be eligible for the award of the Degree of Bachelor of Science after satisfying the requirements of the first three years of the course.

(vii) **BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING DEGREE COURSE IN INDUSTRIAL ENGINEERING**, comprising five years of full-time study in the Faculties of Science and Engineering. Students are required to gain as much industrial experience as possible by working in industry during long vacations. Students will be eligible for the award of the Degree of Bachelor of Science after satisfying the requirements of the first three years of the course.

(viii) **POSTGRADUATE DIPLOMA IN INDUSTRIAL ENGINEERING**

This is a two-year part-time course for graduates in any branch of Engineering or Applied Science with appropriate experience or for persons otherwise acceptably qualified. The successful completion of the course leads to the award of a postgraduate diploma in Industrial Engineering. Those wishing to enrol in this course should write to the Head of the Department of Mechanical Engineering for further details.

The Bachelor of Science (Engineering) degree courses will continue to be available only for those students enrolled in their course before 1st January, 1974.

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**COURSE OUTLINES**

**DEPARTMENT OF MECHANICAL ENGINEERING**

Note to Students Re-enrolling in 1974

All courses in the Department of Mechanical Engineering are being revised from the beginning of 1974.

Students who in 1973 were enrolled for the Bachelor of Engineering degrees will be advised of the standing granted in the new course.

Students who in 1973 were enrolled in one of the Bachelor of Science (Engineering) courses will be permitted to continue in that course or may elect to change to the Bachelor of Engineering course. After the election has been made, students will be advised of the standing granted in the course they have chosen.

All students will also be sent a recommended programme for 1974.

**CLASSIFICATIONS**

(a) Classifying subjects are shown in Bold-faced type.

(b) Classification is determined by enrolment in the classifying subject.

(c) If a student enrolls in more than one classifying subject, then the year or stage of the lower classifying subject applies.

(d) If the student enrolls in no classifying subject, then he is classified in the year or stage of the highest classifying subject he has passed.

(e) Enrolment in individual units of Engineering I will only be permitted in exceptional circumstances. Examination results for such will be withheld until all the units comprising the subject have been completed.

(f) Standing in individual subject units for previous reading of a complete subject or of a subject unit will only be granted for a credit or higher grading in the unit.

**INDUSTRIAL TRAINING**

Students reading for a full-time Bachelor of Engineering degree are normally required to complete periods of practical experience totalling twenty weeks or more, of a type acceptable to the Faculty Board. Students who transfer from part-time to full-time courses or vice versa will be advised individually of their practical training requirements.

Students who are reading for a Bachelor of Engineering degree on a part-time basis may choose to take Industrial Experience units as part of their Elective programme (see Paragraph 4 of the Elective Requirements on Page 199.)

Students reading for a part-time Bachelor of Science (Engineering) degree must complete three years of practical experience before the 31st January in the year in which the degree is to be awarded. Otherwise the award of the degree may be deferred.

**UNITS**

One "unit" approximates to 42 contact hours; for further explanation see page 91.
### SCHEDULE 1.5

**BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

<table>
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<tr>
<th>Subject</th>
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**FOR DETAILS OF YEAR I COURSE SEE PAGE 92**

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* First Half Year

** Second Half Year

+ See Elective Requirements on page 199.

1 Mathematics IIB may be taken in two parts each of three terms duration.

#### RECOMMENDED PROGRAMME FOR THE BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

BY PART-TIME STUDY

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### SCHEDULE 3.5

**BACHELOR OF SCIENCE (ENGINEERING) IN MECHANICAL ENGINEERING**

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For details of Stages 1 and 2 see page 92

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<td>CE212</td>
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<td>EE204</td>
<td>**Introduction to Electrical Energy</td>
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+ First Half Year
+** Second Half Year
+ See Elective Requirements on page 199.
++ Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.

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### STAGE 6

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<td>CE303 Structural Design</td>
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- First Half Year
- Second Half Year

**FOR DETAILS OF YEAR 1 COURSE SEE PAGE 92

YEAR I

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YEAR II

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YEAR III

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YEAR IV

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- First Half Year
- Second Half Year

**Mathematics IIB may be taken in two parts each of three terms duration.
RECOMMENDED PROGRAMME FOR THE
BACHELOR OF ENGINEERING IN
INDUSTRIAL ENGINEERING
BY PART-TIME STUDY

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<td>ME223 Mechanical Technology</td>
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<td>ME384 Design for Production</td>
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* First Half Year
** Second Half Year
+ See Elective Requirements on page 199.
++ Any student who is unable to complete YEAR VI as a full-time student may do so over two part-time years.
### SCHEDULE 3.4

**BACHELOR OF SCIENCE (ENGINEERING) IN INDUSTRIAL ENGINEERING**

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<td><strong>STAGE 2</strong></td>
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<tr>
<td>+Electives</td>
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<tr>
<td><strong>FOR DETAILS OF STAGES 1 &amp; 2 SEE PAGE 92</strong></td>
<td></td>
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**STAGE 3**

- ME222 Mathematics IIB
- ME241 Properties of Materials
- CE212 Mechanics of Solids I

**STAGE 4**

- ME201 Laboratory Measurements
- ME212 Engineering Design
- ME213 Engineering Design
- ME223 Mechanical Technology
- ME232 Dynamics of Machines
- ME251 FLUID MECHANICS
- ME271 Thermodynamics
- GE350 Seminar

**STAGE 5**

- ME301 ENGINEERING COMPUTATIONS
- ME342 Properties of Materials
- ME343 Mechanics of Solids
- ME382 Production Engineering
- ME383 Quality Engineering
- ME361 Automatic Control
- EE203 **Introduction to Electrical Information**
- EE204 **Introduction to Electrical Energy**

**STAGE 6**

- ME313 ENGINEERING DESIGN
- ME333 Dynamics of Machines
- ME384 Design for Production
- ME381 Methods Engineering
- ME681 Industrial Law
- ME385 Accounting and Financial Studies
- GE491 Technical Seminar

* First Half Year

** Second Half Year

+ See Elective Requirements on page 199.

1 Mathematics IIB may be taken in two parts each of three terms duration.

### SCHEDULE 1.6

**BACHELOR OF ENGINEERING IN NAVAL ARCHITECTURE**

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**FOR DETAILS OF YEAR I COURSE SEE PAGE 92**

**YEAR II**

- ME201 Laboratory Measurements
- CE212 Mechanics of Solids I
- ME241 Properties of Materials
- ME251 Fluid Mechanics
- ME271 Thermodynamics
- ME212 Engineering Design
- ME222 Process Technology
- NA201 THEORETICAL NAVAL ARCHITECTURE
- NA221 Naval Architecture Technology
- NA241 Applied Naval Architecture

**YEAR III**

- EE203 *Introduction to Electrical Information* 1
- EE204 **Introduction to Electrical Energy** 1
- ME301 Engineering Computations
- ME342 Properties of Materials
- ME343 Mechanics of Solids
- CE303 Structural Design
- ME352 Fluid Mechanics
- NA311 SHIP DESIGN AND CONSTRUCTION
- NA342 Applied Naval Architecture
- NA351 Resistance and Propulsion of Ships

+ Electives

15
YEAR IV

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* First Half Year
** Second Half Year
+ See Elective Requirements on page 199.

1 Mathematics II B may be taken in two parts each of three terms duration.

RECOMMENDED PROGRAMME FOR THE BACHELOR OF ENGINEERING IN NAVAL ARCHITECTURE BY PART-TIME STUDY

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<tr>
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<tr>
<td>ME094 *Industrial Experience</td>
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</table>
### BACHELOR OF SCIENCE (ENGINEERING) IN NAVAL ARCHITECTURE

#### STAGE 1
- **ENGINEERING 1**
  - Mathematics I:
    - 4 units
- **PHYSICS IA**:
  - 4 units
- Electives:
  - 8 units

#### STAGE 2
- **THEORETICAL NAVAL ARCHITECTURE**:
  - 1 unit
- **APPLIED NAVAL ARCHITECTURE**:
  - 1 unit
- **LABORATORY MEASUREMENTS**:
  - 1 unit
- **FLUID MECHANICS**:
  - 1 unit
- **THERMODYNAMICS**:
  - 1 unit
- **ENGINEERING DESIGN**:
  - 1 unit

#### STAGE 3
- **MATHEMATICS IIB**:
  - 4 units
- **SPECIAL PURPOSE SHIPS**:
  - 1 unit
- **SHIPS MACHINERY**:
  - 1 unit
- **SHIPYARD PRODUCTION & MANAGEMENT**:
  - 1 unit
- **PROJECT/SEMINAR**:
  - 4 units
- Electives:
  - 1 unit

#### STAGE 4
- **THEORETICAL NAVAL ARCHITECTURE**:
  - 1 unit
- **APPLIED NAVAL ARCHITECTURE**:
  - 1 unit
- **LABORATORY MEASUREMENTS**:
  - 1 unit
- **FLUID MECHANICS**:
  - 1 unit
- **THERMODYNAMICS**:
  - 1 unit
- **ENGINEERING DESIGN**:
  - 1 unit

#### STAGE 5
- **ENGINEERING COMPUTATIONS**:
  - 1 unit
- **PROPERTIES OF MATERIALS**:
  - 1 unit
- **MECHANICS OF SOLIDS**:
  - 1 unit
- **FLUID MECHANICS**:
  - 1 unit
- **INTRODUCTION TO ELECTRICAL INFORMATION**:
  - 1 unit
- **INTRODUCTION TO ELECTRICAL ENERGY**:
  - 1 unit
- **SHIP DESIGN & CONSTRUCTION**:
  - 1 unit
- **RESISTANCE & PROPULSION OF SHIPS**:
  - 1 unit

#### STAGE 6
- **FLUID MECHANICS**:
  - 1 unit
- **STRUCTURAL DESIGN**:
  - 1 unit
- **APPLIED NAVAL ARCHITECTURE**:
  - 2 units
- **THEORETICAL NAVAL ARCHITECTURE**:
  - 1 unit
- **SPECIAL PURPOSE SHIPS**:
  - 1 unit
- **SHIPS MACHINERY**:
  - 1 unit
- **SHIPYARD PRODUCTION & MANAGEMENT**:
  - 1 unit

---

A maximum of three Industrial Experience units may be claimed in this course.

See Elective Requirements on page 199.

Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.

---

1 Mathematics IIB may be taken in two parts each of three terms duration.
# SCHEDULE 2.9

**BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

In the combined course set out below the Arts subjects shall be chosen from the approved Schedule of Subjects offered for the degree of Bachelor of Arts.

<table>
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<td>Workshop Practice</td>
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<td>Process Technology</td>
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<td>EE203</td>
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<td>Introduction to Electrical Energy</td>
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* First Half Year
** Second Half Year
† Approximate hours only. Refer to Arts Faculty Handbook for subject details.
+ See Elective Requirements on page 199.

1 Mathematics IIIB may be taken in two parts each of three terms duration.
## SCHEDULE 2.5

**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

<table>
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* First Half Year
** Second Half Year

See Elective Requirements on page 199.
### BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

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<tr>
<td>EE203 *Introduction to Electrical Information</td>
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<td>EE204 **Introduction to Electrical Energy</td>
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<tr>
<td>ME212 Engineering Design</td>
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<tr>
<td>ME213 Engineering Design</td>
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<tr>
<td>ME232 DYNAMICS OF MACHINES</td>
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<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
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<tr>
<td>ME342 Properties of Materials</td>
<td>1</td>
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<tr>
<td>ME343 Mechanics of Solids</td>
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<table>
<thead>
<tr>
<th>Subject</th>
<th>YEAR IV</th>
<th>Units</th>
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<tr>
<td>†Arts Subject Part III</td>
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<td>†Arts Subject Part II or Part III</td>
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<td>ME313 ENGINEERING DESIGN</td>
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<thead>
<tr>
<th>Subject</th>
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<th>Units</th>
</tr>
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<tbody>
<tr>
<td>ME361 Automatic Control</td>
<td>1</td>
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<tr>
<td>ME381 Methods Engineering</td>
<td>1</td>
<td></td>
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<tr>
<td>ME382 Production Engineering</td>
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<tr>
<td>ME383 Quality Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME384 Design for Production</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME385 Accounting and Financial Studies</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME496 PROJECT SEMINAR</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ME681 Industrial Law</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>+Electives</td>
<td>3</td>
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<table>
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<tr>
<th>Subject</th>
<th>YEAR V</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME361 Automatic Control</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME381 Methods Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME382 Production Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME383 Quality Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME384 Design for Production</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME385 Accounting and Financial Studies</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME496 PROJECT SEMINAR</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ME681 Industrial Law</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>+Electives</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

* First Half Year
** Second Half Year
† Approximate hours only. Refer to Arts Faculty Handbook for subject details.
†† See Elective Requirements on page 199.

1 Mathematics IIB may be taken in two parts each of three terms duration.
SCHEDULE 2.4
BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN
INDUSTRIAL ENGINEERING

Subject | Units
-------|------
YEAR I  |      
Engineering I | 4
Mathematics I   | 4
PHYSICS IA | 4
ME121 Workshop Practice | 1
           | 17

YEAR II |      
Mathematics IIA | 4
Mathematics IIC | 4
PHYSICS II | 4
ME201 Laboratory Measurements | 1
ME251 Fluid Mechanics | 1
ME271 Thermodynamics | 1
ME221 Workshop Practice | 1
           | 16

YEAR III |      
MATHEMATICS IIIA | 8
Mathematics IIB | 4
ME241 Properties of Materials | 14
CE212 Mechanics of Solids I | 14
ME222 Process Technology | 1
           | 16

YEAR IV |      
ME232 Dynamics of Machines | 1
ME212 Engineering Design | 1
ME213 Engineering Design | 1
ME223 Mechanical Technology | 1
ME381 Methods Engineering | 1
ME382 Production Engineering | 1
ME383 Quality Engineering | 1
ME384 Design for Production | 1
ME301 ENGINEERING COMPUTATIONS | 1
ME342 Properties of Materials | 1
ME343 Mechanics of Solids | 1
GE350 Seminar | 1
           | 16

YEAR V |      
ME361 Automatic Control | 1
ME333 Dynamics of Machines | 1
ME313 Engineering Design | 1
ME681D Industrial Law | 2
ME385 Accounting and Financial Studies | 2
ME496 PROJECT/SEMINAR | 4
Electives | 3

+ Electives

DEPARTMENT OF MECHANICAL ENGINEERING

CONDITIONS AS TO SELECTION OF ELECTIVES

1. Unless an entering student has already completed studies in Chemistry to a level at least equivalent to 2F in the Higher School Certificate, he should include Chemistry IS as two of the elective units in Year I or, alternatively, he should enrol in Chemistry I as four units.

2. At least six units must be taken within the Faculty of Engineering of which three must be selected from the list of Departmental technical units on page 202.

3. At least four units must be from Faculties other than the Engineering Faculty.

4. In the case of persons in full employment proceeding as part-time students, each year of appropriate employment that is supervised and approved by the Head of the Department is credited as one unit of elective. A maximum of six such units are allowed, described as:

   ME091 Industrial Experience | 1 Unit
   ME092 Industrial Experience | 1 Unit
   ME093 Industrial Experience | 1 Unit
   ME094 Industrial Experience | 1 Unit
   ME095 Industrial Experience | 1 Unit
   ME096 Industrial Experience | 1 Unit

These elective units may be used to meet any elective requirements in Clauses 2 and 3 above, except the Departmental Technical elective requirement in Clause 2.

5. The three elective units in the B.A./B.E. courses and three of the seven elective units in the B.Sc./B.E. courses must be selected from the list of Departmental Technical Electives on page 203.

† See Elective Requirements on page 199.
### LIST OF PREREQUISITES

<table>
<thead>
<tr>
<th>Subject Unit</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME201 Laboratory Measurements</td>
<td>*Maths I, *Physics IA or IB</td>
</tr>
<tr>
<td>ME212 Engineering Design</td>
<td>*ME121, ME111/2, CE111, *Maths I</td>
</tr>
<tr>
<td>ME213 Engineering Design</td>
<td>*ME121, *ME212, ME111/2, CE111, *Maths I</td>
</tr>
<tr>
<td>ME221 Workshop Practice</td>
<td>*ME121</td>
</tr>
<tr>
<td>ME222 Process Technology</td>
<td>*ME121</td>
</tr>
<tr>
<td>ME223 Mechanical Technology</td>
<td>*ME121</td>
</tr>
<tr>
<td>ME232 Dynamics of Machines</td>
<td>Maths I, ME131, ME111/2, CE111</td>
</tr>
<tr>
<td>ME241 Properties of Materials</td>
<td>Maths I, ME111/2, CE111</td>
</tr>
<tr>
<td>ME251 Fluid Mechanics</td>
<td>Maths I, ME131</td>
</tr>
<tr>
<td>ME271 Thermodynamics</td>
<td>Maths I, Physics IA or IB</td>
</tr>
<tr>
<td>ME301 Engineering Computations</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME313 Engineering Design</td>
<td>ME213, ME232, Maths I</td>
</tr>
<tr>
<td>ME333 Dynamics of Machines</td>
<td>ME232, Maths IIB</td>
</tr>
<tr>
<td>ME342 Properties of Materials</td>
<td>*CE212</td>
</tr>
<tr>
<td>ME343 Mechanics of Solids</td>
<td>*Maths I</td>
</tr>
<tr>
<td>ME352 Fluid Mechanics</td>
<td>ME251</td>
</tr>
<tr>
<td>ME361 Automatic Control</td>
<td>Maths IIB</td>
</tr>
<tr>
<td>ME372 Heat Transfer</td>
<td>*Maths I</td>
</tr>
<tr>
<td>ME381 Methods Engineering</td>
<td>Maths I, ME222/3</td>
</tr>
<tr>
<td>ME382 Production Engineering</td>
<td>Maths I, ME222/3</td>
</tr>
<tr>
<td>ME383 Quality Engineering</td>
<td>Maths IIB, ME222/3</td>
</tr>
<tr>
<td>ME384 Design for Production</td>
<td>ME213, ME222/3</td>
</tr>
<tr>
<td>ME385 Accounting &amp; Financial Studies</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME401 Systems Analysis</td>
<td>Maths IIB, ME361</td>
</tr>
<tr>
<td>ME402 Systems Planning, Organization &amp; Control</td>
<td>Maths IIB, ME361</td>
</tr>
<tr>
<td>ME403 Resources Planning &amp; Allocation</td>
<td>Maths IIB, ME361</td>
</tr>
<tr>
<td>ME404 Mathematical Programming</td>
<td>Maths IIB</td>
</tr>
<tr>
<td>ME407 Environmental Engineering</td>
<td>Completed Year II of Course</td>
</tr>
<tr>
<td>ME413 Design of Crankshafts, Flywheel &amp; other Rotating Members</td>
<td>*ME313, *ME333</td>
</tr>
<tr>
<td>ME414 Design of Hydraulic &amp; Pneumatic Power Systems</td>
<td>ME251, *ME352</td>
</tr>
<tr>
<td>ME415 Design of Crane &amp; Hoist Equipment</td>
<td>*CE303, ME213, ME232</td>
</tr>
<tr>
<td>ME416 Design of Pressure Vessels, High Pressure Pipes, Plates &amp; Shells</td>
<td>ME313, ME342/343</td>
</tr>
<tr>
<td>ME417 Design of Worm &amp; Special Purpose Gear Reduction Units</td>
<td>ME213, ME232</td>
</tr>
<tr>
<td>ME418 Design of Thermal Unit Components</td>
<td>ME313, ME372</td>
</tr>
<tr>
<td>ME419 Design of Conveyors &amp; Materials Handling Equipment</td>
<td>*ME313, ME232</td>
</tr>
<tr>
<td>ME434 Advanced Kinematics &amp; Dynamics of Machines</td>
<td>ME333</td>
</tr>
<tr>
<td>ME444 Properties of Materials</td>
<td>ME342</td>
</tr>
<tr>
<td>ME445 Mechanics of Solids</td>
<td>ME343</td>
</tr>
<tr>
<td>ME446 An Introduction to Plastic Analysis</td>
<td>ME342/3</td>
</tr>
<tr>
<td>ME447 An Introduction to Experimental Analysis</td>
<td>ME342/3</td>
</tr>
<tr>
<td>ME448 An Introduction to Photomechanics</td>
<td>ME342/3</td>
</tr>
<tr>
<td>ME449 Reliability Analysis of Mechanical Systems</td>
<td>ME313, Maths IIB</td>
</tr>
<tr>
<td>ME453 Fluid Mechanics</td>
<td>*ME352</td>
</tr>
<tr>
<td>ME454 Turbomachinery</td>
<td>*ME352</td>
</tr>
<tr>
<td>ME473 Thermodynamics</td>
<td>ME271</td>
</tr>
<tr>
<td>ME474 Heat Transfer</td>
<td>ME372</td>
</tr>
<tr>
<td>ME481 Engineering Administration</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME482 Engineering Economics</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME485 Tool Design</td>
<td>ME384</td>
</tr>
<tr>
<td>ME486 Industrial Design</td>
<td>ME313</td>
</tr>
<tr>
<td>ME487 Operations Research — Deterministic Models</td>
<td>Maths IIB</td>
</tr>
<tr>
<td>ME488 Operations Research— Probabilistic Models</td>
<td>Maths IIB</td>
</tr>
<tr>
<td>ME489 Operations Research— Applications in Industry</td>
<td>Maths IIB</td>
</tr>
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</table>

### NAVAL ARCHITECTURE

<table>
<thead>
<tr>
<th>Subject Unit</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA201 Theoretical Naval Architecture</td>
<td>*Maths I, ME111/2, ME131, CE111</td>
</tr>
<tr>
<td>NA221 Naval Architecture Technology</td>
<td>*Maths I, ME111/2, CE111</td>
</tr>
<tr>
<td>NA241 Applied Naval Architecture</td>
<td>ME111/2</td>
</tr>
<tr>
<td>NA311 Ship Design &amp; Construction</td>
<td>NA201, NA221, NA241</td>
</tr>
<tr>
<td>NA342 Applied Naval Architecture</td>
<td>ME251, NA201, NA221, NA241</td>
</tr>
<tr>
<td>NA351 Resistance &amp; Propulsion of Ships</td>
<td>ME251, NA201, NA221, NA241</td>
</tr>
<tr>
<td>NA402 Special Purpose Ships</td>
<td>NA311, NA351</td>
</tr>
<tr>
<td>NA431 Ships' Machinery</td>
<td>NA311, NA351</td>
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<tr>
<td>NA452 Theoretical Naval Architecture</td>
<td>NA311, NA351</td>
</tr>
<tr>
<td>NA481 Shipyard Production and Management</td>
<td>NA311, NA351</td>
</tr>
</tbody>
</table>

* Prerequisites thus indicated may, with the consent of the Head of the Department, be read concurrently with the subject unit named.
Applications in Industry

DEPARTMENTAL TECHNICAL ELECTIVES

Each Elective is to consist of three subject units chosen from the following list.

* SUBJECT UNITS (42 hrs/unit)

ME401 Systems Analysis
ME402 Systems Planning, Organization & Control
ME403 Resources Planning & Allocation
ME404 Mathematical Programming
ME407 Environmental Engineering
ME413 Design of Crankshafts, Flywheels & other Rotating Members
ME414 Design of Hydraulic & Pneumatic Power Systems
ME415 Design of Crane & Hoist Equipment
ME416 Design of Pressure Vessels, High Pressure Pipelines, Plates & Shells
ME417 Design of Worm & Special Purpose Gear Reduction Units
ME418 Design of Thermal Unit Components
ME419 Design of Conveyors & Materials Handling Equipment
ME434 Advanced Kinematics & Dynamics of Machines
ME444 Properties of Materials
ME445 Mechanics of Solids
ME446 An Introduction to Plastic Analysis
ME447 An Introduction to Experimental Analysis
ME448 An Introduction to Photomechanics
ME449 Reliability Analysis for Mechanical Systems
ME453 Fluid Mechanics
ME454 Turbomachinery
ME473 Thermodynamics
ME474 Heat Transfer
ME485 Tool Design
ME486 Industrial Design
ME487 Operations Research — Deterministic Models
ME488 Operations Research — Probabilistic Models
ME489 Operations Research — Applications in Industry

Should other Departments or Faculties select three or more of the subject units to form a subject, the subject so formed shall be called MECHANICAL ENGINEERING III

Elective programmes must be approved by the Head of the Department

* Availability of individual subject units will depend on student demand.

DEPARTMENTAL TECHNICAL ELECTIVES

Preferred combinations of subject units to form Departmental Technical Electives are set out below. Students should carefully consider these combinations before seeking any variation. All elective combinations are of 3 x 42=126 hours' duration.

<table>
<thead>
<tr>
<th>Combination</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>ME401 Systems Analysis</td>
<td>Maths IIB &amp; ME361</td>
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<tr>
<td>ME402 Systems Planning, Organization &amp; Control</td>
<td>Maths IIB</td>
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<tr>
<td>ME403 Resources Planning &amp; Allocation</td>
<td>Maths IIB &amp; ME361</td>
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<tr>
<td>ME407 Environmental Engineering</td>
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</tr>
<tr>
<td>ME487 Operations Research — Deterministic Models</td>
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<tr>
<td>ME488 Operations Research — Probabilistic Models</td>
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<tr>
<td>ME489 Operations Research — Applications in Industry</td>
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</tr>
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<td>ME402 Systems Planning, Organization &amp; Control</td>
<td>Maths IIB</td>
</tr>
<tr>
<td>ME403 Resources Planning &amp; Allocation</td>
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<td>ME445 Mechanics of Solids</td>
<td>ME313</td>
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<td>ME474 Heat Transfer</td>
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<td>ME486 Industrial Design</td>
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<tr>
<td>ME444 Properties of Materials</td>
<td>ME384</td>
</tr>
</tbody>
</table>

Note

The electives to be offered in any one year will depend upon the extent of student demand.
DEPARTMENT OF MECHANICAL ENGINEERING

Subjects offered in the Faculty of Engineering, as listed in the course outlines, are made up of subject units which are described in the subsequent section. Both subject content and unit content may be varied from time to time without prior notification.

Each subject unit has an identification number with prefixed letters indicating the Department responsible for the unit, CE for Civil Engineering, EE for Electrical Engineering, and ME for Mechanical Engineering. The first numeral generally indicates the Year of the full-time course in which the unit is normally taken; the second numeral indicates the field of study, the third numeral indicates the level, or sequence in the field. A prefix letter G indicates that the course is offered jointly by several departments.

The hours shown for each subject unit are the total attendance hours for lectures, laboratory, design and tutorial classes. As a guide to private study and preparation, students should allow, on the average about 1½ hours for each hour of lectures and one hour for each hour of laboratory, design or tutorial attendance. The note Arr. indicates that the unit is elective for which the hours are fixed by arrangement.

### Indicating Numerals for Mechanical Engineering

- ME-0- General courses
- ME-1- Analysis and Design
- ME-2- Mechanical Engineering Practice
- ME-3- Machines
- ME-4- Materials
- ME-5- Fluid Mechanics
- ME-6- Automatic Control
- ME-7- Thermodynamics
- ME-8- Industrial Engineering
- ME-9- Project and Seminar
MECHANICAL AND INDUSTRIAL ENGINEERING

All students are advised to purchase a copy of the University's publication on SI units.

ME111  GRAPHICS  
42

A study of communication and analysis by pictorial means.

Graphical Presentation and Analysis of Data
Vector diagrams, charts, graphs, plotting and curve fitting.

Log-log plotting. Graphical differentiation and integration.

Projection
A detailed study of the methods of projection covering:

sketching; orthogonal projection of points, lines, planes and solids; lengths of lines, angles and intersections between lines, planes and contoured surfaces; orthographic projection, dimensioning and sectioning; isometric projection; perspective projection.

Prescribed Text
Design Drafting
Earle, J. H.
(Addison Wesley 1972)

Reference Texts
Graphics, Science and Design
French, T. E. & Vierck, C. J.
(McGraw-Hill 1970)

Graphics
Levens, A. S.
(Wiley 1968)

Basic Graphics
Luzadder, W. J.
(Prentice-Hall 1968)

Introduction to Engineering Design and Graphics
Beabley, George G. & Chilton, Ernest, G.
(Macmillan 1973)

ME112  ENGINEERING DRAWING AND ELEMENTARY DESIGN  
42

Orthographic and isometric drawings of complete designs.
ME121 WORKSHOP PRACTICE

A study of basic methods and processes used in the engineering trades with instruction, practice and assignments related to Fitting and Machining, Drilling, Welding Processes, Boilermaking, *Patternmaking, Foundry Practice, and the Engineering Inventory of Materials and Components.

*Patternmaking and Foundry Practice will only be available for Metallurgy Students in ME121.

Prescribed Text
Trade Technology Notes

Reference Texts
Shop Theory
H. Ford Trade School
(McGraw-Hill)

Materials and Processes in Manufacturing
DeGarmo, E. P.
(MacMillan)

Manufacturing Processes and Materials for Engineers
(Prentice-Hall)

Graphics Science & Design
French & Vierck
(McGraw-Hill 1970)

Trade Catalogues

ME131 DYNAMICS

A Study of Force and Motion

The forces involved in motion; gravity, dry friction, viscous friction, rolling friction. The "free body" and control volume techniques. Internal and external forces and equilibrium.

Newton's laws of motion applied to point masses, rigid bodies and connected bodies moving in straight line or curved paths, or in simple rotation. Reference frames and relative motion; inertial frames, accelerating frames and rotating frames, Coriolis acceleration with illustrations.

Momentum and impulse, both linear and angular, related to point masses and rigid bodies.

Energy and the conservation principle applied to mechanical work, strain energy, kinetic energy, potential energy and friction "losses," in the context of point masses and rigid bodies.

Prescribed Text
Force and Motion
Johnston, A. K. & Hill, B. J.
(University of Newcastle)

Reference Texts
Mechanics for Engineers:
Mechanics
Beer, F. P. & Johnston, E. R.

Mechanics—Pt. II Dynamics
Meriam, J. L.
(International Student Edition John Wiley 1966)

LABORATORY MEASUREMENTS

Fundamental units and quantities are discussed as well as the means by which they are measured. Variability in measured data is described and an introduction to error analysis is given. The importance of a correct interpretation of experimental data is emphasised, and simple examples of regression analysis are explained.

Basic methods using mechanical, optical or electrical systems or some combination of these, which are used for the measurement of length, strain, area, pressure, temperature, force, torque, fluid flow, vibration, acceleration and other physical properties, are described. Selected laboratory experiments are also provided.
ME212 ENGINEERING DESIGN


Prescribed Text
Theory and Problems of Machine Design
Hall, A. S., Holowenko, A. R. & Laughlin, H. G.
(Schaum Publishing)

Reference Texts
Mechanical Engineering Design
Shigley, J. E.
(McGraw-Hill)

Fundamentals of Mechanical Design
Phelan, R. M.
(McGraw-Hill)

Design of Machine Elements
Faires, V. M.
(Macmillan)

Mechanical Engineers' Handbook Design and Production
Kent, W.
(Wiley)

Design of Machine Members
Doughtie, V. L. & Vallance, A.
(McGraw-Hill)

Machine Design
Black, P. H. & Adams, A. F.
(McGraw-Hill)

Machine Cut Gears Helical & Straight Spur
A.S.B. 61 — 1941

ME213 ENGINEERING DESIGN

The design of brakes, clutches, gear box reduction units and power screws for industrial applications. Modern developments in this area will be discussed.

Prescribed Text
Trade Technology Notes
Tech. Education

Reference Texts
Shop Theory
H. Ford Trade School
(McGraw-Hill)

Materials and Processes in Manufacturing
DeGarmo, E. P.
(MacMillan)

Manufacturing Processes and Materials for Engineers
(Prentice-Hall)
Reference Texts (continued)
Graphics Science & Design French & Vierck
(McGraw-Hill 1970)

Trade Catalogues

ME222 PROCESS TECHNOLOGY 42

Prescribed Text
Materials and Processing in Manufacturing DeGarmo, E. P. (Macmillan)

Reference Texts

Materials, Properties and Manufacturing Processes Datsko, I. (Wiley)

Processes and Materials in Manufacturing Campbell, J. S. (McGraw-Hill)

ME232 DYNAMICS OF MACHINES 42
Kinematics and dynamics of simple mechanisms, cams and toothed gearing.

Prescribed Text
Kinematics and Dynamics of Plane Mechanisms Hirschhorn, J. (McGraw-Hill)

Reference Texts
Dynamics of Machinery Holowenko, A. R. C. (Wiley)
Theory of Machines Shigley, J. E. (McGraw-Hill)
Cam Design, Design and Accuracy Rothbart, H. A. (Wiley)

Basic Graphical Kinematics Kepler, H. B. (McGraw-Hill)

ME241 PROPERTIES OF MATERIALS 70
An introductory subject on materials science, structure and properties of materials, strength and failure criteria for materials, material characterisation. The use and selection of materials for durability, static and dynamic loading conditions, electrical applications, and severe environmental conditions. The particular merits of metals, and of ceramic and organic materials are emphasised.

Text Book
To be advised

Reference Texts
Engineering Materials Science Richards, C. W. (Wadsworth)

Mechanical Behaviour of Materials McClintock & Argon (Addison-Wesley)

Elements of Materials Science Van Vlack, L. H. (Addison-Wesley)
ME251  FLUID MECHANICS  42
Fluid properties and definitions. Fluid statics:— statics of moving systems, forces on surfaces, buoyant forces, stability of floating and submerged bodies. Fluid flow concepts:—
Types of flow, continuity equation, Euler’s equation of motion along a streamline. Bernouilli equation, energy equation. Linear momentum equation. The moment of momentum equation. Linear and angular momentum applications. Introduction to dimensional analysis. Viscous effects:— fluid resistance, laminar and turbulent flow, flow in pipes and conduits. Fluid measurement.

Prescribed Text
*Force and Motion*  
Johnston, A. K. & Hill, B. J.  
(University of Newcastle)

Reference Texts
*Fluid Mechanics*  
Streeter, V. L.  

*Fluid Mechanics with Engineering Applications*  
Dougherty, R. L. & Franzini, J. B.  
(McGraw-Hill)

ME271  THERMODYNAMICS  42

Prescribed Text
*Fundamentals of Classical Thermodynamics*  
Van Wyllet, G. J. & Sonntag, R. E.  
(John Wiley)

ME301  ENGINEERING COMPUTATIONS  42

Prescribed Text
*Numerical Methods and Fortran Programming*  
McCracken, D. P. & Dorn, W. S.  
(Wiley International)

Reference Texts
*A First Course in Numerical Analysis*  
Ralston, A.  
(I.S.E. McGraw-Hill 1965)

*Computer Solution of Linear Algebraic Systems*  
Forsythe, G. & Moler, C. B.  
(Prentice-Hall 1967)

ME313  ENGINEERING DESIGN  42
The design of power unit cylinders, reciprocating power elements, cylinder closures, dynamic struts and dynamic levers using work or indicator diagrams as developed from thermodynamics, fluid mechanics or machine tool theory as the basis of horsepower, load and stress calculation. Effects of inertia, dead weight and centrifugal force on piston loads. Inertia bending of struts and bending induced by bearing friction. Stress summation and factor of safety criteria. Special reference to reciprocating engine, compressor and power press units. Manufacturing techniques and material compatibility. Introduction to optimisation techniques and formalised decision making in design.

Prescribed Text
*Mechanical Design of Machines*  
Siegel, W. J., Malev, V. L. & Hartmann, J. B.  
(International Textbook Co.)

Reference Texts
*Mechanical Engineering Design*  
Shigley, J. E.  
(McGraw-Hill)

*Diesel Engine Design*  
Walshaw  
(Newnes)

*Diesel Engine Design*  
Purdhay  
(Constable)

*Advanced Mechanics of Materials*  
Seely & Smith  
(Wiley)

*Handbook of Stress and Strength*  
Lipson & Juvinall  
(Macmillan)

*Design of High Speed Diesel Engines*  
Howarth, M. H.  
(Constable)

*Engineering Design*  
Matousek, R.  
(Blackie)
**ME333 DYNAMICS OF MACHINES**


**Prescribed Text**

*Mechanical Vibrations*  
Church, A. H.  
(John Wiley)

OR

*Dynamics of Machinery*  
Phelan, R. M.  
(McGraw-Hill)

**Reference Texts**

*Vibrations—Theoretical Methods*  
Yu Chen  
(Addison-Wesley)

*Vibration Problems in Engineering*  
Timoshenko, S. & Young, D. H.  
(Van Nostrand)

*Mechanical Vibrations*  
Seto, W. W.  
(Schaum)

*Fundamentals of Vibrations*  
Anderson, R. A.  
(Macmillian)

**ME342 PROPERTIES OF MATERIALS**


**Prescribed Text**

*Mechanical Behaviour of Materials*  
McClintock & Argon  
(Addison-Wesley)

**ME343 MECHANICS OF SOLIDS**


**Prescribed Texts**

*Mechanics of Materials*  
Shanley, F. F.  
(McGraw-Hill)

*Mechanics of Materials*  
Higdon, A., Ohlsen, E. H., Styles, B. B. & Weese, J. A.  
(Wiley)

**Reference Texts**

*Introduction to Mechanics of Solids*  
Popov  
(Prentice-Hall)

*Introduction to Mechanics of Deformable Solids*  
Drucker, D. C.  
(McGraw-Hill)

*Experimental Stress Analysis*  
Dally, J. W. & Riley, W. F.  
(McGraw-Hill)

**ME352 FLUID MECHANICS**

Basic equations for interactions between fluids and moving vanes. Applications to radial flow pumps and fans, and the development of similarity relationships and descriptions of performance. Similar applications to axial flow pumps and fans, turbo-compressors, water turbines, steam turbines, and gas turbines. Study of cavitation as it affects machines handling liquids.
ME361  AUTOMATIC CONTROL  

Prescribed Text 
To be advised. 

Reference Texts 
Linear Control Systems 
Melsa & Schultz 
(McGraw-Hill) 
Fundamentals of Automatic Control 
Gupta & Hasdorff 
(Wiley) 
Notes for a Second Course in Linear Systems 
Desoer, C. A. 
(Van Nostrand Reinhold) 
Automatic Control Engineering 
Raven, F. H. 
(McGraw-Hill) 

ME372  HEAT TRANSFER  

ME381  METHODS ENGINEERING  

Prescribed Text 
Motion and Time Study 
Niebel, B. W. 
(Irwin) 
Reference Texts 
Methods Engineering 
Krick, E. V. 
(Wiley) 
Motion and Time Study 
Barnes, R. M. 
(Wiley) 
Production Handbook 
Alford L. P. & Bangs, J. R. (eds.) 
(Ronald) 
Industrial Engineering Handbook 
Maynard, H. B. (ed.) 
(McGraw-Hill) 

ME382  PRODUCTION ENGINEERING  
Production planning, Inventory functions, Forecasting; Scheduling and control of production. Design of a production control system. Quality and quantity control. Production inventory systems. 

Prescribed Text 
Production Systems 
Riggs, J. L. 
(Wiley)
ME383 QUALITY ENGINEERING

Reference Texts
Quality Control and Industrial Statistics
Duncan, A. J.
(Prentice-Hall)

Handbook of Industrial Metrology
Amer. Soc. of Tool & Mfg. Engs.
(Prentice-Hall)

Statistical Quality Control
Grant, E. L.
(McGraw-Hill)

Industrial Engineering Handbook
Maynard, H. B. (ed.)
(McGraw-Hill)

Quality Control for Managers and Engineers
Kirkpatrick, E. G.
(Wiley)

ME384 DESIGN FOR PRODUCTION
The application of economics, methods engineering, ergonomics and mechanical engineering to the development and design of a product. Its production (particularly in quantity), distribution and marketing.

Operation methods; metrology, tools, jigs and fixtures, assembly and inspection procedures. Plant facilities.

Reference Texts
Principles of Jig and Tool Design
Kempster, M. H. A.
(E.U.P.)

Designing for Production
Niebel, B. W. & Baldwin, E. N.
(Irwin)

Value Engineering in Manufacturing
Amer. Soc. of Tool & Mfg. Engs.
(Prentice-Hall)

Production Handbook
Amer. Soc. of Tool & Mfg. Engs.
(Ronald)

Industrial Engineering Handbook
Maynard, H. B. (ed.)
(McGraw-Hill)

Fundamentals of Tool Design
Amer. Soc. of Tool & Mfg. Engs.
(Prentice-Hall)

ME385 ACCOUNTING & FINANCIAL STUDIES
For subject description see under Faculty of Economics and Commerce on page 281.

ME401 SYSTEMS ANALYSIS

An introduction to organization systems — production systems. Assemblies of quantifiable and non-quantifiable elements or branches. Sub-system analysis and optimization. Optimization of total system.

Reference Texts
finite Graphs and Networks
Busacker & Saaty
(McGraw-Hill 1965)

Systems Analysis. A computer approach to Decision Models
McMillan, C. & Gonzalez, R. F.
(Irwin Dorsey 1968)

Engineering Systems Analysis
Haberman, C.
(Merrill 1965)

A Methodology for Systems Engineering
Hall, A.
(Van Nostrand 1962)

Systems Engineering Handbook
Machol, R.
(McGraw-Hill)
ME402  SYSTEMS PLANNING, ORGANIZATION AND CONTROL


**Reference Texts**

*Formal Organisation, A Systems Approach*  
Carzo, R. & Yanouzas, J. U.  
(Irwin Dorsey 1965)

*A Mathematical Theory of Systems Engineering*  
Wayne-Weymore, A.  
(Wiley 1967)

*A Concept of Corporate Planning*  
Ackoff, R. L.  
(Wiley 1970)

*Critical Path Methods in Construction Practice*  
Antill, J. M. & Woodhead, R. W.  
(McGraw-Hill 1965)

*Network Analysis for Planning and Scheduling*  
Battersby, A.  
(Macmillan)

*Production Inventory Systems*  
Buffa, E.  
(Irwin)

*A Methodology for Systems Engineering*  
Hall, A.  
(Van Nostrand 1962)

*Systems Engineering Handbook*  
Machol, R.  
(McGraw-Hill 1965)

*Systems Analysis. A Computer Approach to Decision Models*  
Mcmillan, C. & Gonzalez, R. F.  
(Irwin-Dorsey)

*Production Systems. Planning Analysis and Control*  
Riggs, J. L.  
(J. Wiley)

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ME403  RESOURCES PLANNING AND ALLOCATION

Types of resources. Resources availability, approach and classification. Analysis and projection for World, National and Corporate levels of operation. Tactical and strategic problems, conservation of resources.

Generation of resources, Capital and technological resources. The planning, organisation and control of resources, with particular emphasis on long-range planning. The need at all levels for a resources policy. Optimal use of resources and the role of research and development in resources allocation. The importance of mineral resources to Australia. Prediction of resources.

Notions of corporate planning with special reference to the steel industry.

**Prescribed Text**

To be advised.

**Reference Texts**

*A Concept of Corporate Planning*  
Ackoff, R. L.  
(Wiley—Interscience 1970)

*World Resources and Industries*  
Zimmerman, E. W.  
(N.Y., Harper 1951)

*Man, Mind and Land*  
Firey, W.  
(N.Y., Free Press 1960)

*World Prospects for Natural Resources*  
Fisher, J. L. & Potter, N.  

*Minerals and Men*  
McDevitt, J.  
(Baltimore, John Hopkins Press 1968)

*Resources and Man*  
(San Francisco, W. H. Freeman & Co. 1969)

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ME404  MATHEMATICAL PROGRAMMING

Introduction to the solution of static optimisation problems. Dynamic programming; computational refinements of the basic algorithm.

Linear programming; the Simplex algorithm and its revised form; duality theory; sensitivity analysis; decomposition algorithms. Transportation and assignment problems.
Prescribed Texts
Introduction to Dynamic Programming
Nemhauser, G. L.
(Wiley 1966)
Linear Programming
Gass, S. I.
(3rd ed., International Student Edition
Reference Texts
Applied Dynamic Programming
Bellman, R. E. & Dreyfus, S. E.
(Princeton 1962)
Operations Research
Taha, H. A.
(Macmillan 1971)
Non-Linear Programming
Kunzi, H. P., Krelle, W. & Oettli, W.
(Blaisdell 1966)
Mathematical Programming
McMillan, C.
(Wiley 1970)
Note
This subject is identical with the first part of ME581G

ME407 ENVIRONMENTAL ENGINEERING
The role of the Engineer in environmental pollution and control is examined through the interaction of man with air, water and land masses which comprise the environment in which he lives. A brief study of the total earth resource structure will be undertaken in order to make more meaningful the extent of present day air, water and noise pollution problems. The effects of these various pollutants on man, vegetation and other materials will then be considered.
Finally, methods of reducing pollution to ‘acceptable’ levels will be studied through an examination of existing quality standards, control legislation and the various forms of measuring and control hardware.
Reference Texts
Water: Pollution and Conservation
Southgate, B. A.
(Thunderbird Enterprises Ltd.)
The Unclean Sky
Batton, L. J.
(Anchor)
Air Pollution — Vols. I, II & III
Stern, A. C.
(Academic Press)
Engineering Aspects of Thermal Pollution
Parker Krenkel, F. L.
(Vanderbilt Uni. Press)

ME413 DESIGN OF CRANKSHAFTS, FLYWHEELS AND OTHER ROTATING MEMBERS
The design of single and multi-throw crankshafts, flywheels cam and eccentric mechanisms for engines, turbines, compressor, pump or machine tool applications, using hypothetical work or indicator diagrams developed from thermodynamics or machine tool theory as the basis of load, turning moment and stress calculations.
Prescribed Text
Mechanical Design of Machines
Siegel, W. J., Maleev, V. I. & Hartmann, J. B.
(International Textbook Co.)
Reference Texts
Mechanical Engineering Design
Shigley, J. E.
(McGraw-Hill)
Diesel Engine Design
Walshaw
(Newnes)
Diesel Engine Design
Purdie
(Constable)
Advanced Mechanics of Materials
Seely & Smith
(Wiley)
Handbook of Stress and Strength
Lipson & Juvinnall
(Macmillan)
Design of High Speed Diesel Engines
Howarth M. H.
(Constable)
ME414 DESIGN OF HYDRAULIC AND PNEUMATIC POWER SYSTEMS

The design of Hydraulic, Pneumatic and Vacuum Power Units for the provision of power and/or control mechanisms for machine tools, materials handling equipment, etc. Interrelation of load, velocity, acceleration and capacity diagrams in circuit design. Circuit component characteristics. Safety features. Fluid characteristics, fluid flow rates and fluid pressure ratings.

Reference Texts
Hydraulic Machinery Molloy, E. (Newnes)
Principles of Hydraulics
(Trade & Technical Press Ltd.)
Applied Hydraulics in Engineering Morris, H. M. (The Ronald Peers Co.)
Hydraulics in Mechanical Handling Fawcett, J. R. (Trade & Technical Press Ltd.)
Pneumatics Kay, F. X. (Machinery Reference Series)
Hydraulic Handling Trade & Technical Press Ltd.

ME415 DESIGN OF CRANE AND HOIST EQUIPMENT

The designs of the mechanical components for various types of cranes, hoists and associated equipment with special reference to The Australian Standard Crane and Hoist Code, and N.S.W. Department of Labour and Industry requirements. Mechanical Hydraulic and Pneumatic systems. Hydraulic Circuits and Control aspects. Safety and test requirements.

Reference Texts
Electric Cranes Broughton, H. H. (Spon)
S.A.A. CB2 Crane and Hoist Code

ME416 DESIGN OF PRESSURE VESSELS, HIGH PRESSURE PIPELINES, PLATES AND SHELLS


Reference Texts
Pressure Vessel Design Harvey, J. F. (Van Nostrand)
Industrial Piping Littleton, C. T. (McGraw-Hill)
Handbook of Industrial Pipework Marton, W. L. (Pitman & Sons)
Theory of Plates and Shells Timoshenko, S. (McGraw-Hill)
Flanges and Bolting for Pipes, Valves and Shells A.S.B. 52-1971
S.A.A. Boiler Code AS 1200—1972 Standards Assn. of Australia
Unfired Pressure Vessels AS 1210—1972 Standards Assn. of Australia
Water Tube Boilers AS 1228—1972 Standards Assn. of Australia
S.A.A. Pressure Piping Code CB 18 Standards Assn. of Australia

ME417 DESIGN OF WORM AND SPECIAL PURPOSE GEAR REDUCTION UNITS

The design of gear reduction units for industrial requirements with special reference to Australian Standard Code and N.S.W. Department of Labour and Industry requirements. Special reference to vehicle transmission and coupling systems.
Reference Texts

Gears Spur, Helical Bevel and Worm  Houghton, P. S. (The Technical Press Ltd.)

Design of Worm and Spiral Gears  Buckingham, E. & Ryffel, H. H. (The Industrial Press Machinery Publishing Co.)

Machine Cut Gears — Helical and Straight Spur  A.S.B. 61 — 1941
Bevel gears (Machine cut)  A.S.B. 62 — 1965
Worm Gearing  A.S.B. 66 — 1969

ME418 DESIGN OF THERMAL UNIT COMPONENTS  42


Reference Texts

Steam, Air and Gas Power  The Babcock & Wilcox Co.
Combustion Engineering  Lorenzi, D. (Combustion Engineering & Superheater Inc.)
S.A.A. Boiler Code  AS 1200 — 1972 Standards Assn. of Australia
S.A.A. Pressure Piping Code  CB 18 Standards Assn. of Australia
Unfired Pressure Vessels  AS 1210 — 1972 Standards Assn. of Australia
Water Tube Boilers  AS 1228 — 1972 Standards Assn. of Australia

ME419 DESIGN OF CONVEYORS AND MATERIALS HANDLING EQUIPMENT  42

Types of conveyors and materials handling equipment. The design of their mechanical components with special reference to belt, link, screw, vibrating and overhead type conveyors. A review of operational requirements. Loading and unloading devices. Hydraulic power circuits and control aspects. Brief discussion of pneumatic and hydraulic conveying systems.

Reference Texts

Conveyors  Stocker, H. E. (Prentice-Hall)

Pneumatic Handling of Powdered Materials  The Engineers' Equipment Association (Constable)
Conveying Machinery  Atherton, W. H. (Technical Press Ltd.)


ME434 ADVANCED KINEMATICS AND DYNAMICS OF MACHINES  42

Dynamic Motion Analysis; energy distribution method, equivalent mass-and-force method, the rate-of-change-of-energy method.
Advanced Kinematics of the Plane Motion; the inflection circle, Euler-Savary equation, Bobillier's construction, Hartmann's construction.
Introduction to synthesis; graphical and analytical methods.

Prescribed Text

Kinematics and Dynamics of Plane Motion  Hirschborn, J. (McGraw-Hill)
ME444 PROPERTIES OF MATERIALS 42
Dislocation mechanics and fracture mechanics.
Use of composite materials.
Development of filament and whisker reinforcement techniques.
Influence of residual stresses in design. Dynamics, thermal, electrical, magnetic and radiation effects.

Reference Texts
Mechanical Behaviour of Materials
McClintock & Argon
(Addison-Wesley)
Engineering Materials Science
Richards
(Wadsworth)
Modern Composite Materials
Broutman & Krock
(Addison-Wesley)
Fibre Reinforced Materials
Holister, G. S. & Thomas, C.
(Elsevier)

ME445 MECHANICS OF SOLIDS 42
An introduction to the theory of plates and shells with extensions to thick pressure vessels and creep effects.
Application of numerical (approximate) methods.

Reference Texts
Theory of Plates and Shells
Timoshenko & Wainowsky-Krieger
(McGraw-Hill)
Stress Analysis
Zienkiewcz & Holister
(Wiley)

ME446 AN INTRODUCTION TO PLASTIC ANALYSIS 42
Plastic behaviour of materials — idealizations.
Experimental confirmation of laws of plasticity.
Applications where there exists:
(i) No elastic-plastic interface;
(ii) An elastic-plastic interface.

Reference Texts
Advanced Mechanics of Materials
Ford, H.
(1st ed. Longmans 1963)
Plasticity
Hill, R.
(Oxford 1950)
Introduction to Plasticity
Prager, W.
(Addison-Wesley 1959)

ME447 AN INTRODUCTION TO EXPERIMENTAL ANALYSIS 42
The subject presents a systematic approach to the analysis and design of experiments and the interpretation of experimental results. Particular emphasis is placed on data processing and analysis. Selected experiments involving both physical and computer solutions will be undertaken.

Prescribed Text
Engineering Experimental Design Fundamentals
Bartee, E. M.
(Prentice-Hall 1968)

Reference Texts
Experimental Stress Analysis
Dally, J. W. & Riley, W. F.
(International Student ed. McGraw-Hill 1965)
Physical Measurements and Analysis
Cook, N. H. & Rubinowicz
(Addison-Wesley 1963)
Basic Statistical Methods for Engineers and Scientists
Neville, A. M. & Kennedy, J. B.
(International Textbook Co. 1964)
ME448 AN INTRODUCTION TO PHOTOMECHANICS  
42 Hours
Model analysis for two and three dimensional problems which may involve static, dynamic or thermal loading conditions.
Calibration of material and solution of disc problem.

Reference Texts
Photoelasticity  
Frocht, M. M.  
Vol. 1 1st ed. (Wiley 1945)
Vol. 2 1st ed. (Wiley 1948)

Introduction to Photomechanics  
Durelli, A. J. & Riley, W. F.  
(Prentice-Hall 1965)

Experimental Stress Analysis  
Dally, J. W. & Riley, W. F.  
(McGraw-Hill 1965)

ME449 RELIABILITY ANALYSIS FOR MECHANICAL SYSTEMS  
42 Hours
Reliability Case Studies. Automobile suspension ignition system. Measuring system.

Reference Texts
Probabilistic Reliability, An Engineering Approach  
Shooman, M. L.  
(McGraw-Hill 1968)

Fundamentals for Reliability Theory  
Polovko, A. M.  
(Academic Press 1968)

Engineering Reliability and Long Life Design  
Havlík, R. P.  
(Van Nostrand 1964)

ME453 FLUID MECHANICS  
42 Hours
Lectures and laboratory work dealing with a selection from the following topics:
Applications of hydrodynamics
Hydraulic transients
Fractional analysis applications
Cavitation studies
Topics in turbomachinery
One-dimensional compressible flow.

Reference Texts
Applied Hydrodynamics  
Vallentine, H. R.  
(Butterworths)

Hydro-electric Engineering Practice  
Brown, J. H.  
Vol. 2 (Blackie)

Hydraulic Transients  
Streeter, V. L. & Wylie, E. B.  
(McGraw-Hill)

ME454 TURBOMACHINERY  
42 Hours

Reference Texts
Pumps, Fans and Compressors  
Kovats, A. & Desmur, G.  
(Blackie)

Axial Flow Turbines, Fluid Mechanics and Thermodynamics  
Horlock (Bullivants)
**Prescribed Texts**
*Fundamentals of Classical Thermodynamics*
Van Wylen, G. J. & Sonntag, R. E.
(John Wiley)

*Air Conditioning and Refrigeration*
Jennings, B. H. & Lewis, S. R.
(International Text Book)

**Reference Texts**
*Principles of General Thermodynamics*
Hatsopoulos, G. N. & Keenan, J. H.
(John Wiley)

*Guide and Data Book*
ASHRAE

*Thermal Environmental Engineering*
Threlkelo, J. L.
(Prentice-Hall)

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**ME474 HEAT TRANSFER**
42

Development of the general form of the continuity, momentum and energy equations. Application and solution for various physical situations. Turbulent flow heat transfer. Some advanced conduction and radiation heat transfer studies.

**Prescribed Texts**
*Fluid Dynamics and Heat Transfer*
Knudsen, J. G. & Katz, D. L.
(McGraw-Hill)

*Basic Equations of Engineering Science*
Hughes, W. F. & Gaylord, E. W.
(Schaum Publishing Co.)

**Reference Texts**
*Transport Phenomena*
Bird, R. B., Stewart, W. E. & Lightfoot, E. N.
(Wiley)

*Conduction Heat Transfer*
Schneider, P. J.
(Addison-Wesley)

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**ME482 ENGINEERING ECONOMICS**
42

The time value of money, economic criteria for engineering decision making, purchase and replacement economics, cost/benefit analysis. Critical evaluation of cost data for decision making.

Introduction to demand, supply, price and the policy of the firm in various market situations.

Introduction to decision making theory, Bayesian statistics and operations research.

**Prescribed Text**
*Economic Decision Models*
Riggs, J. L.

**Reference Texts**
*Engineering Economy*
Theusen, H. G., Fabrycky, W. J. & Theusen, G. J.
(Prentice-Hall)

*The Elements of Economic Analysis*
Braddock, G. R. & Archbold, D. A.
(McGraw-Hill)

*Engineering Economy*
DeGarmo, E. P. & Canada, J. R.
(Collier-Macmillan)

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**ME485 TOOL DESIGN**
42

The design of tools, jigs and fixtures for various material forming and machining processes. The relative economics of jigs, fixtures and special tooling.
ME486 INDUSTRIAL DESIGN
The creative process and the factors influencing it—detailed study of the problems associated with product design. The integration of analysis, synthesis and evaluation of product design. Studio assignment associated with the design.

Reference Texts
Industrial Design
Van Doren, H. (McGraw-Hill)
Introduction to Creative Design
Edel, D. H. (ed.) (Prentice-Hall)
The Roots of Modern Design
Schanfer, H. (Studio Vista)
Machines and Perception in Industrial Design
Mayle, W. R. (Studio Vista)
Art and Industry
Read, H. (Faber & Feba)
Designing for Production
Baldwin, E. N. & Niebel, B. W. (Irwin)
The Nature of Design
Pye, D. (Studio Vista)

ME487 OPERATIONS RESEARCH—DETERMINISTIC MODELS
Concept of optimisation; Optimisation approaches; Formulation of Models; Linear Programming; Allocation and assignment; Simplex Method; Duality; Theory of Games, Parametric Programming; Integer Programming; Zero-one Programming; Quadratic Programming; Decomposition principle. Network theory; Dynamic Programming. Geometric Programming. Applications.

Reference Texts
Operations Research
Taha, H. A. (Macmillan)
Introduction to Operations Research
Hillier, I. S. & Lieberman, G. J. (Halden-Day)
Mathematical Programming
McMillan, C. (Wiley)
Systems Analysis—A Computer Approach to Decision Models
McMillan, C. & Gonzalez, P. F. (Irwin-Dorsey)

ME488 OPERATIONS RESEARCH—PROBABILISTIC MODELS
Statistical decision theory; Forecasting, methods moving average exponentially smoothed average. Inventory control theory. Fixed order quantity; fixed order cycle systems; Production—inventory systems. Queueing theory; simple queue Multi-server queues. Queues in series. Transients in queues; simulation of systems. Applications.

Reference Texts
Smoothing, Forecasting and Prediction of Time Series
Brown, R. G. (Prentice-Hall)
Operations Research
Taha, H. A. (Macmillan)
Management Decision Making under Uncertainty
Analysis for Inventory Systems
Hadley, G. & Whitin, T. M. (Prentice-Hall)

ME489 OPERATIONS RESEARCH—APPLICATIONS IN INDUSTRY
The case study approach to industrial cases. The application of operations research to industrial problems.
Reference Texts
Exercises in Industrial Management
Eilon, S., Hall, R. I. & King, J. R.
(Macmillan 1966)

Cases in Operations Management
McKenny, J. L., & Rosenbloom, R. S.

Casebooks in Production Management
Dooley, A. R., Holstein, W. K., McKenny, J. L., Rosenbloom, R. S., Skinner, C. W. & Thurston, P. H.
(Wiley 1968)

Case Analysis and Business Problem Solving
Schnelle, K. E.
(McGraw-Hill 1967)

A Manager's Guide to Operational Research
Rivett, B.H.P., & Ackoff, R. L.
(Wiley 1963)

A Guide to Operation Research
Duckworth, E.
(Methuen 1965)

ME491 TECHNICAL SEMINAR 42
ME496 PROJECT/SEMINAR 126
ME091 INDUSTRIAL EXPERIENCE UNITS to ME096  See page 241.

NA201 THEORETICAL NAVAL ARCHITECTURE 42
Hydrostatics, trim and stability, dynamic stability, free surface effects, inclining experiment, launching calculations, use of computers, loading and discharging.

Reference Text
Theory of Naval Architecture
Robb, A. M.
(Charles Griffin & Co.)

NA221 NAVAL ARCHITECTURE TECHNOLOGY 42
Ships' construction and production methods, framing systems, lofting.

Reference Text
Know Your Own Ship
Walton & Baxter
(Charles Griffin & Co.)

NA241 APPLIED NAVAL ARCHITECTURE 84
Drawing exercises, lines plan, structural drawing, hydrostatic calculations.

NA311 SHIP DESIGN AND CONSTRUCTION 42
Design criteria, tonnage, safety requirements, hull form, general arrangements, propulsion machinery, auxiliary machinery, ships' services. Structural analysis, structural design to the requirements of a classification society.

Prescribed Texts
Rules and Regulations for the Construction and Classification of Steel Ships
(Lloyds Register of Shipping)

Marine Engineering
Harrington, R. L. (ed.)
(The Society of Naval Architects)

Ocean Engineering
Brahtz, J. F. (ed.)
(John Wiley)

Reference Texts
Strength of Ships' Structures
Muckle, W.
(Edward Arnold)

Principles of Naval Architecture
The Society of Naval Architects & Marine Engineers
NA342  APPLIED NAVAL ARCHITECTURE  84
Design and drawing practice relating to ship design and construction and resistance and propulsion of ships.

Reference Text
*Principles of Naval Architecture*
The Society of Naval Architects & Marine Engineers

NA351  RESISTANCE AND PROPULSION OF SHIPS  42

Reference Texts
*Theory of Naval Architecture*  Robb, A. M.
(Charles Griffin & Co.)

*The Speed and Power of Ships*  Taylor, D. W.
(U.S. Maritime Administration, Washing, D.C.)

NA402  SPECIAL PURPOSE SHIPS  42
Ships for special cargoes, dredges, tugs, submersibles, offshore structures, supply tenders etc. Design criteria.

Prescribed Text
*Ocean Engineering*  Brahtz, J. F. (ed.)
(John Wiley)

NA431  SHIPS' MACHINERY  42
Propulsion machinery, auxilliary machinery, deck machinery, rigging, navigational aids.

Prescribed Text
*Marine Engineering*  Harrington, R. L. (ed.)
(The Society of Naval Architects)

NA452  THEORETICAL NAVAL ARCHITECTURE  42
Wave theory, ships dynamics, stabilisers. Sea-going qualities, dynamic positioning.

Reference Texts
*Theory of Naval Architecture*  Robb, A. M.
(Charles Griffin & Co.)

*Principles of Naval Architecture*
The Society of Naval Architects & Marine Engineers

NA481  SHIPYARD PRODUCTION AND MANAGEMENT  42
Pre-fabrication techniques, standardisation, yard lay-out, production planning, contract law, launching arrangements.

NA496  PROJECT AND REPORT  126

ME091 ME096  INDUSTRIAL EXPERIENCE UNITS

These subject units are designed to formalise the periods of Industrial Experience which may be studied in lieu of elective units by part-time students. Each of the Industrial Experience units is equivalent to one elective unit of 42 hours. Students who wish to study any or all of the Industrial Experience units ME091-096 in lieu of elective units will be required to attend some 10 lecture and tutorial periods which will deal with working and professional environments, essentials of communication and report writing. In addition, each student will be required to present a seminar relating to aspects of his experience and to report to his industrial experience tutor twice per term. Some assignments relating to employment and experience will be set. Students will also be required to present a report giving a connected account and critical evaluation of his engineering activities and experience during the year. Such units may be used by part-time students in lieu of the elective requirements of clauses 2 and 3, page 199, or vice versa.

Reference Text
*A Guide to Students Undertaking Project Work*  Carmichael, A. J.
(University of Newcastle)
### POSTGRADUATE DIPLOMA SUBJECTS

<table>
<thead>
<tr>
<th>ME581D METHODS ENGINEERING</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>The design of manufacturing facilities, including the product, equipment selection, plant location and layout. The use of human and physical resources, including motion and time study, incentives, work sampling, machine interference; an introduction to ergonomics.</td>
<td>42</td>
</tr>
</tbody>
</table>

**Prescribed Text**
*Motion and Time Study*  
Niebel, B. W. (Irwin)

**Reference Texts**
*Methods Engineering*  
Krick, E. V. (Wiley)

*Motion and Time Study*  
Barnes, R. M. (Wiley)

*Production Handbook*  
Alford, L. P. & Bangs, J. R. (eds.) (Ronald)

*Industrial Engineering Handbook*  

<table>
<thead>
<tr>
<th>ME582D INDUSTRIAL COMPUTATIONS</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A review and revision of probability theory, random variables and distributions. Sampling distributions. Confidence interval estimation. Standard tests of significance. Linear regression and least squares analysis of data.</td>
<td>42</td>
</tr>
</tbody>
</table>

**Prescribed Text**
*Introductory Engineering Statistics*  
Guttman, I. & Wilks, S. S. (Wiley)

**Reference Texts**
*Statistical Methods for Technologists*  
Paradine, C. G. & Rivett, B.H.P. (E.U.P.)

*Probability and Random Variables*  

*Facts from Figures*  
Moroney, M. J. (Pelican)

*Introduction to Statistics*  
Walpole, R. E. (Macmillan)

<table>
<thead>
<tr>
<th>ME583D PRODUCTION ENGINEERING</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production planning; Inventory functions; Forecasting; Scheduling and control of production. Design of a production control system. Quality and quantity control. Production inventory systems.</td>
<td>42</td>
</tr>
</tbody>
</table>

**Prescribed Text**
*Production Systems*  
Riggs, J. L. (Wiley)

**Reference Texts**
*Management Decision for Production Operations*  
Brown, E. G. (Holt, Rinehart & Winston)

*Modern Production Management*  
Buffa, E. S. (Wiley)

*Production Planning and Inventory Control*  

*Computer Modelling and Simulation*  
Martin, F. F. (Wiley)

*Production Handbook*  
Alford, L. P. & Banks, J. R. (eds.) (Ronald)

*Industrial Engineering Handbook*  

<table>
<thead>
<tr>
<th>ME584D OPERATIONS RESEARCH</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>The formation and optimisation of Mathematical models. The development of decision rules. The application of operational research methods to Industrial situations.</td>
<td>28</td>
</tr>
</tbody>
</table>

**Reference Text**
*Fundamentals of Operations Research*  
Ackoff, R. L. & Sasieni, M. W. (Wiley)

<table>
<thead>
<tr>
<th>ME585D ACCOUNTING AND FINANCIAL STUDIES</th>
<th>Hours</th>
</tr>
</thead>
</table>
| *ME681D INDUSTRIAL LAW*  
* For subject descriptions see under Faculty of Economics and Commerce on page 281. | 56 |

84
ME682D CASE STUDIES IN INDUSTRIAL MANAGEMENT 42

Studies in organisational and executive action requirements of specific industrial situations, using the case study method.

Reference Texts

*Selected Case Problems in Industrial Management*
  Holden, P. E. & Shallenberger, F. K. (Prentice-Hall)

*Management, Analysis, Concepts and Cases*
  Haynes, W. W. & Massie, J. L. (Prentice-Hall)

*The World of Work*
  Dubin, R. (Prentice-Hall)

*Formal Organisation*
  Blank, P. M. & Scott, W. R. (Routledge & Keegan)

*Appraisal of Management*
  Martindell, I. (Harper-Bros.)

*Managerial Psychology*
  Leavitt, H. J. (Chicago University Press)

*Organisations: Structure and Behaviour*
  Litterer, J. (Wiley)

ME683D ENGINEERING ECONOMICS 84

The structure of the Australian economy. The theory of the firm, selection of processes and equipment. Decision theory. The application of engineering economic analysis to industrial operations and engineering projects.

Reference Texts

*Principles of Engineering Economy*
  Grant, E. L. & Ireson, E. G. (Ronald)

*The Finance and Analysis of Capital Projects*
  Merritt, A. J. & Sykes, A. (Longmans)

*Economics*
  P. A. Samuelson (McGraw-Hill)

ME684D PROJECT 84

MASTER OF ENGINEERING SCIENCE
(M.Eng.Sc.) Degree Course

GENERAL

The Faculty of Engineering offers a group of subjects which comprise the major part of the Master of Engineering Science formal Master's degree programme.

The Master of Engineering Science degree course is offered on both a part-time and full-time basis in order to give graduate engineers the opportunity to update themselves in technological areas of interest.

This degree course is flexible in that candidates for the degree may select from a large number of subject combinations which may span one or more engineering Departments. Some undergraduate or postgraduate diploma material may be taken from inside or outside the Faculty of Engineering as credit for the degree, provided that such material is relevant to the programme as a whole. This possibility offers the advantage of advanced training and education which is broad in scope. The course supplements existing Master of Engineering and Doctor of Philosophy programmes which are usually of a research nature.

SCOPE OF COURSE

Subject units will be offered on a Faculty-wide basis in areas of existing academic specialisation. It will be necessary for the Dean, as administrative head of the Faculty, to approve the programme.

In general the basic "unit" specified in the Degree Requirements is a programme which involves the student in a total of approximately 120 hours' work. This total includes all formal course work plus assignments and study. If the "unit" is a formal instructional course the 120-hour total includes 42 hours of lectures or the equivalent. A number of the topics offered consist of two units. A complete M.Eng.Sc. programme normally consists of ten units of formal course work and two units of project work although in special cases the size of the project may be increased to three or four units, with a corresponding reduction in the formal course work.

Under normal circumstances, the course may be completed in one year when taken on a full-time basis, and two years when taken on a part-time basis.

The following pages contain Departmental listings of approved M.Eng.Sc. subjects and some suggested programmes for integrated courses in various areas of interest. A student may, however, select any combination of the listed topics subject to the approval of the Head(s) of the relevant Department(s) and the Dean.
RECOMMENDED PROGRAMMES

MASTER OF ENGINEERING SCIENCE

It is recommended that candidates wishing to specialise in one of the following areas should select their course work programme from the subjects listed for that area.

A. APPLIED MECHANICS/STRUCTURES

Subjects offered by the Department of Civil Engineering
CE511G Advanced Structural Analysis and Design 2
CE512G Prestressed Concrete Design 2
CE553G Civil Engineering Systems 2

Subjects offered by the Department of Mechanical Engineering
ME503G Design of Experiments for Engineering Research 2
ME511G Experimental and Theoretical Stress Analysis 2
ME515G Advanced Design Concepts in Mechanical Engineering 2
ME517G Materials Handling and Transportation Systems 2
ME535G Vibration and Noise Problems in Industry 2
ME536G Advanced Dynamics of Machines 1
ME546G Elasticity, Plasticity and Applications 2
ME581G Mathematical Programming 2

B. COMPUTER SCIENCE

Subjects offered by the Department of Electrical Engineering
EE516 Computer-Aided Analysis of Power Systems 1
EE563 Computer Operating Systems 1
EE564 Compilers, Assemblers and Interpreters 1
EE565 Pattern Recognition 1
EE566 Automata and Computing Machines 1
EE567 Computer Process Control 1
EE568 Advanced Computer Architecture 1
EE569 Formal Languages and Automata 1

Subjects offered by the Department of Mechanical Engineering
ME581G Mathematical Programming 2

Subjects offered in other Faculties

Department of Mathematics
Programming and Algorithms 1
Data Structures and Programming 1
Mathematics III, Topic Z 1

Department of Commerce
Commercial Programming 1

C. ENGINEERING MATERIALS

Subjects offered by the Department of Civil Engineering
CE552G Transportation and Traffic Engineering 2

Subjects offered by the Department of Mechanical Engineering
ME503G Design of Experiments for Engineering Research 2
ME511G Experimental and Theoretical Stress Analysis 2
ME517G Materials Handling and Transportation Systems 2
ME546G Elasticity, Plasticity and Applications 2
ME581G Mathematical Programming 2

Together with approved topics and subjects which may be offered by the Faculties of Science and Applied Science

D. ENVIRONMENTAL STUDIES/ENVIRONMENTAL ENGINEERING

Subjects offered by the Department of Chemical Engineering
ChE501 Chemical Process Principles for Effluent Control 1
ChE513 Advanced Combustion 2
ChE521 Air Pollution Effluent Control 2
ChE522 Control of Industrial Liquid Effluents 2
ChE523 Advanced Topics in Effluent Control 1 or 2

Subjects offered by the Department of Civil Engineering
CE534G Water and Waste Water Treatment 2
CE535G Water Pollution and Water Quality Management 2

Subjects offered by the Department of Mechanical Engineering
ME503G Design of Experiments for Engineering Research 2
ME505G Systems Analysis and Design 2
ME507G Resources Planning and Allocation 2
ME508G Air Pollution Studies 2
ME535G Vibration and Noise Problems in Industry 2
ME575G Heat Transfer 1
ME581G Mathematical Programming 2

Together with approved topics or subjects which may be offered by other Faculties
E. FLUID MECHANICS/WATER RESOURCES ENGINEERING

Subjects offered by the Department of Civil Engineering  Units
CE531G Advanced Fluid Mechanics (Civil)  2
CE532G River and Coastal Engineering  2
CE534G Waste and Waste Water Treatment  2
CE535G Water Pollution and Water Quality Management  2

Subjects offered by the Department of Mechanical Engineering
ME505G Systems Analysis and Design  2
ME554G Fluid Mechanics  1
ME555G Advanced Turbomachinery  2
ME581G Mathematical Programming  2

F. FURNACE ENGINEERING

Subjects offered by the Department of Chemical Engineering
ChE502 Reaction Engineering  2
ChE511/512 Advanced Heat Transfer  2
ChE513 Advanced Combustion  2
ChE514 Furnace Engineering  2
ChE521 Air Pollution Effluent Control  2
ChE542 Comminution  1 or 2

Subjects offered by the Department of Electrical Engineering
EE541 Modern Control  1
EE542 Modern Control  1

Subjects offered by the Department of Mechanical Engineering
ME503G Design of Experiments for Engineering Research  2
ME581G Mathematical Programming  2

G. OPERATIONS RESEARCH/MANAGEMENT SCIENCE

Subject offered by the Department of Chemical Engineering
ChE531 Process Optimization  2

Subjects offered by the Department of Civil Engineering
CE551G Construction Planning and Control  2
CE553G Civil Engineering Systems  2

Subjects offered by the Department of Mechanical Engineering
ME502G Operations Research and Decision Theory  2
ME503G Systems Analysis and Design  2
ME581G Mathematical Programming  2
ME582G Probabilistic Models in Operations Research  2
ME583G Modelling of Management Problems  1
ME584G Simulation  1
ME685G Advanced Operations Research  2

Subjects offered by other Faculties
Department of Mathematics
Selected Topics in Mathematics IV.

Department of Commerce
Selected topics from the Diploma in Business Studies

Where possible it is recommended that students who wish to study in this area undertake subjects ME581G to ME584G inclusive as a first year programme.

H. MINERAL PROCESS ENGINEERING

Subjects offered by the Department of Chemical Engineering
ChE502 Reaction Engineering  2
ChE513 Advanced Combustion  2
ChE514 Furnace Engineering  2
ChE531 Process Optimization  2
ChE541 Particulate Separations  1 or 2
ChE542 Comminution  1 or 2
ChE603 Advanced Problems in Mass Transfer and Reaction Engineering  1 or 2

Subjects offered by the Department of Electrical Engineering
EE541 Modern Control  1
EE542 Modern Control  1

Subjects offered by the Department of Mechanical Engineering
ME502G Operations Research and Decision Theory  2
ME503G Design of Experiments for Engineering Research  2
ME546G Elasticity, Plasticity and Applications  2
ME581G Mathematical Programming  2
ME685G Advanced Operations Research  2
I. SYSTEMS

Units

Subject offered by the Department of Civil Engineering
CE553G  Civil Engineering Systems  2

Subjects offered by the Department of Electrical Engineering
EE541  Modern Control  1
EE542  Modern Control  1
EE543  Optimization Techniques  1
EE544  Communication Systems  1
EE545  Communication Systems  1
EE546  Advanced Topics in Control Systems  1
EE547  Advanced Topics in Communication Systems  1
EE567  Computer Process Control  1

Subjects offered by the Department of Mechanical Engineering
ME505G  Systems Analysis and Design  2
ME581G  Mathematical Programming  2

Subjects offered by other Faculties
Department of Mathematics
  Stochastic Processes
  Signal Detection

GENERAL STATEMENT
Before preparing their course for any year students should check in the
Departmental lists which subjects are to be offered in that year.

Approval for any course chosen from the subject listings must be given by
the Head of the Department concerned and the Dean of the Faculty of
Engineering.

DEPARTMENT OF CHEMICAL ENGINEERING

MASTER OF ENGINEERING SCIENCE TOPICS

The following topics have been approved for inclusion in the M.Eng.Sc.
course programme. Those topics which will not be offered in 1974 are
marked †.

Topics are offered subject to adequate enrolment. Units are equivalent to
42 hours contact time.

Formal lecture courses 1974

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE501</td>
<td>1</td>
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<tr>
<td>ChE502</td>
<td>1</td>
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<tr>
<td>ChE503</td>
<td>2</td>
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<tr>
<td>ChE511</td>
<td>1</td>
</tr>
<tr>
<td>ChE512</td>
<td>1</td>
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<tr>
<td>ChE513</td>
<td>2</td>
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<tr>
<td>ChE514</td>
<td>2</td>
</tr>
<tr>
<td>ChE521</td>
<td>2</td>
</tr>
<tr>
<td>ChE522</td>
<td>2</td>
</tr>
<tr>
<td>ChE531</td>
<td>2</td>
</tr>
</tbody>
</table>

Tutorial topics

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE541</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE542</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE603</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE613</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE623</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

On consultation with the Department, courses can be planned to specialise
either in environmental control or in furnace engineering.

* First half year
** Second half year
*** Full year
† Chemical Process Principles is recommended as a prerequisite to these
courses for students who have not previously completed Chemical
Engineering subjects.
ChE501 CHEMICAL PROCESS PRINCIPLES FOR EFFLUENT CONTROL
This is primarily a bridging course for students in the field of environmental control who have not had a chemical engineering background, and deals with specific problems in stoichiometry, particle separation and reaction rate related to gas and water treatment methods.

References
Basic Principles and Calculations in Chemical Engineering (2nd ed.) Himmelblau, D. M. (Prentice-Hall 1967)
Chemical Reaction Engineering (2nd ed.) Levenspiel, O. (Wiley 1972)

ChE502 REACTION ENGINEERING
Kinetics of Reactions involving mass transfer with Chemical Reaction and their application to the design of reactors for gas-solid catalytic reactions.

ChE503 COMPUTATIONAL METHODS IN CHEMICAL ENGINEERING
The advent of digital computers has changed the approach of chemical engineers to design and analysis. The course is aimed at illustrating how mathematics may be applied to chemical engineering problems when it is realised that the resulting model can be solved on computers. Examples will be taken from statistics, fluid mechanics, stage operations, reaction engineering, automatic control and optimization.

Text
Reference
Fortran IV Manual

ADVANCED HEAT TRANSFER
ChE511 Part (a) *

ChE512 Part (b) **
Studies in heat transfer in packed beds (e.g. blast furnaces, catalytic reactors) and in unsteady conditions.

References
To be advised.

ChE513 ADVANCED COMBUSTION ***
A detailed study of the nature of industrial flames and their behaviour in furnace enclosures—the chemical reaction involved, mixing aerodynamics of jets, flames and combustion systems; prediction of flame length, shape and radiative properties.

Texts
Combustion of Pulverized Coal Field, M. A. et al (BCURA 1967)

References

ChE514 FURNACE ENGINEERING
The design and operation of furnaces; heat balances, calculation of losses, insulation, gas recuperation and regeneration; approximate methods of heat-transfer computation; temperature distribution; refractories; physical construction; control; fuels and firing methods; economics of fuel selection and waste-heat recovery; effluent pollution control.

Texts
Industrial Furnaces Trinck, W. & MacWhinney (J. Wiley)

ChE521 AIR POLLUTION EFFLUENT CONTROL ***
The general problem; legislative controls; combustion and other processes producing gaseous or gas carried effluents; control methods; practice and fundamental principles of gas washing, settlement filtration, cycloning and electrostatic precipitation. Process modification, by-product recovery, removal of pollutants by reaction, costs and economics.
ChE522 CONTROL OF INDUSTRIAL LIQUID EFFLUENTS

The general problem; statutory requirements; practice, fundamental principles and automatic control characteristics of neutralization and other chemical recovery methods, flocculation, sedimentation, biological digestion, ion-exchange and molecular sieves. By-product recovery.


References

Water and Waste Water Engineering (Vol. 2)
Fair, G. M., Geyer, J. C. & Okun, D. A.
(Wiley 1968)

Liquid Waste of Industry
Nemerow, N. L.
(Addison-Wesley 1971)

ChE531 PROCESS OPTIMIZATION

The course will consist of lectures, tutorials and guided reading on the mathematical methods used in the optimisation of process plant. Students should be proficient in mathematics and computer programming. Numerical and analytical methods for the optimising of single and multivariable functions including hill climbing techniques. Linear and dynamic programming. Economic profitability criteria including the handling of uncertainty—simulation. Introduction to reliability engineering.

Text

Cost and Optimization Engineering
Jelen, F. C.
(McGraw-Hill 1970)

Reference

Process Optimization Theory and Practice
Beveridge & Schecter
(McGraw-Hill 1970)

ChE603 ADVANCED PROBLEMS IN MASS TRANSFER AND REACTION ENGINEERING

Principles and design methods for multi-component distillation and absorption, ion-exchange equipment, catalytic reactors etc.; problems arising from bubble and drop coalescence.

References

Design of Equilibrium Stage Processes
Smith, B. D.
(McGraw-Hill 1963)

Elementary Chemical Reactor Analysis
Rutherford, Aris
(Prentice Hall 1969)

TUTORIAL COURSES—SELECTED TOPICS

In a number of fields of particle mechanics, comminution or reaction engineering, there are particular skills either within the Department or available from specialists in the Newcastle Area, and guided-reading tutorial courses may be arranged for students with specific interests in the fields of ore, coal, or other solid feed separation and preparation, in Reaction Engineering, or in detailed study of advanced topics in the field of environmental control.
MASTER OF ENGINEERING SCIENCE SUBJECTS

The following subjects have been approved for inclusion in the M.Eng.Sc. course programme. Those subjects which will not be offered in 1974 are marked †. The other subjects will be offered subject to adequate enrolment.

LECTURE COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE511G</td>
<td>Advanced Structural Analysis and Design ***</td>
<td>2</td>
</tr>
<tr>
<td>CE512G</td>
<td>Prestressed Concrete Design ***</td>
<td>2</td>
</tr>
<tr>
<td>CE521G</td>
<td>Materials of Construction ***</td>
<td>2</td>
</tr>
<tr>
<td>CE522G</td>
<td>Advanced Rock and Earth Engineering</td>
<td>2</td>
</tr>
<tr>
<td>†CE531G</td>
<td>Advanced Fluid Mechanics (Civil) ***</td>
<td>2</td>
</tr>
<tr>
<td>CE532G</td>
<td>River and Coastal Engineering ***</td>
<td>2</td>
</tr>
<tr>
<td>CE534G</td>
<td>Water and Waste Water Treatment ***</td>
<td>2</td>
</tr>
<tr>
<td>CE535G</td>
<td>Water Pollution and Water Quality Management ***</td>
<td>2</td>
</tr>
<tr>
<td>†CE551G</td>
<td>Construction Planning and Control ***</td>
<td>2</td>
</tr>
<tr>
<td>CE552G</td>
<td>Transportation and Traffic Engineering ***</td>
<td>2</td>
</tr>
<tr>
<td>†CE553G</td>
<td>Civil Engineering Systems ***</td>
<td>2</td>
</tr>
</tbody>
</table>

* First half year  
** Second half year  
*** Full year

DESCRIPTION OF TOPICS AND TEXTS

**CE511G ADVANCED STRUCTURAL ANALYSIS AND DESIGN ***

This course is oriented towards the analysis and design of steel structures. Two topics from the following will be selected.

(a) Instability of beams, columns, and frames, including analysis of thin walled sections in torsion.

(b) Matrix analysis of structures, including finite element methods. (It will be assumed that students have some familiarity with the linear matrix displacement method).

(c) Advanced plastic analysis including linear programming methods of analysis and design, and the provision of SAA CA1.

**Reference Texts**

- *Structural Members and Frames* Galambos, T. V. (Prentice-Hall 1968)

**CE512G PRESTRESSED CONCRETE DESIGN**

Review of design procedures of statically determinate prestressed concrete structure, design of indeterminate prestressed concrete structures. Study of the effects of creep and shrinkage. Detailed study of anchorage zones in pre- and post-tensioned members.

**Prescribed Texts**

- *Prestressed Concrete Vols. I and II* Guyon, Y. (Wiley)
- *Prestressed Concrete Design and Construction* Leonhardt, F. (Wilhelm Ernst & Sohn)

**CE521G MATERIALS OF CONSTRUCTION**

2. Construction Materials
   (a) Steel: Metallurgy; precautions in fabrication, corrosion protection, brittle fracture prevention, structural properties and uses.
CE531G ADVANCED FLUID MECHANICS (CIVIL) ***
After a grounding in theoretical hydrodynamics, this course will cover topics in advanced hydraulics that are relevant to civil engineering design problems, mainly in the field of steady and unsteady open channel flow, pipe systems, and the design and performance of hydraulic structures.

**Prescribed Text**
Open Channel Flow
Henderson, F. M. (Collier-Macmillan International)

**Reference Texts**
- Applied Hydrodynamics
  Vallentine, H. R. (Butterworths)
- Hydraulic Transients
- Hydraulic Transients

CE532G RIVER AND COASTAL ENGINEERING***


**Prescribed Texts**
Open Channel Flow
Henderson, F. M. (Collier-Macmillan 1966)

Hydraulics of Sediment Transport

Coastal Hydraulics

**Reference Texts**
- Oceanographical Engineering
  Wiegel, R. L. (Prentice-Hall 1964)
- Fluvial Processes in Geomorphology
  Leopold, L. B., Wolman, M. G. & Miller, J. P. (Freeman 1964)
- An Introduction to Fluvial Hydraulics
  Leliavsky, S. (Dover 1966)
- Handbook of Fluid Dynamics
Development of drinking water standards. Sampling and testing procedures. Developments and trends in wastewater engineering. Wastewater characteristics.

Physical unit operations, chemical unit procedures, biological unit processes. Design of facilities for physical and chemical treatment of water and wastewater. Design of biological wastewater treatment units. Rural water supply precautions. Small sewage treatment and disposal systems.

**Reference Texts**

Water and Wastewater Engineering

Water Treatment Plant Design
American Water Works Association  (New York, A.W.W.A. 1969)

Manual of British Water Engineering Practice


**Reference Texts**

River Pollution Vol. 2 Causes and Effects  Klein, L.  (Butterworths 1962)

River Pollution Vol. 3 Control  Klein, L.  (Butterworths 1966)


Disposal of Sewage and Other Waterborne Wastes  Imhof, K., Muller, W. J. & Thistlethwayte, D. K. B.  (2nd ed. Butterworth 1971)


1. Engineering Economics: Economic comparisons, pretender or contract planning, tendering procedures, philosophy of tendering.

2. Construction Planning: Network analysis, organisation charts for labour, materials and plant, cost and time control.

3. Planning Assignment: Example of major project planning involving planning for construction, estimating and submission of tender.

**Prescribed Text**

Civil Engineering Management  Antill, J. M.  (Angus & Robertson 1970)

**Reference Texts**


Economic Decision Models for Engineers and Managers  Riggs  (McGraw-Hill 1968)

Introduction to Operations Research  Churchman, Arnoiff & Ackoff  (Wiley 1957)
The following subjects have been approved for inclusion in the M.Eng.Sc. course programme. Those subjects which will not be offered in 1974 are marked †. The other subjects will be offered subject to adequate enrolment.

All subjects are 1 unit (42 hours) unless otherwise noted.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Texts</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE516</td>
<td>Computer-Aided Analysis of Power Systems</td>
<td></td>
<td>Stagg and El-Abiad</td>
</tr>
<tr>
<td>EE541</td>
<td>Modern Control</td>
<td>EE341 and EE342</td>
<td>Anderson, B. D. &amp; Moore, J. B.</td>
</tr>
<tr>
<td></td>
<td>(Linear Optimal Control Theory)</td>
<td></td>
<td>(Prentice-Hall 1971)</td>
</tr>
<tr>
<td>EE542</td>
<td>Modern Control **</td>
<td></td>
<td>Kirk, D. R.</td>
</tr>
<tr>
<td></td>
<td>(Nonlinear Optimal Control Theory)</td>
<td></td>
<td>(Prentice-Hall 1971)</td>
</tr>
<tr>
<td>EE543</td>
<td>Optimization Techniques</td>
<td></td>
<td>Sage, A. P.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Prentice-Hall 1968)</td>
</tr>
</tbody>
</table>
EE543  OPTIMIZATION TECHNIQUES (not offered in 1974)
A course including lectures, tutorial and computer analysis. Mathematical background to optimization. Comparison of optimization methods; engineering applications — such as to problems of identification, control, pattern recognition and resource allocation.

Prescribed Text
Introduction to Optimization Techniques
(Fundamentals and Applications of Nonlinear Programming) Masanao Aoki
(New York, Macmillan 1971)

Reference Text
Optimization Theory with Applications Donald Pierre
(New York, Wiley 1969)

EE544  COMMUNICATION SYSTEMS **
This course introduces the common forms of analog modulation, as well as pulse modulation systems including pulse code modulation. Performance in the presence of noise is considered.

Prerequisites
EE331, EE332 or EE341, EE342 or consent of instructor.

Prescribed Text
(McGraw-Hill 1971)

EE545  COMMUNICATION SYSTEMS *
Stochastic processes including stationary gaussian processes from a time-domain viewpoint. Kalman filtering and application to AM and FM demodulation.

Prerequisite
EE342 or equivalent.

Prescribed Text
Introduction to Stochastic Control Theory Astrom, K. J.
(Academic Press 1970)

EE546  ADVANCED TOPICS IN CONTROL SYSTEMS*
A course of lectures, tutorial and laboratory work on sampled-data control systems, z-transform, state-variable techniques, sampling and reconstruction.
A term paper will be required.

Prescribed Text
Discrete-Time and Computer Control Systems
Cadzow, J. A. & Martens, H. R.
(Prentice-Hall Inc. 1970)

Reference Text
Discrete-Data Control Systems Kuo, B. C.
(Prentice-Hall Inc. 1970)

EE547  ADVANCED TOPICS IN COMMUNICATION SYSTEMS**
A primarily experimental course with some lectures and tutorial work. Generation and modulation of microwave frequencies; measurement of frequency, wave length and attenuation; use of stubs and other forms of impedance matching.
Students will also prepare a term paper.

Prerequisite
EE451 or Physics III or consent of instructor.

EE563  COMPUTER OPERATING SYSTEMS *
Functions of an Operating System. Multiprogramming and multi-access systems. Input-output control, file management. Multiprocessor systems. The user interface.

Prerequisite
EE361

Prescribed Text
Computer Operating Systems Barron
(Chapman & Hall)

Reference Text
Systems Programming Donovan
(McGraw-Hill)

EE564  COMPILERS, ASSEMBLERS AND INTERPRETERS **
Prerequisite
EE361

Prescribed Text
Compiler Construction for Digital Computers Gries (Wiley)

Reference Texts
Computer Organisation and Programming Gear (McGraw-Hill)
Systems Programming Donovan (McGraw-Hill)
Introduction to Computer Organisation and Data Structures Stone (McGraw-Hill)

EE565 PATTERN RECOGNITION
(not offered in 1974)
A course of lectures and tutorial work, with some laboratory use of the computer in pattern recognising systems. Theory of trainable pattern — classifying systems; fourier — optical methods. Machines that learn with and without a teacher. Current research results obtained in the department, will be included.

Prerequisite
Mathematics IIB

Reference Texts
Learning Machines Nilsson, J. (McGraw-Hill)
Pattern Recognition Uhr (Wiley 1966)
Decision-making Processes in Pattern Recognition Sebestyen, G. (N.Y., Macmillan Book Co. 1962)

EE566 AUTOMATA AND COMPUTING MACHINES
(not offered in 1974)
This is a course of lectures and tutorial work giving an introduction to the theory of finite and infinite computation, and to logic machines.

Prerequisite
Mathematics I

Reference Texts
Finite State Models for Logical Machines Hennie, F. (John Wiley)
Brains, Machines and Mathematics Michael Arbib (McGraw-Hill)
Computation (Finite and Infinite Machines) Minsky, M. (Prentice-Hall)

EE567 COMPUTER PROCESS CONTROL
(not offered in 1974)
Modelling the automated process — physical and economic models. Optimization of both well defined and poorly defined processes. Computer simulation languages. Analog computation.

Reference Texts
Computer Simulation for Engineers Stephenson, R. E. (Harcourt Brace & Jovanovich 1971)

EE568 ADVANCED COMPUTER ARCHITECTURE **
Lectures, seminars and tutorials.

Prerequisites
Computer Structure (EE361) Computer Operating Systems (EE463)

Prescribed Text
To be determined.

Reference Texts
Computer Architecture Foster Basic Machine Principles Iliffe Computer Structures Bell & Newell
EE569  FORMAL LANGUAGES AND AUTOMATA*
Languages and Grammars. Properties of regular, context-free and context-sensitive grammars. Relationship between automata and formal languages.

Prerequisite
Mathematics I

Corequisite
EE564 complements this course but is not mandatory.

Prescribed Text
Formal Languages and their Relation to Automata
Hopcroft & Ullman
(Addison-Wesley)

EE580  THESIS/PROJECT
Multiples of 1 unit
Topics to be arranged with individual supervisors.

EE590  SEMINAR ***
A series of seminars for full-time postgraduate students. Each student will prepare approximately one seminar per semester on a technical or theoretical subject. Each student will also attend EE491 seminars.

DEPARTMENT OF MECHANICAL ENGINEERING

MASTER OF ENGINEERING SCIENCE SUBJECTS

The following subjects have been approved for inclusion in M.Eng.Sc. programmes. Subjects marked † will not be offered in 1974. The other subjects will be offered subject to adequate enrolments.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME404</td>
<td>Mathematical Programming</td>
<td>1</td>
</tr>
<tr>
<td>ME502G</td>
<td>Operations Research and Decision Theory</td>
<td>2</td>
</tr>
<tr>
<td>ME503G</td>
<td>Design of Experiments for Engineering Research</td>
<td>2</td>
</tr>
<tr>
<td>ME505G</td>
<td>Systems Analysis and Design</td>
<td>2</td>
</tr>
<tr>
<td>ME507G</td>
<td>Resources Planning and Allocation</td>
<td>2</td>
</tr>
<tr>
<td>ME508G</td>
<td>Air Pollution Studies</td>
<td>2</td>
</tr>
<tr>
<td>ME511G</td>
<td>Experimental and Theoretical Stress Analysis</td>
<td>2</td>
</tr>
<tr>
<td>ME515G</td>
<td>Advanced Design Concepts in Mechanical Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ME517G</td>
<td>Materials Handling and Transportation Systems</td>
<td>2</td>
</tr>
<tr>
<td>†ME535G</td>
<td>Vibration and Noise Problems in Industry</td>
<td>2</td>
</tr>
<tr>
<td>†ME536G</td>
<td>Advanced Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME546G</td>
<td>Elasticity, Plasticity and Applications</td>
<td>2</td>
</tr>
<tr>
<td>ME554G</td>
<td>Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME555G</td>
<td>Advanced Turbomachinery</td>
<td>2</td>
</tr>
<tr>
<td>†ME575G</td>
<td>Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
<td>2</td>
</tr>
<tr>
<td>ME582G</td>
<td>Probabilistic Models in Operations Research</td>
<td>2</td>
</tr>
<tr>
<td>ME583G</td>
<td>Modelling of Management Problems</td>
<td>1</td>
</tr>
<tr>
<td>ME584G</td>
<td>Simulation</td>
<td>1</td>
</tr>
<tr>
<td>†ME685G</td>
<td>Advanced Operations Research</td>
<td>2</td>
</tr>
</tbody>
</table>
## ME502G Operations Research and Decision Theory

- Development of models as an aid in decision making.
- Mathematical concepts of statistics in problem solving.
- Mathematical programming. Inventory control theory.
- Queuing theory and applications.

**Reference Text**
- Principles of Operations Research, Wagner, H. M. (Prentice-Hall)

**Reading**
- Readings in Mathematical Programming, Vajda, S. (Pitman)

### ME503G Design of Experiments for Engineering Research

A systematic approach to the analysis and design of experiments and the interpretation of experimental results. The course has been divided into three approximately equal parts as follows:

1. Statistical methods for the design and evaluation of experiments.
2. Model analysis, use of true and distorted models as well as analogues. Use of dimensional analysis.

**Reference Texts**
- Introduction to Scientific Research, Bright-Wilson (McGraw-Hill)
- Methods of Correlation Analysis and Regression Analysis, Ezekiel & Fox (Wiley)
- Physical Measurements and Analysis, Cook & Rabinowicz (Addison-Wesley)

### ME505G Systems Analysis and Design


**Reference Texts**
- Finite Graphs and Networks, Busacker & Saaty (McGraw-Hill 1965)
- Engineering Systems Analysis, Holerman, C. (Merrill 1965)

### ME507G Resources Planning and Allocation

Classification of resources. The distribution and abundance of natural resources and their importance to industrial societies. Issues in resource management: depletion of nonrenewable resources; policies for conservation and substitution, their goals, utility and practical implementation; management of renewable resources, quantitative models, optimal rates of utilisation.

**Reference Books**
- Resources and Man, Natl. Acad. Sci. (Freeman and Co. 1969)
ME508G AIR POLLUTION STUDIES
This course will cover the following themes:
(a) Atmosphere diffusion models and physico-chemical interactions on the local and global scale.
(b) Establishing air quality goals with incomplete information.
(c) Pollution sources and ambient pollution measurements: emphasis on the motor vehicle.
(d) Control strategies: legislation, environmental impacts, and economic considerations.

Reference Texts
Air Pollution 3 vols.
Stern, A. C.
(Academic Press 1968)

Atmospheric Diffusion
Pasquill, F.
(Van Nostrand 1962)

Introduction to the scientific study of Air Pollution
McCalmac, B. M.
(Reidel 1971)

Air Pollution and Health Royal College of Physicians
(Pitman 1970)

Environmental Protection
Chanlett, E. T.
(McGraw-Hill 1973)

ME511G EXPERIMENTAL AND THEORETICAL STRESS ANALYSIS
An introduction to the experimental and theoretical analysis of complex components with emphasis on the use of computer techniques. Theoretical and experimental applications of the use of strain gauge, photoelastic and modelling methods will be covered. Certain aspects of simulation techniques will also be given.

Reference Texts
The Finite Element Method in Engineering Science
Zienkiewicz, O. C.
(McGraw-Hill 1971)

Reference Texts (cont.)
Analysis of Stress and Strain
(McGraw-Hill 1958)

An Introduction to the Theory of Elasticity
Southwell, R. V.
(Dover 1969)

Mathematical Programming
McMillan, C.
(Wiley 1970)

Introduction to Photomechanics
Durelli, A. J. & Riley, W. F.
(Prentice-Hall 1965)

Experimental Stress Analysis
Dally, J. W. & Riley, W. F.
(McGraw-Hill 1965)

ME515G ADVANCED DESIGN CONCEPTS IN MECHANICAL ENGINEERING
The application of systems analysis principles to the solution of problems associated with the design of mechanisms. Formalising of the design process. Fundamental concepts of reliability. Reliability analysis. Methods of improving the reliability of systems. Computer programming for mechanical design applications. The optimum design of typical mechanical components.

Reference Texts
Engineering Design
Matouseki, R.
(Blackie)

Engineering Design
Morrison, D.
(McGraw-Hill)

Optimum Design of Mechanical Elements
Johnson, R. C.
(Wiley)

Probabilistic Reliability. An Engineering Approach
Shooman, M. L.
(McGraw-Hill 1968)

Fundamentals for Reliability Theory
Polovko, R. M.
(Academic Press 1968)

Engineering Reliability and Long Life Design
Haviland, R. P.
(Van Nostrand 1964)

The Use of Computers in Engineering Design
Furman, T. T.
(E.U.P.)
ME517G MATERIALS HANDLING AND TRANSPORTATION SYSTEMS
An introduction using a Systems approach to transport needs, which makes use of Systems Analysis, Network Methods, Stock Control Techniques as well as Sensitivity Studies.
The technical characteristics and unit-cost data for various types of transport systems are examined. Examples considered will include Conveyor Systems, Pipeline Systems (Pneumatic and Hydraulic), road and rail systems and sea transport systems such as Lash, Splash, Ro-Ro, Container, &c. Other studies will include Stock-piling, Packaging and cargo transfer systems.
Evaluation and optimisation of transport systems with an introduction to their design.
Reference Texts
To be advised.

ME535G VIBRATION AND NOISE PROBLEMS IN INDUSTRY
The course presents a systematic study of both noise and vibration problems which are of common occurrence in Industrial Plants and structures. The course is divided into two parts, as follows:—
Practical noise control.
Prescribed Texts
Fundamentals of Vibrations
Anderson, R. A. (Macmillan)
Noise Reduction
Beranek (McGraw-Hill)
Reference Texts
Matrix Methods in Elastomechanics
Shock and Vibration Handbook Vol. 2
Harris & Crede (McGraw-Hill)

ME536G ADVANCED DYNAMICS OF MACHINES
Dynamic motion analysis: the energy distribution method, equivalent mass-and-force method, the rate-of-change-of-energy method.
Advanced kinematics of the Plane Motion: the inflection circle, Euler-Savary equation, Bobilli's construction, Hartmann's construction.
Introduction to synthesis; graphical methods, analytical methods.
Prescribed Text
Kinematics and Dynamics of Plane Motion
Hirschhorn, J. (McGraw-Hill)
Reference Texts
Dynamics of Machinery
Holowenko, A. R. (Wiley)
Kinematics and Linkage Design
Hall, A. S. (Prentice-Hall 1960)

ME546G ELASTICITY, PLASTICITY AND APPLICATIONS
Development of theories of elasticity and plasticity. Application of these theories to elastic, elasto-plastic and plastic problems.
Use of approximate methods of solution.
Application of slip-line field solutions to certain plasticity problems.
Use of experimental methods.
Reference Texts
Stress Analysis
Zienkiewicz & Holister (Wiley)
Applied Elasticity
Wang (McGraw-Hill)
The Mathematical Theory of Plasticity
Hill, R. (Oxford)
Advanced Mechanics of Materials
Ford (Longmans)
ME554G FLUID MECHANICS
Lectures and Laboratory Work dealing with a selection of the following topics.


Reference Texts
Handbook of Fluid Dynamics Streeter, V. L. (McGraw-Hill)
Applied Hydrodynamics Vallentine, H. R. (Butterworths)
Centrifugal and Axial Flow Pumps and Compressors Kovats, A. (Pergamon)

ME555G ADVANCED TURBOMACHINERY
More advanced study of the fluid mechanics and thermodynamics of flow in cascades and three-dimensional guiding surfaces, leading to the design study of a selected turbomachine.

Reference Text

ME575G HEAT TRANSFER
Lectures and laboratory work dealing with a selection of the following topics.

Heat transfer in laminar and turbulent flow
Heat transfer with boiling
Condensation heat transfer
Heat exchangers
Radiant heat transfer and furnace applications
Applications of dimensional analysis
Applications of computer techniques in heat and mass transfer.

Reference Texts
To be advised.

ME581G MATHEMATICAL PROGRAMMING
A survey of methods for the solution of static, deterministic optimisation problems.

Linear programming the simplex algorithm and its revised form duality theory sensitivity analysis decomposition algorithms transportation and assignment problems.

Linear programming in integers cutting plane algorithms branch-and-bound methods implicit enumeration algorithms for binary integer programmes.

Network, scheduling and other combinatorial problems. Introduction to the theory of convex nonlinear programmes the Kuhn-Tucker theorem applications to quadratic programming and geometric programming.

Dynamic programming methods.

Prescribed Texts
Introduction to Dynamic Programming Nemhauser, G. L. (Wiley 1966)
Perspectives on Optimisation Geoffrion, A. M. (ed.) (Addison-Wesley 1972)

Reference Texts
Linear Programming Hadley, G. (Addison-Wesley, World Student Series 1969)
Introduction to Linear and Nonlinear Programming Luenberger, D. G. (Addison-Wesley 1973)
ME582G PROBABILISTIC MODELS IN OPERATIONS RESEARCH
Review of relevant probability and statistics theory, utility theory, Bayes' theorem, decision trees, decision models under risk and uncertainty, queueing theory, Markov models, renewal theory, variable inventory models, forecasting, time series analysis, production-inventory models, quality assurance models, reliability.

Reference Texts
To be advised.

ME583G MODELLING OF MANAGEMENT PROBLEMS
Principles of model building, classification of models, cause-effect structures, organizational objectives, problem formulation, management problems in industry and government, models for marketing, manpower, production, inventory, distribution, and investment, case studies of management problems.

Reference Texts
To be advised.

ME584G SIMULATION
The basic methodology of simulation and its relationship to Operations Research and the scientific method, analogue, digital and hybrid simulation, the representation of uncertainty in simulation models, sampling methods, simple example of simulation of a queue to illustrate the problems and methods involved in the construction of different models to answer different questions, the general discrete event network and its limitations, general solutions to the modelling of such networks, the classical 3 phase model, programming languages for simulation, design of simulation experiments, simulation project.

Reference Texts
The Art of Simulation, Tocher, K. D. (E.U.P. 1963)

*ME681G INDUSTRIAL LAW

ME685G ADVANCED OPERATIONS RESEARCH
The application of the Operational Research Methods and techniques to tactical and strategic industrial problems. Analysis and simulation of production—inventory control systems, queueing systems, investment and replacement, quality control and reliability.

Reference Texts
To be advised.

* For subject description see under Faculty of Economics and Commerce on page 281.
INDUSTRIAL LAW

A course of 2 hours of lectures and a tutorial of 1 hour per week throughout the year.

SYLLABUS

A study of Industrial Law divided into two broad parts: a study of the law affecting the individual employer and employee; and a study of the law affecting employer- and employee-groups. The first part includes analysis and description of the master-servant relationship at common law; duration, termination and terms of the contract of service; remedies for breach by either party of the contract of service; promises in restraint of trade; the doctrine of vicarious liability; the employer’s duty of care at common law; the employer’s statutory duties; the employer’s defences to an employee’s action for damages; workers’ compensation. The second part includes an examination of the constitutional background of industrial legislation; the notion of inconsistency between State and Commonwealth laws; the Commonwealth industrial power; the Commonwealth systems of industrial regulation; the N.S.W. industrial arbitration systems; strikes and lockouts; special “industrial torts”; enforcement and penal provisions; standard working hours and leave with pay; wage fixation; legal status of industrial organisations.

Reading Guide

Workers’ Compensation Practice in N.S.W.  
Boulter, N.  
(Law Book Co.)

Outline of Industrial Law  
Cullen, C. L. & Macken, J. J.

Australian Industrial Regulation  
Foenander, O. de R.  
(Law Book Co.)

Industrial Conciliation and Arbitration in Australia  
Foenander, O. de R.  
(Law Book Co.)

Recent Developments in Australian Industrial Regulation  
Foenander, O. de R.  
(Law Book Co.)

Trade Unionism in Australia  
Foenander, O. de R.  
(Law Book Co.)

Cases and Materials on Labour Law in Australia  
Glasbeek, H. J. & Eggleston, E.  
(Butterworths)

Individual Employment Law  
Hepple, B. A. & O’Higgins, P.  
(Sweet & Maxwell)
Reading Guide (continued)

Federal Industrial Laws
Mills, C. P. (Butterworths)

New South Wales Industrial Laws
Mills, C. P. (Butterworths)

Workers' Compensation in New South Wales
Mills, C. P. (Butterworths)

Industrial Relations in Australia
O'Dea, R. (West Publishing Corp.)

Australian Compulsory Arbitration 1900-1970
Portus, J. H. (Law Book Co.)

The Development of Australian Trade Union Law
Portus, J. H. (Melbourne University Press)

Introduction to Business Law
Shtein, B. J. L. & Lindgren, K. E. (Law Book Co.)

Labour Law in Australia
Skyes, E. I. & Glasbeek, H. J. (Butterworths)

The Employer, The Employee and the Law
Sykes, E. I. (Law Book Co.)

Strike Law in Australia
Sykes, E. I. (Law Book Co.)

Students will be advised at the first lecture of those books which are essential and which they should possess.

STATUTES

Annual Holidays Act, 1944 (N.S.W. Government Printer)
Apprentices Act, 1969 (N.S.W. Government Printer)
Commonwealth of Australia Constitution Act, 1900 (U.K.) (Australian Government Printer)
Conciliation and Arbitration Act, 1904 (Australian Government Printer)
Factories, Shops and Industries Act, 1962 (N.S.W. Government Printer)
Industrial Arbitration Act, 1940 (N.S.W. Government Printer)
Long Service Act, 1955 (N.S.W. Government Printer)

Statutes (cont.)

Scaffolding and Lifts Act, 1912 (N.S.W. Government Printer)
Workers' Compensation Act, 1926 (N.S.W. Government Printer)

EXAMINATION

Two papers.

Students will be permitted to take into the examination copies of the Statutes referred to in the Reading Guide and lists of cases to be supplied during the course, provided the copies are not marked otherwise than by underlining.

ACCOUNTING AND FINANCIAL STUDIES 56

The use of accounting information for various decisions. Basic accounting concepts; the double entry technique; preparation of financial statements; analysis and interpretation of financial statements. Basic cost accounting; management control process; budgeting and budgetary control; standard costing; responsibility accounting; performance evaluation; cost analysis for management decisions including capital expenditure evaluation; capacity utilisation and control; statistical techniques for operational cost control.

Reference Texts

Accounting in Business Decisions

Cost-Effective Information Systems
Cohen, B. J. (A.M.A.)

Basics Accounting and Cost Accounting
Grant, E. L. & Bell, L. F. (McGraw-Hill)

Australian Business Handbook
Griffiths, N. (McGraw-Hill)

Cost Accounting — A Managerial Emphasis
Horngren, C. T. (Prentice-Hall)

Accounting for Management Planning and Decision Making
Korn, S. W. & Boyd, T. (Wiley)

An Insight into Management Accounting
Sizer, J. (Pelican)

Introductory Accounting
Smyth, E. B. & Burke, W. L. (Law Book Co.)

EXAMINATION

One three-hour paper.
SUBJECTS TAUGHT IN
THE FACULTY OF MATHEMATICS

MATHEMATICS I
A subject of four lectures and two tutorial hours per week for three terms comprising the following topics. Summaries of these topics, together with extended booklists will appear in the handbook of the Faculty of Mathematics and will also be available from the Department.

Topic
AN   Real Analysis
AL   Algebra
CA   Calculus
NM   Numerical Mathematics

Prescribed Texts
AN   Calculus Vol. I 2nd ed. (Ginn Blaisdell 1967)
   Real Analysis — An Introductory Course
   Giles, J. R. (Wiley 1973)
   A Basis for Linear Algebra
   Calculus Vol. 1 2nd ed.
   Apostol, T. (Ginn Blaisdell 1967)
NM   Basic Fortran IV Programming

PART II SUBJECTS
The following topics are among those offered by the Mathematics Department. Certain combinations of these topics specified below will comprise the part II subjects offered by the Department: each topic consists of about 27 lectures and 13 tutorials. A pass in Mathematics I is a prerequisite for entry to each part II subject given by the Department; in addition some topics will require other topics as a corequisite or prerequisite as shown. Summaries of these topics, together with extended booklists will appear in the handbook of the Faculty of Mathematics and will also be available from the Department.

Topic   Corequisite or Prerequisite Topic
A Mathematical Models C
B Complex Analysis C
C Calculus and Vector Calculus
D Linear Algebra

Topic E—Differential Equations and Integral Transforms
Differential Equations and Integral Transforms C

Topic F—Numerical Analysis and Computing
Numerical Analysis and Computing

Topic G—Fourier Series, Partial Differential Equations and Special Functions
Fourier Series, Partial Differential Equations and Special Functions C

Topic H—Probability and Statistics
Probability and Statistics C

Topic I—Topic in Statistics, e.g., Non-parametric Methods
Topic in Statistics, e.g., Non-parametric Methods H

Topic J—Topic in Applied Mathematics, e.g., Mechanics
Topic in Applied Mathematics, e.g., Mechanics C E

Topic K—Topic in Pure Mathematics, e.g., Group Theory
Topic in Pure Mathematics, e.g., Group Theory

Topic L—Analysis of Metric Spaces
Analysis of Metric Spaces

Prescribed Texts
Topic A—Mathematical Models
No prescribed text.

Topic B—Complex Analysis
Complex Variables with Physical Applications
Hauser, A. A. (Simon & Schuster 1971)

OR
Complex Variables
Levinson, N. & Redheffer, R. M. (Holden-Day 1970)

OR
Theory and Problems of Complex Variables

Topic C—Calculus and Vector Calculus
Theory and Problems of Advanced Calculus

Topic D—Linear Algebra
No prescribed text.

Topic E—Differential Equations and Integral Transforms
Elementary Differential Equations and Boundary Value Problems
MATHEMATICS IIA

See Faculty of Mathematics Handbook.

MATHEMATICS IIB

A subject of four lectures and two tutorial hours per week for three terms, consisting of the following topics. Students in the Departments of

Chemical Engineering, Topics C, D, E, F
Civil Engineering, Topics C, D, E, H
Electrical Engineering, Topics C, D, E, H
Mechanical Engineering, Topics C, D, E, H
Surveying, Topics B, C, D, H
Combined B.Sc./B.E., Any four of the eight topics A-H from the part II list on page 284.

MATHEMATICS IIC

MATHEMATICS IIIA

MATHEMATICS IIIB

(See Faculty of Mathematics Handbook).

ELECTIVE MATHEMATICS

Subject to meeting any pre- and corequisite requirements, students may take additional Part II topics as elective units. When taken in this way each topic is regarded as a separate subject of one unit value designated by an Engineering number.

The numbers allocated are:

EM2A Mathematical Models
EM2B Complex Analysis
EM2C Calculus and Vector Calculus
EM2D Linear Algebra
EM2E Differential Equations and Integral Transforms
EM2F Numerical Analysis and Computing
EM2G Fourier Series, Partial Differential Equations and special functions
EM2H Probability and Statistics
EM2I Topic in Statistics, e.g. Non-parametric Methods
EM2J Topic in Applied Mathematics e.g. Mechanics
EM2K Topic in Pure Mathematics e.g. Group Theory
EM2L Analyses of Metric Spaces
Recommended electives for students in the different Departments are as follows:

- **Chemical Engineering** — EM2B, EM2G
- **Civil Engineering** — EM2B, EM2G
- **Electrical Engineering** — EM2B, EM2F
- **Mechanical Engineering** — EM2B, EM2G, EM2L

Students may not take as an elective unit any topic which is included in Mathematics IIB for the Department in which they are enrolled.

Full descriptions of these subjects and book lists will be found in the Faculty of Mathematics Handbook, and will also be available from the Department of Mathematics.

### SUBJECTS TAUGHT IN THE FACULTY OF SCIENCE

#### CHEMISTRY I

A subject comprising about 90 lectures and 90 hours of tutorial and laboratory classes covering the following topics:

- **Inorganic Chemistry** (30 lectures)
  - The periodic properties of the elements and their compounds; chemistry of s-block elements (Groups 1A and 2A), the p-block elements (Group IIB), the noble gases, hydrogen, the oxygen group (Group VIB), the halogens (Group VIIIB) and d-block elements (briefly).
- **Organic Chemistry** (30 lectures)
  - The chemistry of carbon and its compounds: hydrocarbons; chemistry of compounds containing oxygen, nitrogen and halogens as functional groups; reaction mechanisms; molecules containing two or more functional groups; separation and purification of compounds.
- **Physical Chemistry** (30 lectures)
  - The mole concept; atomic and molecular structure; structure binding and energy; chemical equilibria and energetics; chemical kinetics.

The annual examination will consist of three papers, each of three hours duration, one being held in the mid-year period.

#### CHEMISTRY IS

(For Civil, Electrical and Mechanical Engineering Students)

A subject comprising about 60 lectures and 30 hours of tutorials, computational classes and student participation demonstrations on selected principles of chemistry developed against an engineering background. The central theme is the contribution of chemistry to the control and exploitation of man's environment with special reference to energy and material resources. Among the topics included are the following:

- The chemical nature of natural resources; chemical energetics in relation to combustion; ionic and phase equilibria against a background of water usage, treatment and beneficiation; electrochemistry in relation to corrosion and related phenomena; structural chemistry of engineering materials; organic chemistry with special reference to petrochemistry, polymers, fuels and lubricants.

The annual examination will consist of one paper of three hours duration.
CHEMISTRY IIA
A subject comprising about 90 lectures and 180 hours of tutorial and laboratory classes covering the following topics.

Analytical Chemistry (15 lectures)
Principles of physical methods, solutions; elementary aspects of spectroscopic determination of molecular structure.

Inorganic Chemistry (25 lectures)
Valence and molecular structure; V.B., M.O., V.S.E.P.R. and crystal field theories. Nature and importance of coordination chemistry; types of metal complexes—stability, liability and stereochemistry; the use of physical methods in elucidation of structure; systematic chemistry of the transitional metals.

Organic Chemistry (25 lectures)
Aliphatic compounds; aromatic compounds; condensation reactions; reaction mechanisms.

Physical Chemistry (25 lectures)
Thermodynamics; kinetics and chemical affinity.
The annual examination will consist of two papers, each of three hours duration.

CHEMISTRY IIIB
A subject of three lectures and six laboratory hours per week for three terms comprising eight units of which the student must attempt six. Each unit is of equal length—approximately ten lectures, four tutorials and twenty-eight hours of laboratory or other support activities. Each student programme must be approved by the Head of the Department. Previous or concurrent study of Chemistry IIA is advisable but not compulsory.
The units offered may vary from year to year and the topics available include: electronic instrumentation for Chemists; problem solving, evaluation of chemical pollution; analysis in organic systems; radiochemistry; chemistry in industrial processes; science, conflict and society; chemistry of colloids; polymers, ionic transport in solution; non-aqueous chemistry; chemistry of S, P and B compounds; symmetry and chemistry.
Each unit will be examined separately (by one hour examination) and the annual examination will be obtained by combination of the individual unit marks.

CHEMISTRY IIIA
A subject comprising about 90 lectures and 270 hours of tutorial and laboratory classes covering the following topics:

Analytical Chemistry (15 lectures)
Principles of modern analytical techniques.

Inorganic Chemistry (25 lectures)
Introductory quantum chemistry; organo-metallic chemistry; recent chemistry of non-metals and metals.

Physical Chemistry (25 lectures)
Statistical thermodynamics; surface chemistry and catalysis; electrochemical ionics and thermodynamics of cells.

Organic Chemistry (25 lectures)
Stereo-electronic methods of predicting chemical behaviour; free radicals and photochemistry; chemistry of simple heterocyclic systems; approach to chemical synthesis.
The annual examination will consist of not less than two papers, each of three hours duration.

ENGINEERING GEOLOGY (for students in Engineering)
A subject of one lecture and two laboratory hours per week for 14 weeks together with two days field work.
The subject introduces the principles of geology and their applications to engineering problems.

PHYSICS IIA
A subject for students who may wish to proceed to Physics II, for students in the Faculty of Applied Science, and for all students in the Faculty of Engineering except Chemical Engineering. (Some students in Chemical Engineering may be advised to take Physics IB).
The subject is presented as a rigorous, mathematically based discipline with emphasis on the unifying principles which link together different areas of the subject. Physics taken as part of the High School science course to 2F standard or better will be of considerable help in understanding the subject.
The subject will comprise 3 lectures and 3 hours of laboratory and tutorial work per week. Lectures will cover mechanics, wave motion, electromagnetism, thermal physics, geometrical optics, physical optics, and quantum physics. The treatment throughout will assume some knowledge of calculus.
The examination will be conducted in three two hour papers. Each paper will examine the work covered in one term and will be held shortly after the end of that term. There will also be a one hour written examination on the year's practical work.
PHYSICS IB
A subject for students who in general do not intend to proceed with further studies in Physics. (A credit pass or better in Physics IB will normally be required for entry to Physics II). Physics taken as part of the High School science course to a 2S standard or better will be of considerable help in understanding the subject.

The subject will comprise 3 lectures, and 3 hours of laboratory work or demonstrations and practice periods per week. The examinations will be similar in structure to Physics IA. The treatment will require a minimum of mathematics and will involve an experimental approach throughout. The coverage of the subject will be somewhat broader than in Physics IA.

PHYSICS II
(Units PH221 and PH222L of B.E. Degree Course) for B.E. (Electrical Engineering students)

A course of approximately forty-five lectures (PH221) and approximately forty-five hours of laboratory work (PH222L). The subject will be offered over a full year and will be examined by two 11 hour papers. Unit PH221 includes Electromagnetics and Quantum Mechanics; unit PH222L will include laboratory work associated with the lecture course.

A pass in this subject will not qualify as a prerequisite for admission to Physics IIIA.

PHYSICS II*
for B.Sc./B.E. (Electrical Engineering students)

A course of three lectures and three laboratory hours per week, examined by two three-hour papers. The following topics will be covered.

Mechanics
Thermal Physics
Quantum Physics
Electromagnetism
Electromagnetic Field Theory
Physical Optics

A pass in Physics II by a combined degree student will qualify as a prerequisite for Physics IIIA.