On behalf of the staff of the Faculty of Engineering, I wish to extend a very warm welcome to all students—those who are entering the University and the Faculty for the first time and those who are returning to commence another year of studies.

To new and prospective students may I begin by briefly acquainting you of the structure of the Faculty of Engineering. The Faculty comprises five Departments: Chemical, Civil, Electrical and Mechanical Engineering and Metallurgy. In addition to the Bachelors degree programmes offered in these five major areas, the Department of Electrical Engineering offers the B.E. in Computer Engineering, the Department of Mechanical Engineering the B.E. in Industrial Engineering, while the Department of Civil Engineering, which has to date offered the first two years of the four year Bachelor of Surveying course, is now introducing the full B.Surv. course. Courses are available on a full-time or part-time basis, or a combination of these, and in each degree programme the opportunity for some specialization exists in the later course years through a wide selection of technical electives. The Faculty is also active at the postgraduate level, offering formal courses leading to the Diploma in Industrial Engineering and Master of Engineering Science, as well as providing opportunities for postgraduate research at Masters and Doctorate levels. Through the specialized research interests of the various Departments, a wide range of study areas is available.

The Engineering Faculty is conscious of the need to maintain professional standards and is continually up-dating course material, critically evaluating teaching and assessment methods, and introducing many innovations to meet the current demands and future requirements of the professions and society. Whilst students are required to gain an in-depth knowledge of the fundamental principles of their chosen field, it is also important that they gain some breadth of understanding in other subject areas. Besides the essential core material, our degree programmes provide some flexibility in the choice of electives with the opportunity to study subjects in other faculties. For those seeking a wider educational experience, opportunities exist for study in one of the several five-year full-time combined degree programmes the Engineering Faculty has introduced in conjunction with the Faculties of Arts, Science, Mathematics, and Economics and Commerce.

As part of the degree requirements, all students are to obtain a period of industrial experience. Full-time students are encouraged to gain this experience during University vacations; part-time students in appropriate employment have the opportunity of taking Industrial Experience Elective Units which count towards their degree. These units encourage students in industry to gain a great deal more benefit from their work experience as well as providing important feed-back
to the members of the Engineering Faculty on the relationship of the academic work of the University with students' work assignments in industry.

Besides the emphasis given to meeting academic requirements, it is essential that students gain a well-rounded tertiary educational experience. The University environment, with its excellent campus and facilities, together with the many extra-curricula activities, creates an opportunity for obtaining a total experience, indeed a unique experience in one's lifetime. For this reason I would encourage you to take full advantage of the opportunities available to you and, where time permits, take an active interest in the various facets of University life.

The staff of the Faculty will do everything possible to make your work both interesting and enjoyable and will be anxious to help you with any problems you may have. I personally would be most happy to assist you wherever I can and would be grateful for any feedback of a constructive nature that you may wish to offer.

In conclusion, I wish you well in your studies at this University. There is no doubt that a course of study leading to an Engineering or Metallurgy degree requires a great deal of dedication and perseverance, but the task is certainly a rewarding one.

A. W. Roberts
Dean (1976)
Faculty of Engineering

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Faculty of Engineering

The colour band on the spine of this handbook is the lining colour of the hood worn by Bachelors of Engineering of this University.

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Professors
B. D. O. Anderson, BSc, BE(Sydney), PhD(Stanford), FAAA, FIEEE, FIEAust, AMIREAust, MSIAM
J. B. Moore, BE, MEngSc(Queensland), PhD(Santa Clara), MIEEE (Head of Department)

Senior Lecturers
J. G. Alva, BSc(Durham), MSc(Eng) (London), CEng, MIEEE
A. Cantoni, BE, MEngSc(Queensland), PhD(Santa Clara), MIEEE
G. C. Goodwin, BSc, BE, PhD(New South Wales), MIEEE, MIEAust

Lecturers
B. J. Cook, HND(Elect) (Plymouth Polytechnic), PhD(Bristol)
F. J. Lidgley, BSc(Borough Polytechnic), PhD(Surrey), MIEEE
P. J. Moylan, BSc, MIEEE, AMACs
K. K. Sahula, BE(Roorkee), MS, PhD(Iowa), MIEEE, MACM
R. J. Evans, ME(Elect) (Melbourne)

Professional Officers
R. W. Goodhew, BE(New South Wales), ASTC, MIEAust, AMIEEE
B. A. Thomas, BSc(Eng), GradlEAust, EngAssocIEEEAust

Departmental Office Staff
B. J. Kelleher, BE, BCom
Elizabeth M. Fewings
Elizabeth J. Cleary
Dianne E. Piefke

MECHANICAL ENGINEERING

Professors
R. A. Antonia, BE, MEngSc, PhD(Sydney)
A. W. Roberts, BE, PhD(Research Australia), ASTC, FIEEE

Associate Professors
E. Betz, ME PhD(Research Australia), ASTC, FIEEE, MASME
A. K. Johnston, BE(Sydney), MS(Iowa), PhD(Research Australia), FIEEE

Senior Lecturers
K. R. Bridger, BE(Research Australia), ASTC, MIEAust
L. W. Browne, BE(Sydney), PhD
G. D. Butler, BE(Research Australia), MSc(Cranfield) ASTC, MIEAust
A. J. Chambers, BE(Research Australia), ME; PhD(Stanford), GradIEEEAust
M. J. Hallinan, ASTC
J. W. Hayes, BE, MEngSc(Sydney), MIEAust, AMAusIMM
K. L. Hitz, BE(Research Australia), PhD, GradIEEEAust
H. A. Willems, BE(Research Australia), ME; DiplNavalArch MTS(Dordrecht), ASTC, MRINA

Lecturers
D. R. A. Budney, MSc(Alberta), PhD(Research Australia)
D. S. R. S. Kamath, BE(Andhra), MEngSc(Kharagpur), MAMSE, MIE(I), MIEAust, MASEE, AAFFPA
R. D. Parbery, ME, BSc
B. T. Valaire, BSc(Tech) (Research Australia), ME, GradIEEEAust

Senior Tutors
B. J. Hill, BSc(Eng), MEngSc, GradIEEEAust
N. Wang, BSc(Eng), MEngSc

Professional Officers
J. A. Lewis, BSc(Research Australia), ME, ASTC, MIEAust, AMAusIMM
M. Ooms, BE
R. J. Scobie, ASTC
O. J. Scott, BE

Departmental Office Staff
B. J. Kelleher, BE, BCom
Marcia M. Couper
Isabel Sherwood
Diana P. Grayson

Honorary Associate
W. Anderson, DipMEE(Queensland)

METALLURGY

Professor
E. O. Hall, MSc(Research Australia), PhD(Cambridge), FInstP, MAusIMM, FIM(Lond.), FAIP, FRSA

Associate Professor
W. A. Oates, BMet(Sheffield), MSc

Senior Lecturers
J. D. Browne, BSc(London), MSc(Research Australia), PhD(Monash), AAIP
D. C. Jaffrey, BSc(Queensland), MSc(McMaster), PhD(Cambridge)
J. E. McLenann, MSc(Research Australia), ASTC, AIM(Lond.)
N. A. Molloy, BE(Queensland)

Professional Officers
J. A. Grahame, ASTC
D. D. Todd, MSc(Research Australia), PhD, ASTC, ARACI, DipOeng(ORI Surrey)

Departmental Office Staff
Elizabeth M. Burns

Student Advisor
J. E. McLennan
A. UNDERGRADUATE COURSES

DEGREE REQUIREMENTS

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1. GENERAL

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) Each of the degrees of Bachelor of Engineering and Bachelor of Metallurgy may be conferred either as an ordinary degree or as a degree with honours.

(b) 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.

(c) In each degree course, the most distinguished of the candidates being awarded First Class Honours may be awarded a University Medal.

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 Department in which the candidate is enrolling.

4. Timetable Requirements

A candidate may not enrol in any year in any combination of subjects which is incompatible with the requirements of the timetable 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 carry out such other work as the Department offering the subject may require.

(b) To pass a subject, a candidate shall satisfy the requirements of sub-section (a) of this section 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 in 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 or replaced by progressive assessments made during the course of instruction.

7. Special and Deferred 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. Prerequisites and Corequisites
A candidate may not enrol in any subject unless he has satisfied the requirements for prerequisites and has enrolled in or has already passed the corequisite prescribed for that subject except with the permission of the Dean acting on the recommendation of the Head of Department offering the subject.

12. Standing
(i) A candidate may be granted standing in subjects prescribed for the course in which he is enrolled in recognition of work completed in this University or another institution subject to the provisions of By-law 5.8.1.3.
(ii) A candidate may be granted credit for elective units in recognition of subjects passed elsewhere which are not offered in this University.

13. 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.

14. Mutually Exclusive Subjects or Part Subjects
A candidate may not have counted towards the degree units derived from more than one of such subjects or part subjects as the Faculty Board may deem to be mutually exclusive.

15. Alternative Subjects
A candidate may, with the permission of the Head of Department, substitute for any subject another subject deemed by the Faculty Board to be an acceptable alternative.

2. BACHELOR OF ENGINEERING
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 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

3. BACHELOR OF METALLURGY
To qualify for admission to the degree of Bachelor of Metallurgy, a candidate shall satisfy the requirements for the course as prescribed in Schedule 2.1 to these Requirements and satisfy the industrial experience requirements as prescribed by the Faculty Board.

4. BACHELOR OF SURVEYING
To qualify for admission to the degree of Bachelor of Surveying, a candidate shall satisfy the requirements for that degree as prescribed in Schedule 4.1 to these Requirements.

5. BACHELOR OF SCIENCE (ENGINEERING)
(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 to these 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) course in Civil, Electrical, Mechanical and Industrial Engineering and Naval Architecture.

(i) 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.

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

(a) transfer to the Bachelor of Engineering course 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.

6. BACHELOR OF SCIENCE (METALLURGY)

To qualify for admission to the degree of Bachelor of Science (Metallurgy) a candidate shall satisfy, normally by part-time study, the requirements for the first three years of the course as set out in Schedule 2.1 to these Requirements and satisfy the industrial experience requirements as prescribed by the Faculty Board.

7. COMBINED DEGREE COURSES

(i) Admission to a 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.

(ii) Admission to combined courses will be restricted to students with an average of Credit level.

(iii) The Deans of both Faculties, after consultation with the Heads of Departments concerned, shall certify that the work in the combined degree is no less in quantity and quality than if the two degrees were taken separately.

(iv) Bachelor of Engineering

A candidate may satisfy the requirements for admission to the degree of Bachelor of Engineering in any specialisation together with the requirements for admission to the degree of Bachelor of Arts or Bachelor of Commerce or Bachelor of Science by completing a combined course approved by the Faculty Board of the Faculty of Engineering and the Faculty Board, Faculty of Arts, Faculty of Economics and Commerce or Faculty of Science as appropriate.

8. 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.

9. 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 provision of these Requirements.
APPENDIX A — ELECTIVE REQUIREMENTS

Elective units must be selected with the approval of the Head of Department and the Dean 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

Elective I

Elective I requires the completion of professionally relevant topics of a total rating of not less than five units (normally 7½ hours/week) taken from other departments in the University. Normally students will include EE203 Introduction to Electrical Information — EE204 Introduction to Electrical Energy and materials science and structural mechanics (e.g. CE202). Students of a sufficient level of achievement may, with the approval of the Head of Department of Chemical Engineering, replace these topics with advanced work in Chemistry, Mathematics, Metallurgy or Industrial Engineering.

Elective IA

Elective IA consists of six units to be taken between Stage 5 and Stage 6 and may include up to four units of advanced topics in Chemical Engineering III for students who wish to specialise in some particular field of Process Engineering (e.g. Fuels and High temperature Processes, Hydrometallurgy, etc.) In this case the remaining units of this elective must be selected appropriately by consultation with the Head of Department of Chemical Engineering.

Elective II

Elective II is normally a full first year level subject or equivalent material taken in breadth and depth in a faculty other than Engineering.

INDUSTRIAL EXPERIENCE ELECTIVES

One Elective unit will accrue for each year’s satisfactorily reported experience of adequate technical content. At least two reports will be required for each year. A maximum of four units will be allowed and may be equated to Elective II or to units from Elective I.

2. DEPARTMENT OF CIVIL ENGINEERING

(a) Bachelor of Engineering and Bachelor of Science (Engineering)

Electives may consist of any subject(s) or part subjects offered within the Faculty or by other faculties, subject to the approval of the Heads of Department of Civil Engineering and of any other department responsible for the subject or part subject, except that 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.

(b) Bachelor of Surveying

Electives may consist of any 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.

3. DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of Engineering in Electrical or Computer Engineering

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

1. Six elective units must be taken in the Faculty of Engineering, 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 subject from the Faculty of Engineering and two non-engineering electives. 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. Chemistry I may be taken in lieu of Chemistry II and two non-engineering electives and Physics II in lieu of PH221 and two non-engineering electives.

6. For the Bachelor of Arts/Bachelor of Engineering degree in Electrical Engineering, the rules are as for the Bachelor of Engineering degree save that the eight elective units to be taken outside the Faculty of Engineering must all be applied to Arts subjects.

7. For the Bachelor of Science/Bachelor of Engineering degree in Electrical Engineering, the rules are as for the Bachelor of Engineering 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.
8. In any year, except the first year of the course, 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 five elective units. Not more than four such units may be substituted for non-engineering units and not more than four such units may be substituted for units within the six engineering elective units. 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.

9. Exclusion classes see note 6

The twelve elective units in the BSc (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. A number of subjects offered outside the Faculty of Engineering are not acceptable as electives for Electrical Engineers. A list of these subjects is held in the Department of Electrical Engineering and should be consulted prior to enrolment.

4. DEPARTMENT OF MECHANICAL ENGINEERING

1. At least 2 units of 4-unit elective in Year III must be taken outside the Faculty.

2. Not more than 6 units may be taken outside the Faculty.

3. At least 3 of the 6 elective units taken in Year IV must be selected from the departmental list of technical electives.

4. For students in full employment proceeding as part-time students, each year of appropriate employment that is supervised and approved by the Head of Department is credited as 1 unit of elective.

A maximum of 5 such units is allowed, described as:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME092</td>
<td>Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>ME093</td>
<td>Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>ME094</td>
<td>Industrial Experience</td>
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<tr>
<td>ME095</td>
<td>Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>ME096</td>
<td>Industrial Experience</td>
<td>1</td>
</tr>
</tbody>
</table>

These elective units may be used to meet any elective requirements in Clauses 1 and 2 above, except the departmental technical elective requirement in Clause 3.

5. DEPARTMENT OF METALLURGY

Elective I

The four elective units in the second year programme must be chosen from:

- Physics II (4)
- Maths II Topics (1 each)
- Electronics & Instrumentation (4)
- EE203 Introduction to Electrical Information (1)
- ME251 Fluid Mechanics (1) or
- CE231 Fluid Mechanics (1) or
- ChE21 Fluid Statics & Dynamics
- ME372 Heat Transfer (1) or
- ChE212 Heat Transfer (1)
- ME223 Mechanical Technology (1)
- ME131 Dynamics (1)
- ME111/112 Graphics/Engineering Drawing & Elementary Design (3)
- CE111 Statics (1)
- CE221 Properties of Materials (1) or
- ME241 Properties of Materials (1)
- ME202 Dynamics of Engineering Systems (1)

or other appropriate subjects approved by the Head of Department.

Elective II

The six elective units in the third year programme may be selected from:

(a) Any third or fourth year subjects offered by other Engineering Departments or the Faculty of Mathematics or the Faculty of Science subject to the approval of Head of Department.

(b) Up to 2 units selected from the list of second year electives not already taken.

(c) Any other appropriate subject approved by the Head of Department.
APPENDIX B

TRANSITION ARRANGEMENTS 1976

For transition arrangements for the 1976 in the Departments of Civil, Electrical, Mechanical Engineering and Metallurgy see the 1976 Faculty Handbook pages 23 to 26.

TRANSITION ARRANGEMENTS 1977

DEPARTMENT OF ELECTRICAL ENGINEERING

Any student currently enrolled for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering) in Electrical Engineering and who has not completed the Requirements for the award of those degrees by the end of 1976 shall be deemed to be enrolled thereafter for the new degree courses with credit for all subjects passed in the old courses. 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>Subject</th>
<th>New Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE101</td>
<td>Introduction to Electrical Engineering</td>
</tr>
<tr>
<td>EE231</td>
<td>Electrical Circuits</td>
</tr>
<tr>
<td>EE311</td>
<td>Electrical Machinery</td>
</tr>
<tr>
<td>EE322</td>
<td>Electronics</td>
</tr>
<tr>
<td>EE323</td>
<td>EE324L Electronics Laboratory</td>
</tr>
<tr>
<td>EE342</td>
<td>Automatic Control</td>
</tr>
<tr>
<td>EE412</td>
<td>Advanced Topics in Heavy Current Electrical Engineering</td>
</tr>
<tr>
<td>EE441</td>
<td>Modern Control</td>
</tr>
<tr>
<td>EE444</td>
<td>Communication Systems</td>
</tr>
<tr>
<td>EE562</td>
<td>Advanced Topics in Switching Theory</td>
</tr>
<tr>
<td>EE131</td>
<td>Circuit Fundamentals</td>
</tr>
<tr>
<td>EE232</td>
<td>Electrical Circuits</td>
</tr>
<tr>
<td>EE314</td>
<td>Electrical Machines</td>
</tr>
<tr>
<td>EE323</td>
<td>Linear Electronics</td>
</tr>
<tr>
<td>EE324L</td>
<td>EE324L Linear System Theory</td>
</tr>
<tr>
<td>EE342</td>
<td>Linear System Theory</td>
</tr>
<tr>
<td>EE315</td>
<td>Power Electronics</td>
</tr>
<tr>
<td>EE345</td>
<td>Sample Data &amp; Digital Control</td>
</tr>
<tr>
<td>EE344</td>
<td>Communications</td>
</tr>
<tr>
<td>EE462/562</td>
<td>Topics in Switching Theory</td>
</tr>
</tbody>
</table>

COMBINED DEGREE COURSES

A student may enrol in the combined courses leading to the Bachelor of Arts/Bachelor of Engineering, Bachelor of Commerce/Bachelor of Engineering, Bachelor of Science/Bachelor of Engineering, Bachelor of Metallurgy/Bachelor of Mathematics degrees 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 enrol in a combined Arts/Engineering course. 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**

A candidate who has enrolled in such a combined course shall complete all requirements for the Bachelor of Engineering in any specialisation and comply with the Requirements for the degree of Bachelor of Science, with the provision that Engineering I is recognised as a Science Part I subject (and that a subject taken for the Science degree course may be accepted as Elective III for the Engineering degree course.) Normally the requirements for the degree of Bachelor of Science shall be completed before the candidate enrolls for the final year of the Engineering degree course.

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

**Mathematics/Metallurgy**

After completing a successful first year of study towards either the degree of Bachelor of Mathematics or the degree of Bachelor of Metallurgy a candidate may enrol in a Mathematics/Metallurgy course. A candidate who has enrolled in such a combined course
shall qualify for admission to the ordinary degrees of Bachelor of Mathematics and Bachelor of Metallurgy by passing Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA and either Mathematics IIIB or a Part III subject chosen from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics, and by satisfying all the requirements for the degree of Bachelor of Metallurgy,

except that
(a) Mathematics I shall be replaced by Chemistry I or Geology I or any other subject approved by the Deans;
(b) Metallurgical Computations shall be replaced by Mathematics IIIB, which may be taken in two parts, each of three terms duration;
(c) No Mathematics subjects may be taken as electives.

Commerce/Engineering
There are no specific requirements for Commerce/Engineering courses except that the candidate shall meet the requirements for both degrees. Approved or recommended combined courses are set out in the Departmental sections of this Handbook.

FACULTY POLICIES
The Faculty Board has laid down policies in relation to certain matters. These policy statements are reproduced here for the guidance of students.

AWARD OF HONOURS
The Award of Honours in the degree of Bachelor of Engineering is based on the complete record of the candidate over the entire course. Students are requested to contact the department responsible for the course in which he is enrolled for further details.

INTERPRETATION OF THE ACADEMIC PROGRESS BY-LAWS
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 the following guidelines shall be applied to students enrolled in the Faculty.

(a) First Year full-time or first two years part-time
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 26.

(b) First two years full-time or first four years part-time
Students must meet the requirements of By-law 5.4.2.

(c) Later years of the course
A student will be expected to pass at least one third of the subjects attempted each year and maintain an overall average pass rate of at least 50% of the normal programme for the whole period of enrolment. The progress of any student who fails to meet this standard will be reviewed by the Faculty Board which may recommend to the Admissions Committee that the student be excluded from the Faculty. A student will be required to Show Cause for a second failure in any subject (By-law 5.4.2.).

INDUSTRIAL TRAINING
This is a general statement covering all aspects of industrial training. Students wishing to take Industrial Experience Elective units should refer to Departmental entries for details of the requirements.

For a full-time Bachelor of Engineering or Bachelor of Metallurgy degree students 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.

For a Bachelor of Engineering degree on a part-time basis students may choose to take Industrial Experience units as part of their Elective programme. The University can accept no responsibility for finding suitable employment for students wishing to enrol for Industrial Experience units. To be eligible for an Industrial Experience Unit, the student must be in approved employment on the 1st November preceding the year in which the unit is to be taken. The approved employment must continue for one calendar year, i.e. until the 30th October of the year in which the unit will be counted. Normally no Industrial Experience unit will be allowed in the first year of enrolment. Students must attend lectures, seminars etc. and submit such reports as the Head of Department may require. All reports will be retained by the Department.

For a Bachelor of Science (Engineering) or Bachelor of Science (Metallurgy) degree students must complete three years of practical experience before 31st January in the year in which the degree is to be awarded. Otherwise the award of the degree may be deferred.

MUTUALLY EXCLUSIVE SUBJECTS
(See Section 14 of the Requirements)

The Faculty Board has deemed the following subjects or part subjects to be mutually exclusive:—
(3) ME482 Engineering Economics and ME385 Accounting & Financial Studies.
(4) ME385 Accounting & Financial Studies and Accounting I.

YEAR/STAGE CLASSIFICATION

Full-time students are classified by year.
Part-time students are classified by stage.
Classification is determined by the number of units passed in accordance with the following table:

<table>
<thead>
<tr>
<th>Units</th>
<th>Year</th>
<th>Units</th>
<th>Stage</th>
<th>Units</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>I</td>
<td>0-17</td>
<td>I</td>
<td>0-7</td>
<td>I</td>
</tr>
<tr>
<td>16-31</td>
<td>II</td>
<td>18-33</td>
<td>II</td>
<td>8-16</td>
<td>II</td>
</tr>
<tr>
<td>32-47</td>
<td>III</td>
<td>34-49</td>
<td>III</td>
<td>17-25</td>
<td>III</td>
</tr>
<tr>
<td>48+</td>
<td>IV</td>
<td>30+</td>
<td>IV</td>
<td>26-34</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35-43</td>
<td>V</td>
<td>32-39</td>
<td>V</td>
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<td>44-52</td>
<td>VI</td>
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<tr>
<td></td>
<td></td>
<td>53+</td>
<td>VII</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Students enrolled for the final year of any combined course will be classified as Year V.

Publication of Faculty Board Minutes

A copy of Faculty Board decisions on matters of general interest will be displayed on all Departmental Notice Boards, in the Library, the University Union and the Staff House.

Decisions in relation to individual students, personal staff matters and other items which are of a confidential nature will not be included in the published list.

Use of Electronic Calculators in Examinations

The Faculty of Engineering favours the use of unprogrammed electronic calculators in examinations provided that the calculators used are noiseless and self-contained. However, the final decision whether calculators may be used in a particular examination is a matter for the examiner. If calculators are to be permitted, the examiner should take precautions in setting the examination and in invigilation to ensure that there is no undue advantage for any student using such equipment. In particular, the calculators are not to be used as a means of bringing information into the examination room, e.g. in the form of programmed cards, unless permission to do so is explicitly given by the examiner.

Submission of Project Reports

All Undergraduate Project reports must be submitted no later than the Friday which follows the 47th Monday of the year.
All Master of Engineering Science Project reports must be submitted up to, but not later than the Wednesday of the fourth week of the year in which the candidate wishes to graduate.

Replacement of Subjects Failed in First-half Year by Second Half-year Subjects

A student who fails one or more first half-year subjects may be permitted to take up to two additional second half-year units provided that he has the prerequisite requirements. He cannot, however, replace compulsory first half-year units by optional second half-year ones. He will be required to repeat the compulsory subjects the following year.

Special Consideration/Special Examinations

Senate has ruled that a student may apply for special consideration or special examination for mid-year examinations. This will also apply to assignments and term quizzes which are considered in assessing the student's final grading.

Consequently, any student who is prevented by illness or other circumstances from siting a mid-year examination or quiz or from submitting an assignment should submit a request for special consideration, accompanied by a medical certificate where appropriate, to the Secretary to the University.

ALTERNATIVE SUBJECTS

(see Section 15 of the Requirements)

The Faculty Board has deemed the following groups of subjects to be acceptable alternatives:

4. CE212 Heat and ME372 Heat Transfer.

STANDING AND EXEMPTION EXAMINATIONS FOR HOLDERS OF TECHNICAL COLLEGE CERTIFICATES

A student may apply for standing in any subject. The Head of the appropriate Department will decide whether the student shall be granted standing on the basis of qualifications held or whether the student shall be required to sit for an exemption examination.

As a guide to students the holder of a Technical College Certificate containing appropriate subjects may expect to be granted standing in the following subjects or subject units:

<table>
<thead>
<tr>
<th>Subject Units</th>
<th>Subject Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) CE212 Mechanics of Solids I and ME214 Mechanics of Solids I.</td>
<td></td>
</tr>
<tr>
<td>(2) CE221 Properties of Materials I and ME241 Properties of Materials.</td>
<td></td>
</tr>
<tr>
<td>(3) CE211 Fluid Statics &amp; Dynamics, CE231 Fluid Mechanics I and ME251 Fluid Mechanics.</td>
<td></td>
</tr>
<tr>
<td>(4) CE212 Heat and ME372 Heat Transfer.</td>
<td></td>
</tr>
</tbody>
</table>
ME111 Graphics
ME112 Engineering Drawing & Elementary Design
ME121 Workshop Practice
ME222 Process Technology
ME223 Mechanical Technology
Met151 Microstructure of Materials
CE161 Land Surveying I

The following subjects (or subject units) are those in which a student holding the appropriate Technical College Certificate may expect to be granted an exemption examination:—

CE111 Statics
EE203 Introduction to Electrical Energy
EE204 Introduction to Electrical Information
ME131 Dynamics
ME212 Engineering Design
ME213 Engineering Design

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, the unit value is assessed on the basis of the work-load required for that subject as part of a normal year's programme. Normally, Part I subjects each count as 4 units while complete Part II and Part III subjects have a higher unit value. However, the unit value specified for subjects in other faculties is determined from time to time by the Faculty Board.

For further information students should consult the Dean of the Faculty.

In the Master of Engineering Science Requirements a unit is defined as exactly one-twelfth of a full-time year, and in all postgraduate courses, including the Master of Engineering and Doctor of Philosophy 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.

FIRST YEAR PROGRAMMES

Students enrolling for the first year of an Engineering course should study the following notes carefully before completing their enrolment form.

Your programme will vary slightly according to the Department in which you are enrolling. For details of Engineering I, Electives and ME121 Workshop Practice see the notes below.

Students are also advised not to purchase drawing instruments and calculators until after discussions during the first Engineering I lecture. If a book is listed as a prescribed textbook a student may purchase this, as soon as he wishes, but is advised not to purchase any other books until after the first lecture in the subject.

Full-time students enrol for

Chemical Engineering

ME121 Workshop Practice

Civil Engineering
(including Mining Engineering)

ME121 Workshop Practice

Electrical Engineering

ME121 Workshop Practice

ME131 Dynamics
Met182 Electronic Structure of Materials

Mechanical Engineering
(including Industrial Engineering)

ME121 Workshop Practice

ME121 Workshop Practice

ME151 Microstructure of Materials

Metallurgy

ME121 Workshop Practice

ChE101 Industrial Process Principles
Met141 Mechanical Properties of Materials
Met151 Microstructure of Materials
Recommended programmes for part-time students are:

**Chemical Engineering**
- Engineering I
- Physics IA or IB
- Workshop Practice

**Civil Engineering**
- Engineering I
- Mathematics I
- Workshop Practice

**Surveying**
- Mathematics I
- Civil Engineering IS
- Economics I

**Electrical Engineering**
- Engineering I
- Mathematics I
- Electronic Structure of Materials

**Mechanical Engineering**
- Engineering I
- Mathematics I
- Workshop Practice

**Metallurgy**
- Mathematics I
- Physics IA

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) EE131 Circuit Fundamentals
   (b) CE111 Statics
   (c) ME111 Graphics
   (d) ME112 Engineering Drawing & Elementary Design
   (e) ME131 Dynamics
   (f) ChE101 Industrial Process Principles

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**Departmental Requirements are**

**Chemical Engineering**
- (b), (c), (d) & (f)

**Civil Engineering**
- (b), (c), (d) & (e)
- (including Mining Engineering)

**Electrical Engineering**
- (a), (b), (c) & (d)

**Mechanical Engineering**
- (b), (c), (d) & (e)
- (including Industrial Engineering & Naval Architecture)

**Electrical Engineering**
First year Electives must be selected in accordance with the Elective Requirements on page 27.

3. Workshop Practice

ME121 Workshop Practice is a compulsory subject in all courses except Surveying.

Standing for the subject may be granted to those students with equivalent training or relevant experience and applications for standing should be made at the time of enrolment.

Students required to take the subject should enrol for it as follows:

**Chemical Engineering & Mechanical Engineering**
- In the first year of enrolment

**Civil Engineering**
- Normally in the second year of enrolment

**Electrical Engineering**
- In either the first or second year of enrolment

**Metallurgy**
- Full-time—In the first year of enrolment
- Part-time—In the first or second year of enrolment

**Subject Name**

The name shown is the official name which should be used on all enrolment, re-enrolment and variation forms.

Each subject has an identification number with prefixed letters indicating the Department responsible for the subject —

- ChE — Chemical Engineering
- CE — Civil Engineering
- EE — Electrical Engineering
- ME — Mechanical Engineering
- Met — Metallurgy
- GE — Interdepartmental Subjects

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.

The fields of study are shown at the beginning of each departmental subject entry.
A suffix letter J indicates that the subject is a joint offering of more than one department. The six digit number which precedes the name is the Computer Code Number for the subject.

Prerequisites and Corequisites
Prerequisites are those subjects which the student must have already passed before enrolling in the subject. Corequisites are those subjects in which the student must enrol concurrently unless he has already passed them.

The Dean, on the recommendation of the Head of Department, may relax pre- and corequisites. Prerequisites in the Department of Mechanical Engineering marked with an asterisk may with the approval of the Head of Department be read concurrently with the subject unit named.

Hours
All subjects in the Faculty of Engineering are based in units of 42 contact hours each. A full explanation of the unit is given on page 26.

The 42 contact hours are spread over a whole year (1-1/2 hours per week for 28 weeks) or over a half year (3 hours per week for 14 weeks). As far as possible this information has been given in the entries but students should check with Departments before completing their timetables.

Examinations and Assessment
Progressive Assessment based on assignments, practical work etc. is used throughout the Faculty and in some subjects the final grade is based entirely on progressive assessment. The hours shown for examinations refer to final examinations only.

However, the method of examination as set out under the various subject headings is tentative and may be varied at the discretion of the Lecturer concerned. Students will be advised of any such variations before the end of 4th week of first term.

Content
This section gives a general description of the content of the subject and indicates the broad areas covered.

Preliminary Reading is included where applicable. Students should make every effort to complete the preliminary reading before starting the subject.

Texts
Essential books which are recommended for purchase.

References
Students should not restrict their reading to the texts and other references are listed to cover various aspects of the subject. Students may need to read all or part of a reference to gain an appreciation of a particular topic.

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-engineers, as well as in the industries producing conventional "chemicals". The new fields of biochemical and bio-medical engineering apply chemical engineering principles to biological processes and to research into the functions of and artificial substitution for such systems as kidneys and other organs. The "energy crisis" is creating a large demand for Chemical Engineers in the fuel processing industry.

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 (B.E.) may be read as a four year full-time course or with up to five years part-time and one final year full-time (or equivalent). A course of two years part-time followed by three years full-time is an excellent pattern. The degree is recognised for the full academic requirements of corporate membership of The Institution of Engineers, Australia and The Institution of Chemical Engineers (Great Britain).

Combined Degrees — B.A./B.E., B.Com./B.E., B.Sc./B.E., for honours level students are normally five years full-time. The combined Science degree may be taken with a major in Chemistry, Mathematics, Biology or Geology.

Bachelor of Science (Engineering) is normally a six year part-time degree. The syllabus has been developed to provide for some specialization in the fields of Applied Chemistry, Fuel Technology or Mineral Processing with the objective of professional recognition in these fields. It is recognised by the Royal Australian Chemical Institute and the Institute of Fuel. The Institution of Chemical Engineers recognises it as exempting from two of 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 chemical processes and equipment. Electives are available permitting students to widen their education or deepen their specialist ability by selection from subjects throughout the whole university.

SCHEDULE 1.1

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I4</td>
<td></td>
</tr>
<tr>
<td>Chemistry 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></td>
<td>17</td>
</tr>
<tr>
<td>Year II</td>
<td></td>
</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></td>
<td>15</td>
</tr>
<tr>
<td>Industrial Experience</td>
<td></td>
</tr>
<tr>
<td>Year III</td>
<td></td>
</tr>
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<td>Chemical Engineering IIA</td>
<td>7</td>
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<tr>
<td>Chemical Engineering IIB</td>
<td>3</td>
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<tr>
<td>Elective I</td>
<td>5</td>
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<td></td>
<td>15</td>
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<tr>
<td>Industrial Experience</td>
<td></td>
</tr>
<tr>
<td>Year IV</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering III</td>
<td>5</td>
</tr>
<tr>
<td>Projects II</td>
<td>6</td>
</tr>
<tr>
<td>Elective II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

1 Standing may be granted in all or part of ME121 Workshop Practice on production of a certificate that equivalent training has been obtained.
2 See Elective Requirements—Appendix A.
3 Mathematics IIB may be taken in two parts each of three terms duration.
4 See Year I programme details on page 27.

Recommended Programme for the Bachelor of Engineering in Chemical Engineering By Part-time Study

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</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>ME121 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
</tr>
<tr>
<td>Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Stage 3</td>
<td></td>
</tr>
<tr>
<td>Chemistry IIA</td>
<td>5</td>
</tr>
<tr>
<td>Mathematics IIB Part 1</td>
<td>2</td>
</tr>
<tr>
<td>Chemical Engineering I Part 1</td>
<td>1</td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Stage 4</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB Part 2</td>
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</tr>
<tr>
<td>Chemical Engineering I Part 2</td>
<td>5</td>
</tr>
<tr>
<td>Chemical Engineering IIA Part 1</td>
<td>2</td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Stage 5</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIA Part 2</td>
<td>5</td>
</tr>
<tr>
<td>Chemical Engineering IIB</td>
<td>3</td>
</tr>
<tr>
<td>Elective I</td>
<td>1</td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Year VI Full Time2</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering III</td>
<td>5</td>
</tr>
<tr>
<td>Projects II</td>
<td>6</td>
</tr>
<tr>
<td>Elective I (allowing for Industrial units)</td>
<td>2</td>
</tr>
<tr>
<td>Elective II (allowing for Industrial units)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

1 Standing may be granted in all or part of ME121 Workshop Practice on production of a certificate that equivalent training has been obtained.
2 Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.
3 See Elective Requirements—Appendix A.
# 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>
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<td>Engineering I</td>
<td>4</td>
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<tr>
<td>Physics IA or IB</td>
<td>4</td>
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<tr>
<td>ME121 Workshop Practice</td>
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<td></td>
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<tr>
<td><strong>Stage 2</strong></td>
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<tr>
<td>Chemistry I</td>
<td>4</td>
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<tr>
<td>Mathematics I</td>
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<td></td>
<td>8</td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
<td></td>
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<tr>
<td>Chemistry IIA</td>
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<tr>
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<tr>
<td>Chemical Engineering I Part 1</td>
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<td></td>
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<td><strong>Stage 4</strong></td>
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<tr>
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<tr>
<td>2 Elective IA</td>
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<td></td>
<td>8</td>
</tr>
<tr>
<td>Industrial Experience Units</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Standing may be granted in all or part of ME121 Workshop Practice on production of a certificate that equivalent training has been obtained.
2. See Elective Requirements—Appendix A.

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 programme for the Department of Chemical Engineering would be:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year I</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

| Year II                                   |                             |
| Mathematics IIB Part 1                   |                             |
| Chemistry IIA                             |                             |
| Chemical Engineering I                    |                             |
| Arts Subject I                            |                             |

| Year III                                  |                             |
| Mathematics IIB Part 2                   |                             |
| Chemical Engineering IIA Part 1          |                             |
| Elective I                               |                             |
| Arts Subject II                           |                             |
| Arts Subject I or II                      |                             |
| Industrial Experience                     |                             |

| Year IV                                   |                             |
| Chemical Engineering IIA Part 2          |                             |
| Chemical Engineering IIB                 |                             |
| Arts Subject III                          |                             |
| Industrial Experience                     |                             |

| Year V                                    |                             |
| Chemical Engineering III                  |                             |
| Arts Subject I, II or III                 |                             |
| Projects II                               |                             |
BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

The course followed must comply with Section 19 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme has been approved by the two Faculty Boards:

Subject                                                                 Units
Year I
2Chemistry I                                                                 4
2Mathematics I                                                               4
Engineering I                                                                4
Physics IA/IB                                                                4
ME121 Workshop Practice                                                      1
                                                                                   17
Year II
Chemical Engineering I                                                      6
Chemistry II                                                                 5
2Mathematics II B Part 1                                                    2
2One Economics & Commerce subject Group A                                    4
                                                                                   17
Year III
Chemical Engineering IIA                                                   7
2Mathematics II B Part 2                                                    2
2One Economics & Commerce subject Group A                                    4
2One Economics & Commerce subject Group A or B                               4
                                                                                   17
Year IV
ME301 Engineering Computations                                            1
ME313 Engineering Design                                                   1
ME333 Dynamics of Machines                                                  1
ME342 Properties of Materials                                               1
ME343 Mechanics of Solids                                                   1
ME361 Automatic Control                                                    1
ME381 Methods Engineering                                                   1
ME383 Quality Engineering                                                   1
ME384 Design for Production                                                1
ME487 Operations Research—Deterministic Models                             1
ME488 Operations Research—Probabilistic Models                             1
2One Economics & Commerce subject Group C                                    4
                                                                                   15

Notes
* First half year
** Second half year
1 Three elective units must be chosen from the list of Departmental Electives
2 The subjects which count towards the B.Com. degree are those marked 2 plus six Engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject

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 part I subject and Chemical Engineering I as a Science part II subject (Clause 12b of the Science degree requirements) and that a subject taken for the Science degree may be accepted as Elective II 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.

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

Subject                                                                 Units
Year I
Chemistry I                                                                 1
Engineering I                                                               1
Mathematics I                                                               1
Physics IA or IB                                                           1
ME121 Workshop Practice                                                    1
                                                                                   5
Year II
Chemical Engineering I                                                     1
Chemistry IIA                                                               1
Mathematics IIB                                                             1
                                                                                   3
Year III
Chemistry IIIA                                                              1
Chemical Engineering IIA Part 1                                            1
Elective I                                                                 1
Industrial Experience                                                      1
                                                                                   4

36
Subject
Year IV
Chemical Engineering IIA Part 2
Chemical Engineering IIB
and one of:
Chemistry IIB, IIIB, Geology I, Biology I, Physics II
Industrial Experience

Year V
Chemical Engineering III
Elective II
Projects II

[Similar programmes can be made to major in Mathematics, Biology or Geology]
1 A candidate must have taken Physics IA to enrol for Physics II as the Science subject.

DESCRIPTION OF SUBJECT ENTRIES
Indicating Numerals
ChE-0-
ChE-1-
ChE-2-
ChE-3-

Field of Study
General
Chemical Engineering Science
Unit Operations
Engineering Practice

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).

541100 Engineering I
(i) ME111 Graphics
(ii) ME112 Engineering Drawing and Elementary Design
(iii) CE111 Statistics
(iv) ChE101 Industrial Process Principles

541201 ME121 Workshop Practice
(iv) 511101 ChE101 Industrial Process Principles

Hours 1½ hours per week

Examination One 3-hour paper

Content
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 melting and steel production, cement manufacture, combustion of coal and oil, production of tonnage oxygen, ammonia and acids.

Texts
Wall, T. F. An Outline of Industrial Process Principles (Dept of Chemical Engineering, Univ. of Newcastle)

References
Himmelblau, J. Basic Principles and Calculations in Chemical Engineering (Van Nostrand 1973)

512200 Chemical Engineering I

Prerequisites Maths I and Physics IA or IB

Hours 9 hours per week

Examination Two 3-hour final papers and term tests.

Content
Part I
(i) & (ii) ChE201/202 Fuels and Processes
Part II
(iii) ChE203 Laboratory
(iv) & (v) ChE211/2 Fluids and Heat
(vi) ChE221 Stage Separation Processes
(vii) ChE231 Design

Part-time students may take the subject in two parts as indicated.
Part I

(i) ChE201 Fuels and Combustion

Hours Approx. 42 hours

Content
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
Harker, J. H. & Allen, D. A. Fuel Science (Oliver & Boyd 1972)

(ii) ChE202 Industrial Chemical Processes and Equipment

Content
Chemical engineering principles of chemical processing, chemical equilibrium and process selection, process equipment and materials of construction. Major chemical industries discussed include: Water and waste water treatment, Coal chemicals, Industrial gases, Ammonia and methanol, Acids and Chloro-Alkali industries, Phosphate fertilisers, Petroleum refining and Petrochemicals.

Text

Reference
Kent, J. A. Riegels Handbook of Industrial Chemistry 7th edn (Van Nostrand 1973)

Part II

(iii) ChE203 Laboratory

Hours 84 hours

(iv) & (v) ChE211/2 Fluids and Heat

Content
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.

Introductory lectures on statistical methods and computer use will be given and throughout the assignments, elementary statistical treatment and interpretation of data are required together with an error analysis.

Texts

(iv) ChE211 Fluid Statics and Dynamics

Content
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, fans and pumps.

Text
Giles, J. R. Fluid Mechanics and Hydraulics (McGraw-Hill)

(v) ChE212 Heat

Content
Conduction of heat; Fouriers equation, steady state undirectional 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.

**Texts**


(vi) **ChE221 Stage Separation Processes**

**Hours**

Approx. 21 hours

**Content**

Introduction to the concept of single and multi-stage separation processes. Definition of an ideal equilibrium stage, stage efficiency and introduction to methods for determining the number of ideal stages required for a given separation. Solid liquid extraction will be used to illustrate the above.

**Text**


**Reference**


(vii) **ChE231 Design (Chemical Engineering I)**

**Hours**

21 hours

**Content**

Unfired pressure vessels to code design, design of simple structures and piping systems. Elementary instrumentation.

**Texts**

SAA Code *Engineering Drawing Practice AS CuI Pti 1976*

SAA Code *Unfired Pressure Vessels AS 1210-1972*

SAA Code *Steel Structures Code AS 1250-1972*

Nash, W. A. *Theory and Problems of Strength of Materials* (Schaum 1957)

**513100 Chemical Engineering IIA**

**Prerequisites**

Chemical Engineering I and Chemistry I

**Hours**

10½ hours per week

**Examination**

Four 3-hour papers and progressive assessment

**Content**

**Part I**

(i) ChE301 Computations

(ii) ChE311 Thermodynamics

(iv) ChE312 Reaction Engineering

**Part II**

(i) ChE302 Unit Operations Laboratory

(v) ChE313 Transport Principles

(vi) ChE321 Continuous Contacting Processes

(vii) ChE322 Particulate Systems

(i) **ChE301 Computations**

**Hours**

Approx. 21 hours

**Content**

Computations for heat and mass transfer, thermodynamic functions and data processing will be used as an introduction to numerical methods emphasising iterative techniques. Extensive use of FORTRAN IV and Input/Output operations, sub-programs, subroutines, ICL computer packages and efficient programming in FORTRAN will be made.

**Topic outlines**

Curve fitting by classical graphical methods.

Curve fitting with data transforms by least squares polynomial approximation, mini-max polynomials; coefficient errors.

Iterative solution of algebraic and transcendental single-simultaneous equations by first or second order methods, weighting factors on convergence efficiency.

Matrix methods in solving sets of equations.

Solution of single/simultaneous differential equations of first or higher order.

ICL Analogue Simulation package.

**Texts**


References

(ii) ChE302 Unit Operations Laboratory

**Hours** Approx. 84 hours

**Content**
A number of experiments study in depth the principles of lecture topics. Applied statistical techniques are used to obtain the maximum amount of useful information from raw data. Techniques include curve fittings of empirical equations; analysis of variance and error analyses.

**Texts**

(iii) ChE311 Thermodynamics

**Hours** Approx. 42 hours

**Content**
Thermodynamics applied to the description of the properties of gases and liquids both ideal and non ideal cases; the expansion and compression processes leading to power generation and cryogenics, to solution equilibria leading to phase and chemical reaction equilibria, to the application of reaction equilibria to corrosion and electrolytic solutions.

**Text**

(iv) ChE312 Reaction Engineering

**Hours** Approx. 42 hours

**Content**
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. An introduction to design for heterogeneous reacting systems.

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

(v) ChE313 Transport Principles

**Hours** Approx. 42 hours

**Content**
Heat and mass transfer in unsteady state conditions, transport theory for momentum, heat and mass transfer in laminar and turbulent flow conditions. Boundary layer theory. The course stresses the application of mathematics to the solution of engineering problems. Analogies between heat mass and momentum transfer.

**Text**

(vi) ChE321 Continuous Contacting Processes

**Hours** Approx. 42 hours

**Content**
Continuous contact separation processes applied to humidification, gas absorption, distillation and liquid-liquid extraction processes.

**Texts**

(vii) ChE322 Particulate Systems

**Hours** Approx. 42 hours

**Examination** To be advised

**Content**
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 separation in gas or liquids; action of gravitational and centrifugal fields, design and performance of separation and pollution control equipment under these conditions — settling chambers, gas and liquid cyclones, centrifuges; flocculation, hindered settling, sludge thickening; Flow through fixed beds-Fluidisation-Filtration-analytical and design methods. Agitation and mixing scale-up and shape considerations; Evaporation and crystallisation. Dust and gas removal for environmental control.

Text
Coulson, J. M. & Richardson, J. F. Chemical Engineering Vol. 11 2nd edn (Pergamon 1970)

References

513200 Chemical Engineering IIB

Prerequisites Chemical Engineering I
Pre- or Corequisite Chemical Engineering IIA
Hours 4½ hours per week
Examination One 3-hour paper and one 8-hour paper

Content
(i) ChE314 Process Control
(ii) ChE331 Process Economics
(iii) ChE332 Equipment Design — including materials and corrosion

(i) ChE314 Process Control

Hours Approx. 42 hours

Content
Introduction to process dynamics, the well stirred vessel, treatment of experimental data, Laplace Transform Applications. Block diagram notation, open loop and closed loop systems, the transfer function application and limitations. Control modes. Stability of closed loop system, elementary root locus., Bode diagram. Feed forward. Control, cascade control with applications to control of temperature, flow pressure and composition. Laboratory exercises.
Content

Process and engineering flow sheets

Process Heat Exchange — Process and detail design of various classes of heat exchangers for liquids, condensing vapours and boiling liquids.

Process Vessels — Process and detail design of tray and packed process vessels — design of process vessels as free standing vessels — design of simple storage vessels to relevant codes; instrumentation of process vessels.

Materials and Corrosion — The chemistry and physics of corrosion; selection of materials and design methods for corrosive materials and atmospheres. Other factors influencing selection of materials.

Mechanical Drives — Design and selection of bearings, shafts, pulleys and belt drives, seals and glands etc.

Miscellaneous — Outline of types, application design and selection of the following:
- Electric motors, turbines, vacuum systems and process refrigeration systems.

Texts
Kern, D. Q.  
SAA Code  

SAA Code  
Engineering Drawing Practice ASCZ1 Pt 1 1976

SAA Code  
Unfired Pressure Vessels AS1210-1972

SAA Code  
Steel Structures Code AS 1250-1972

Reference
Rase, H. R. & Barrow, M. H.  
Project Engineering for Process Plants (Wiley 1957)

GENERAL ELECTIVE SUBJECTS

ChE341 — Fuel Technology I — 1 unit

Prerequisites  
1st courses in Engineering of Metallurgical Chemistry and fluid mechanics.

Hours  
Approx. 1½ hours per week

Content
Fuel and energy resources and demand. Properties and testing for combustion purposes of common fuels, particularly coal, coke, petroleum products and natural gas. Air quantities for combustion, heat losses in products of combustion, thermodynamics of combustion systems. Gas, oil and pulverized coal flames; burner systems to control stability, flame position and flame shape. Solid fuel combustion and reduction; fixed beds, gas producers and blast furnaces. Abridged bed combustion systems.

References
Beer, J. M. & Chigier, N. A.  
Combustion Aerodynamics (Applied Science 1972)

Brame, J. S. S. & King, J. G.  
Fuel (Arnold)

ChE342 — Furnace Heat Transfer — 1 unit

Prerequisites  
1st courses in heat transfer and fluid mechanics

Hours  
Approx. 1½ hours per week

Content
Furnace type and uses; high temperature heat transfer mechanisms. Generalised model of furnace efficiency and losses. Convective heat transfer on large surfaces, from impinging jets; heat transfer in packed beds. Conductive thermal storage losses. Radiative exchange between surfaces; exchange area concept; direct and total interchange in a closed system. Gas radiation; the grey gas model for real gases; gas emissivity and exchange areas. Models for furnace systems, well-stirred, speckled; plug flow. Heat exchange characteristics of the model. Steam boiler furnaces and reheating furnaces as two zone systems. Introduction to zoning methods for more complete systems.

Texts
Hottel, H. C. & Sarofim, A. F.  
Radiative Transfer (McGraw-Hill 1967)

Trinks, W. & McWhinney  
Industrial Furnaces (Wiley)

514100 Chemical Engineering III

Prerequisites  
Chemical Engineering IIA and IIB

Hours  
7 hours per week

Examination  
Three 3-hour papers in November and progressive assessment.

Content
ChE402 Seminar
ChE431 Process Engineering

Together with not less than six topics selected from:

ChE411 Advanced Combustion (or ChE341 Fuel Technology I 1 or 2 topics)
ChE412 Radiant Heat Transfer (or ChE342 Furnace Heat Transfer — 2 topics)
ChE413 Selected topics in Heat and Mass Transfer
ChE414 Advanced Reaction Engineering
ChE415 Advanced Transport Theory
ChE416 Advanced Process Control
ChE421 Multicomponent Separations
ChE422 Particle Mechanics
ChE431 Environmental Control
ChE432 Process Evaluation and Optimization
ChE401 Advanced Computations

Texts
As for Level 3 subjects except ChE432

Eckenfelder, W. W. Industrial Water Pollution Control (McGraw-Hill 1966)

References
To be advised

ChE402 Seminar

Hours
Approx. 42 hours

Content
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.

ChE431 Process Engineering

Hours
Approx. 42 hours

Content
1. Plant Location — Factors influencing the location of process plants with particular reference to Australian conditions — Pollution requirements.

2. Plant Layout — Outline of requirements, i.e. safety, operation and maintenance D.L.I. regulations — use of models — selected examples in plant layout for process equipment, utilities and instrumentation.


5. Plant Reliability — Introduction to concept of reliability engineering.

6. Power and Process Reticulation — Design of process piping systems for steam, air, gas and process fluids — trapping and drainage — design of supports and trestles — insulation — introductory piping flexural analysis.

7. Materials Handling — Review of relevant theory, design and selection of the following:
Process weighing, process storage, conveyor and elevator systems.

8. Engineering responsibilities in environmental and safety control and labour relationships.

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

ChE401/432 Projects II

Hours
6 units require 20 hours per week

Content
ChE401: An assigned task of experimental investigation, or of design, construction and testing of experimental equipment to be reported formally in a thesis.

ChE432: 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.

509100 Elective I

Content
At least 5 units taken from:

<table>
<thead>
<tr>
<th>Units</th>
<th>Course</th>
</tr>
</thead>
</table>
| CE201 | Materials and Structures
|       | (alternately ME241-14 units; Materials Science IS 2 units) |
| EE203-4 | Introduction to Electrical Information & Energy |
| ChE341 | Fuel Technology I |
| ChE342 | Furnace Heat Transfer |
| CE471 | Energy |
| GE350 | Chemistry Advanced Topics (from IIB, IIIA, IIIB, to not more than 3 units) |
| GE472 | Energy II may be available for students who have completed Energy I. |

Energy I or II may not be credited at more than 1 unit (2 topics) as a 4th Year Advanced Topic

Mathematics Advanced Topics (to not more than 3 units)
Metallurgy Advanced Topics (to not more than 3 units)
ME361 Automatic Control
ME401 (402) Systems Analysis
Civil Engineering is the application of science to the improvement of the community's environment. It is concerned with the design and construction of water supply and conservation projects, hydro-electric development, 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 judgement, 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 construction 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), Bachelor of Science/Bachelor of Engineering in Civil Engineering (full-time course) and Bachelor of Commerce/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.

Up to and including 1976, 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 have been offered by the University of Newcastle through the Department of Civil Engineering. Starting in 1977, the University of Newcastle will offer its own complete Bachelor of Surveying course as set out on pages 82 et seq. Students who have already begun the University of New South Wales course at this University will be able to transfer without difficulty to the new course.

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 years 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.

Definition of units
In the following course schedules, the relative weights of individual subjects are measured in units, each of which is defined as 42 attendance hours, i.e. 1.5 hours per week for the whole year or the equivalent in the case of subjects taken outside the Faculty.

SCHEDULE 1.2

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>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry IS</td>
<td>2</td>
</tr>
<tr>
<td>CE171 Structural Surveying I</td>
<td>2</td>
</tr>
<tr>
<td><strong>Year II</strong></td>
<td></td>
</tr>
<tr>
<td>2Mathematics IIB</td>
<td>4</td>
</tr>
<tr>
<td>CE212 Mechanics of Solids</td>
<td>1</td>
</tr>
<tr>
<td>CE221 Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>CE222 Materials Technology</td>
<td>2</td>
</tr>
<tr>
<td>CE231 Fluid Mechanics I</td>
<td>1</td>
</tr>
<tr>
<td>CE241 Water Resources Engineering</td>
<td>2</td>
</tr>
<tr>
<td>CE223J Engineering Geology</td>
<td>1</td>
</tr>
<tr>
<td>EE203 Introduction to Electrical Information</td>
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<tr>
<td>EE204 Introduction to Electrical Energy</td>
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<tr>
<td>ME121 Workshop Practice</td>
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<tr>
<td>ME271 Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td><strong>Year III</strong></td>
<td></td>
</tr>
<tr>
<td>CE313 Structural Analysis &amp; Design I</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>GE350 Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CE351 Civil Engineering Systems I</td>
<td>1</td>
</tr>
<tr>
<td>CE372 Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
</tr>
<tr>
<td>3Elective(s) I</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

Required Programme for the Bachelor of Engineering in Civil Engineering By Part-time Studies

<table>
<thead>
<tr>
<th>Stage</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
<td>Engineering I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Chemistry IS</td>
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<tr>
<td></td>
<td>CE171 Structural Surveying I</td>
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<tr>
<td></td>
<td>ME121 Workshop Practice</td>
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</tr>
<tr>
<td><strong>Stage 3</strong></td>
<td>Mathematics IIB Part I (C, E)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE212 Mechanics of Solids</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE221 Properties of Materials</td>
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<tr>
<td></td>
<td>CE222 Materials Technology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE223J Engineering Geology</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>EE203 Introduction to Electrical Information</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>EE204 Introduction to Electrical Energy</td>
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</tr>
<tr>
<td><strong>Stage 4</strong></td>
<td>Mathematics IIB, Part II (D, H)</td>
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</tr>
<tr>
<td></td>
<td>GE231 Fluid Mechanics I</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>GE241 Water Resources Engineering</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>GE350 Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE351 Civil Engineering Systems I</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE372 Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME271 Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3Elective(s) I</td>
<td>4</td>
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<td><strong>Total</strong></td>
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<tr>
<td>Stage</td>
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<td>Units</td>
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<tr>
<td>-------</td>
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</tr>
<tr>
<td>5</td>
<td>CE313 Structural Analysis &amp; Design I</td>
<td>4</td>
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<td></td>
<td>CE324 Soil Mechanics</td>
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<td></td>
<td>CE332 Fluid Mechanics II</td>
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</tr>
<tr>
<td></td>
<td>ME301 Engineering Computations</td>
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<td></td>
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<td>6</td>
<td>CE414 Structural Analysis &amp; Design II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CE425 Earth &amp; Rock Engineering</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Elective I</td>
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<td></td>
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<tr>
<td>7</td>
<td>CE452 Engineering Construction</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE453 Project</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ME482 Engineering Economics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Elective II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

1 Satisfactory completion of 5-day survey camp is required, normally in Stage 3.
2 See Elective Requirements — Appendix A.

**SCHEDULE 3.2**

*BACHELOR OF SCIENCE (ENGINEERING) IN CIVIL ENGINEERING*

Stages 1, 2, 3 and 4 will not be offered after 1976

<table>
<thead>
<tr>
<th>Stage 5</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CE313 Structural Analysis &amp; Design I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CE332 Fluid Mechanics II</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE372 Transportation Engineering</td>
<td>1</td>
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<td></td>
<td>CE324 Soil Mechanics</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Stage 6</td>
<td>CE414B Structural Design II</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE452 Engineering Construction</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE241 Water Resources Engineering</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>GE350 Seminar</td>
<td>1</td>
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</table>

Select two units from —

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE425 Earth and Rock Engineering</td>
<td>(1)</td>
</tr>
<tr>
<td>CE351 Civil Engineering Systems</td>
<td>(1)</td>
</tr>
<tr>
<td>ME482 Engineering Economics</td>
<td>(1)</td>
</tr>
<tr>
<td>CE414A Structural Analysis II</td>
<td>(2)</td>
</tr>
</tbody>
</table>

OR any other Department Elective subject to satisfaction of prerequisites.

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

The course followed must comply with Section 7 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme is recommended:

The first four years are identical with the B.E. programme except that Electives I and II must consist of Arts/Science subjects Parts I and II respectively.

**Year V**

| Arts/Science Subject Part I                  | 4     |
| Arts/Science Subject Part II                 | 5     |
| Arts/Science Subject Part III                | 8     |
|                                             | 17    |

**Note**

Students wishing to major in Mathematics should ensure that Mathematics IIIB in the B.E. programme is replaced by Mathematics IIA as necessary co- and pre-requisites to Mathematics IIC and Mathematics IIIA respectively.

**BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING IN CIVIL ENGINEERING**

The course followed must comply with Section 7 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme has been approved by the two Faculty Boards:

**Year I**

<p>| 2Engineering I                              | 4     |
| 2Mathematics I                              | 4     |
| Physics I                                   | 4     |
| Chemistry IS                                | 2     |
| Engineering Surveying                       | 2     |
|                                             | 16    |</p>
<table>
<thead>
<tr>
<th>Year II</th>
<th>Subject</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>2Mathematics IIB</td>
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<tr>
<td>CE121 Mechanics of Solids</td>
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<td>CE221 Properties of Materials</td>
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<td>CE222 Materials Technology</td>
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<tr>
<td>CE231 Fluid Mechanics I</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CE241 Water Resources Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CE223J Engineering Geology</td>
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<td></td>
</tr>
<tr>
<td>EE203 *Introduction to Electrical Information</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EE204 **Introduction to Electrical Energy</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2One Economics &amp; Commerce subject Group A</td>
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<table>
<thead>
<tr>
<th>Year III</th>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>ME121 Workshop Practice</td>
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<td></td>
</tr>
<tr>
<td>ME271 Thermodynamics</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CE313 Structural Analysis &amp; Design I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CE324 Soil Mechanics</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CE332 Fluid Mechanics II</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CE351 Civil Engineering Systems</td>
<td>1</td>
<td></td>
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<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CE372 Transportation Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2One Economics &amp; Commerce subject Group A</td>
<td>4</td>
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<table>
<thead>
<tr>
<th>Year IV</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE414 Structural Analysis &amp; Design II</td>
<td>4</td>
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</tr>
<tr>
<td>CE425 Earth &amp; Rock Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CE452 Engineering Construction</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CE453 Project</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2One Economics &amp; Commerce subject Group A</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2One Economics &amp; Commerce subject Group B</td>
<td>4</td>
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<table>
<thead>
<tr>
<th>Year V</th>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>2One Economics &amp; Commerce subject Group B</td>
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<tr>
<td>2One Economics &amp; Commerce subject Group B or C</td>
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<tr>
<td>2One Economics &amp; Commerce subject Group C</td>
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<tr>
<td>2One Economics &amp; Commerce subject Group C</td>
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<table>
<thead>
<tr>
<th>Notes</th>
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<tbody>
<tr>
<td>* First half year</td>
<td></td>
</tr>
<tr>
<td>** Second half year</td>
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</tbody>
</table>

2 The subjects which count towards the B.Com. degree are those marked 2 plus six Engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject.

---

**SCHEDULE 4.1**

**BACHELOR OF SURVEYING**

Full-time Course

<table>
<thead>
<tr>
<th>Year</th>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>Year I</td>
<td>Mathematics I</td>
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<tr>
<td></td>
<td>CE101 3Civil Engineering I</td>
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<tr>
<td></td>
<td>Economics I</td>
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<tr>
<td></td>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV111 Surveying I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV121 Survey Camp I</td>
<td></td>
</tr>
<tr>
<td>Year II</td>
<td>Mathematics IIB</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV231 Survey Computations I</td>
<td>2</td>
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<tr>
<td></td>
<td>SV212 Surveying II</td>
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<tr>
<td></td>
<td>CE241 Water Resources Engineering</td>
<td>2</td>
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<tr>
<td></td>
<td>CE372 Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Urban &amp; Regional Economics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>EE203 Introduction to Electrical Information</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV222 Survey Camp II</td>
<td></td>
</tr>
<tr>
<td>Year III</td>
<td>SV313 Surveying III</td>
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</tr>
<tr>
<td></td>
<td>SV332 Survey Computations II</td>
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</tr>
<tr>
<td></td>
<td>SV341 Astronomy I</td>
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<tr>
<td></td>
<td>SV351 Geodesy I</td>
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<tr>
<td></td>
<td>SV361 Photogrammetry I</td>
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<td>Geography IIIB</td>
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<td>Town Planning A</td>
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<td>SV323 Survey Camp III</td>
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<td>Year IV</td>
<td>SV414 Surveying IV</td>
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<td>SV432 Geodesy II</td>
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</tr>
<tr>
<td></td>
<td>SV452 Photogrammetry II</td>
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</tr>
<tr>
<td></td>
<td>SV471 Land Valuation</td>
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<td>Geography III Elective</td>
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<td>Organisational Behaviour</td>
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<tr>
<td></td>
<td>SV481 Project</td>
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</tr>
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<td></td>
<td>SV482 Professional/Project Seminar</td>
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</tr>
<tr>
<td></td>
<td>2Electives</td>
<td>4</td>
</tr>
</tbody>
</table>

1 Mathematics IIB may be taken in two parts each of three terms duration.
2 See Elective Requirements — Appendix A.
3 First year students will not be enrolled in CE101 in 1977. This subject, or an equivalent, will be included in a proposed rearrangement of the later years of the course.
Recommended Programme for the Bachelor of Surveying by part-time studies

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
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<td>Economics I</td>
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<td><strong>Stage 2</strong></td>
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<td>Physics IA</td>
<td>4</td>
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<tr>
<td>SV111 Surveying I</td>
<td>4</td>
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<td>SV121 Survey Camp I</td>
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<tr>
<td><strong>Stage 3</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB</td>
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</tr>
<tr>
<td>SV231 Survey Computations I</td>
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</tr>
<tr>
<td>Urban &amp; Regional Economics</td>
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</tr>
<tr>
<td><strong>Stage 4</strong></td>
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</tr>
<tr>
<td>SV212 Surveying II</td>
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</tr>
<tr>
<td>CE241 Water Resources Engineering</td>
<td>2</td>
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<tr>
<td>EE203 Introduction to Electrical Information</td>
<td>1</td>
</tr>
<tr>
<td>CE372 Transportation Engineering</td>
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</tr>
<tr>
<td>SV222 Survey Camp II</td>
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</tr>
<tr>
<td><strong>Year VI</strong></td>
<td></td>
</tr>
<tr>
<td>Same as full-time Year III</td>
<td></td>
</tr>
</tbody>
</table>

| Year VII                    |       |
| Same as full-time Year IV   |       |

1 Any student who is unable to undertake years V and VI as a full-time student may do so over three part-time years. Such a student may be required to attend day classes in most subjects.

CALCULATORS
It will be necessary for each student to obtain a suitable pocket-sized scientific calculator during First Term. Advice will be provided by the surveying staff as to suitable models.

DESCRIPTION OF SUBJECT ENTRIES

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 1½ hours 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.

**Indicating Numerals Field of Study**

<table>
<thead>
<tr>
<th>Civil Engineering Subjects</th>
<th>Surveying Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE-0- Service Courses</td>
<td>SV-0- Servicing course</td>
</tr>
<tr>
<td>CE-1- Structures</td>
<td>SV-1- General Surveying</td>
</tr>
<tr>
<td>CE-2- Materials</td>
<td>SV-2- Survey Camps</td>
</tr>
<tr>
<td>CE-3- Fluid Mechanics</td>
<td>SV-3- Survey Computations</td>
</tr>
<tr>
<td>CE-4- Water Resources</td>
<td>SV-4- Astronomy</td>
</tr>
<tr>
<td>CE-5- Civil Engineering practice</td>
<td>SV-5- Geodesy</td>
</tr>
<tr>
<td>CE-6- Surveying — Specialist courses</td>
<td>SV-6- Photogrammetry</td>
</tr>
<tr>
<td>CE-7- Surveying and Transportation</td>
<td>SV-7- Land Studies</td>
</tr>
<tr>
<td>CE-9- Special Topics</td>
<td>SV-8- Project and Seminars</td>
</tr>
<tr>
<td></td>
<td>SV-9- Special courses</td>
</tr>
</tbody>
</table>

**521103 CE101 Civil Engineering IS**

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Nil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>2 lecture hours and 1 tutorial hour per week</td>
</tr>
<tr>
<td>Examination</td>
<td>Progressive assessment</td>
</tr>
</tbody>
</table>
Statics: Force systems, equilibrium, pin-jointed frames
Properties of Materials: Behaviour of materials under static and dynamic loads.
Mechanics of Solids: Uniaxial loading, stress and strain, internal forces and stresses, deflection of beams.
Fluid Mechanics: Fluid properties, hydrostatics, fluid dynamics, continuity, energy, momentum. Flow in pipes, conduits and open channels.
Soil Mechanics: Soil properties, seepage, soil stresses, settlement, compaction, strength and failure criteria.

References
Lambe, T. W. & Whitman, R. V.
Shanley, F. R.
Streeter, V. L.

521101  CE111 Statics
Prerequisites Nil
Hours 1 lecture hour and ½ tutorial hour per week
Examination  One 3-hour paper

Content
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.

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

References
Beer & Johnston Mechanics for Engineers Statics 2nd edn (McGraw-Hill)
Meriam, J. L. Statics 2nd edn (S.I.) (Wiley 1975)

521104  CE171 Engineering Surveying I†
Prerequisites Nil
Hours 1¼ lecture hours, ½ tutorial hour, 1 fieldwork hour per week and a survey camp.

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

Examination  One 3-hour paper

Content
Basic measurement techniques and instruments, transversing, 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.

Text
Bannister, A. & Raymond, S.

References
Barry, B. A.
Clark, D.

522402  CE201 Engineering for Surveyors
Prerequisite Engineering I
Hours  2 lecture hours and 1 tutorial hour per week
Examination Progressive assessment

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

References
Lambe, T. W. & Whitman, R. V.
Linsley, R. K. et al.
Shanley, F. R.
Streeter, V. L.

521107  CE212 Mechanics of Solids
Prerequisites Engineering I and Maths I
Hours 1¼ lecture hours and ½ tutorial hour per week
Examination  One 3-hour paper

Content
Uniaxial loading, states of stress and strain, stress and strain relationships, internal forces, internal stresses, deflection of beams, torsion, riveting.
Text

References

522106 CE221 Properties of Materials

Prerequisites Engineering I

Hours 1 lecture hour and ½ lab tutorial hour per week

Examination One 3-hour paper

Content

Suggested Preliminary Reading

References
McClintock, F. A. & Argon, A. S. Mechanical Behaviour of Materials (Addison-Wesley 1966)

522105 CE222 Materials Technology

Hours 1½ lecture hours and 1½ laboratory and tutorial hours per week.

Examination Two 3-hour papers, the first at mid-year.

522202 CE231 Fluid Mechanics I

Prerequisites Maths I and ME131 Dynamics

Hours 1 lecture hour and ½ hour of tutorials and laboratory work per week

Examination One 3-hour paper
**Content**


**Text**


**References**


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522203 CE241 Water Resources Engineering

**Hours**

2 lecture hours and 1 tutorial hour per week

**Examination**

One 3-hour paper

**Content**


**Texts**


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*Bresler, B. et al. Hot Rolled Carbon Steel Sections and Plates (B.H.P. Co. Ltd)*

**References**


Metcalf & Eddy Jr *Wastewater Engineering* (McGraw-Hill 1972)

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523004 CE303 Structural Design

**Prerequisites**

CE212 and ME241

**Hours**

2 lecture hours and 1 tutorial hour per week

**Examination**

One 3-hour paper (R. C. Design)

One 3-hour paper (Steel Design)

**Content**

Design of steel and reinforced concrete structures for students not following the Civil Engineering course.

**Texts**

As for CE313 (Design)

**References**

As for CE313 (Design)

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523101 CE313 Structural Analysis and Design I

**Prerequisites**

CE212 and CE221

**Hours**

4 lecture hours and 2 tutorial hours per week

**Examination**

One 3-hour paper (Analysis)

One 3-hour paper (R. C. Design)

One 3-hour paper (Steel Design)

**Content**

Analysis of elastic statically determinate and indeterminate systems by classical methods; limit analysis; basic design of steel and reinforced concrete structures.

**Texts**

Analysis

Nil

Design

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

Bresler, B. et al. *Design of Steel Structures* (Wiley)
or McGuire, W.
or Gorenc, B. E. & Tinyou, R.
Lay, M. G.

References

Analysis
Baker & Heyman, J.
Coates, R. C. et al.
Horne, M. R.
Norris, C. H. & Wilber, J. B.
Raz, S. A.

Design
Bennett, E. W.
Ferguson, P. M.
Gray, C. S.
Sachs, P.
SAA

"Steel Structures" (Prentice-Hall)
"Steel Designer's Handbook" (N.S.W. U.P.)
"Source Book for the Australian Steel Structures Code AS1250" (AISC)
"Reinforced Concrete" (Pitman 1976)
"Steel Structures Code AS1250 - 1975"
"Code for Concrete in Buildings AS1480 - 1973"
"Loading Code AS1170 Pt I Dead and Live Load - 1971"
"AS 1170 Pt II Wind Loads - 1973"

"Plastic Design of Frames Vols 1 & 2" (Cambridge U.P.)
"Structural Analysis" (Nelson 1972)
"Plastic Theory of Structures" (Nelson 1971)
"Elementary Structural Analysis" (McGraw-Hill 1960)
"Analytical Methods in Structural Engineering" (Wiley 1974)
"Structural Concrete Elements" (Chapman Hall 1973)
"Reinforced Concrete Fundamentals" 3rd edn (Wiley)
"Steel Designer's Manual" (Lockwood)
"Wind Forces in Engineering" (Pergamon)
"Engineering Drawing Practice - ASCA A1" - 1966
"Metric Drawing Standard"
"Code for High Strength Bolts - AS1511 - 1973"
"Code for Welding in Building AS1554 Pt II - 1972 Automatic and Semi-automatic Welding"

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

523105 CE313A Structural Analysis I (Topic in Civil Engineering IIM in the Faculty of Mathematics)

Prerequisites
CE212 and Maths I

Hours
2 lecture hours and 1 tutorial hour per week

Examination
One 3-hour paper

Content
Analysis component of CE313
Analysis of elastic statically determinate and indeterminate systems by classical methods; limit analysis.

Texts

References

523102 CE324 Soil Mechanics

Prerequisite
CE212

Pre- or Corequisite
CE332

Hours
2 lecture hours and 1 laboratory hour per week

Examination
One 3-hour paper

Content
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.

Text
Scott, C. R.

References

523301 CE332 Fluid Mechanics II

Prerequisite
CE231
**Hours**

2 lecture-hours and 1 tutorial and laboratory hour per week

**Examination**

One 3-hour paper

**Content**

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

**Preliminary Reading**

Rouse, H. & Ince, S. *History of Hydraulics* (Dover 1963)

**References**

Davis, C. V. & Sorenson

Morris, H. M. *Applied Hydraulics in Engineering* (Ronald 1963)

Rouse, H. *Engineering Hydraulics* (Wiley 1951)


Valentine, H. R. *Applied Hydrodynamics* (Butterworths)

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**523107 CE351 Civil Engineering Systems I**

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

Two 1½-hour term papers and one 3-hour final paper

**Content**


**References**

Blunden, W. R. *The Land-Use/Transport System* (Pergamon)

Yoder, E. J. *Principles of Pavement Design* (Wiley)

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**524101 CE414 Structural Analysis and Design II**

**Prerequisites**

CE313 and Maths IIB

**Hours**

3½ lecture-hours and 2½ tutorial hours per week

**Examination**

One 3-hour paper
Content

Text
SAA

References
Bresler, B., Lin, T. Y. & Scalzi, J. B.
Coates, R. C. et al.
Horne, M. R. & Merchant, W.
Lay, M. G.
Lin, T. Y.
Martin, H. C.
Norris, C. H. & Wilbur, J. B.
Warner, R. F. et al.

Prestressed Concrete Code AS1481 — 1974
Design of Steel Structure 2nd edn (Wiley)
Structural Analysis (Nelson 1972)
The Stability of Frames (Pergamon 1965)
Source Book for the Australian Steel Structures Code AS1250 (A.I.S.C.)
Design of Prestressed Concrete Structures (Wiley)
Introduction to Matrix Methods of Structural Analysis (McGraw-Hill 1966)
Elementary Structural Analysis 2nd edn (McGraw-Hill 1960)
Reinforced Concrete (Pitman 1976)

524103 CE414A Structural Analysis II

Prerequisites
CE313 or CE313A and Maths IIB

Hours
1½ lecture hours and 1½ tutorial hours per week

Examination
One 3-hour paper

Content
Analysis component of CE414.

References
Coates, R. C. et al.
Horne, M. R. & Merchant, W.
Martin, H. C.
Norris, C. H. & Wilbur, J. B.
Structural Analysis (Nelson 1972)
The Stability of Frames (Pergamon 1965)
Introduction to Matrix Methods of Structural Analysis (McGraw-Hill 1966)
Elementary Structural Analysis 2nd edn (McGraw-Hill 1960)

524104 CE414B Structural Design II

Prerequisite
CE313

Hours
1½ lecture hours and 1½ tutorial hours per week

Examination
Progressive assessment

Content
Design component of CE414.

Text
SAA

References
Lay, M. G.
Lin, T. Y.
Martin, H. C.
Norris, C. H. & Wilbur, J. B.
Warner, R. F. et al.

Prestressed Concrete Code AS1481 — 1974
Source Book for the Australian Steel Structures Code AS1250 (A.I.S.C.)
Design of Prestressed Concrete Structures (Wiley)
Reinforced Concrete (Pitman 1976)

524403 CE425 Earth and Rock Engineering

Prerequisite
CE324

Hours
1 lecture hour and ½ tutorial hour per week

Examination
Progressive assessment

Content
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.

Text
Peck, R. B. et al.

References
Lee, I. K. (ed.)
Terzaghi, K. & Peck, R. B.

Foundation Engineering 2nd edn (Wiley 1974)
Soil Mechanics, New Horizons (Butterworths 1974)
Soil Mechanics in Engineering Practice 2nd edn (Wiley 1967)

524102 CE452 Engineering Construction

Hours
2 lecture hours and 1 tutorial hour per week

Examination
One 3-hour paper
Content
Management: Construction company failures and the need for efficient management; principles of management, management functions and techniques; nature and type of organisations structure.
Administration: Costing; estimating; engineering contracts; drawings and specifications; tendering.
Project Planning and Control: Planning; constructing and analysing networks; resource levelling; cost minimization; presentation of information; control.
Construction Plant: Classification, selection and use of plant; plant organization; plant costs, purchase or hire; site establishment and temporary works.
Construction Methods and Equipment: Earthmoving; drilling and blasting; tunnelling; foundation drilling; piling; bridge and building construction.
Texts
Antill, J. M. Civil Engineering Management (Angus & Robertson 1973)
References
Carson, A. B. Foundation Construction (McGraw-Hill)
Peurifoy, R. L. Construction, Planning, Equipment and Methods (McGraw-Hill)

524040 CE453 Project

Prerequisites & Corequisites
According to the nature of Topic.

Hours
Personal contact with supervisor. Minimum work load of 3 hours per week

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

ELECTIVES

In all electives, the subdivision of the course into lectures, tutorials etc; the form of examination and the prescribed and reference texts unless indicated below, will be advised by the lecturer.

Industrial Experience — Electives
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 before October 31 in the year prior to that 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.

524029 CE415 Elastic Continua

Pre(Co-)requisite
CE414 or CE414A

Hours
1 lecture hour and ½ tutorial hour per week

Examination
One 2-hour final paper

Content

References

524030 CE416 Plastic Frame Design

Pre(Co-)requisite
CE414 or CE414A

Hours
1 lecture hour and ½ tutorial hour per week

Examination
One 2-hour final paper

Content
Review of upper and lower bound theorems, beams, columns, connections, design of braced frames, column deflection curves, subassemblages, unbraced frames.

References
Lehigh University Plastic Design of Multi-story Frames (1965)
524031 CE417 Steel Beams, Columns and Frames

Pre(Co-)prerequisite
CE414

Hours
1 lecture hour and 1 tutorial hour per week

Examination
One 3-hour paper

Content
Instability of beams, columns and frames, including analysis of thin-walled sections in torsion; box girder analysis.

References
Croll, J. G. A. & Walker, A. C.
Galambos, T. V.
British Constructional Steelwork Assn

524032 CE418 Brickwork and Timber Design

Pre(Co-)prerequisite
CE414

Hours
1 lecture hour and 1 tutorial hour per week

Examination
Progressive assessment

Content
The properties and behaviour of brickwork and its components. The design of brickwork structures including recent developments in high rise construction. The properties and behaviour of timber. The design of timber structures.

Text
Pearson, R. G. et al.

References
Timber Engineering Design Handbook
(Jacaranda Press)
Recommended Practice for Engineered Brick Masonry (Structural Clay Products Institute, U.S.A.)
SAA Brickwork Code AS1640 — 1974
SAA Timber Engineering Code — AS1720 — 1975

524033 CE419 Engineering Seismology

Prerequisites
Nil

Hours
1½ lecture hours per week

Examination
Progressive assessment

Content
Causes of earthquakes, the theory of plate tectonics; introduction to classical seismology; seismicity, source mechanisms, source parameters, simple source models; wave propagation, propagation of strong ground motion; effects of local geology and topography; design earthquake estimation; statistical characterization of high-frequency ground motion, introduction to random vibration theory; tectonics and seismicity of the South-West Pacific and resulting earthquake engineering problems.

Texts
To be advised.

References

524034 CE426 Advanced Properties of Materials

Prerequisites
CE212 and CE221

Hours
1 lecture hour and 1 tutorial hour per week

Examination
One 3-hour paper

Content

Texts
To be advised.

References

524035 CE427 Concrete Technology

Prerequisite
CE222

Hours
1½ lecture hours per week for 20 weeks and 1½ laboratory hours per week for 8 weeks.

Examination
One 2-hour paper

Content
Characteristics of special concretes. Use of high alumina, slag, fly ash and other special cements; gap-graded mixes; lightweight aggregate; fibre reinforcement; small scale concrete models.

Texts
To be advised.

References
To be advised.
524036 CE428 Soil Mechanics

**Prerequisite**
CE324

**Hours**
1 lecture hour and ½ tutorial hour per week

**Examination**
Progressive assessment

**Content**
More advanced work including recent experimental and analytical advances in soil mechanics.

**Texts**
Nil

**Reference**
Scott, R. F. *Principles of Soil Mechanics* (Addison-Wesley 1963)

524037 CE429 Foundation Engineering

**Prerequisite**
CE324

**Hours**
1 lecture hour and ½ tutorial hour per week

**Examination**
Progressive assessment.

**Content**
Course time will be divided between more advanced analytical and design methods, and exercises in practical soils engineering. Current soil mechanics projects in and about Newcastle will be followed and sites visited. Each student will undertake a small but complete foundation investigation including site investigation, laboratory testing, design recommendations and presentation of a brief written report.

**Texts**
Nil

**References**
To be advised.

524038 CE433 Theoretical Hydrodynamics

**Prerequisite**
CE332

**Hours**
1 lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper

**Content**
Proof and applications of the Navier-Stokes equations and the vorticity equation; irrotational flow and the use of complex variable methods to solve some of the basic engineering problems such as airfoil lift and percolation under dams.

524039 CE434 Open Channel Flow

**Prerequisite**
CE332

**Hours**
1 lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper

**Content**
Further methods of plotting longitudinal profiles, and solution of more difficult problems involving channel transitions and controls. Introduction to unsteady flow; the method of characteristics, and the principles of flood routing.

**Text**
Henderson, F. M. *Open Channel Flow* (Collier-Macmillan 1966)

**References**
As for CE332

524040 CE435 River and Coastal Engineering I

**Prerequisite**
CE332

**Hours**
1 lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper

**Content**

**Texts**
Henderson, F. M. *Open Channel Flow* (Collier-Macmillan 1966)
Muir Wood, A. M. *Coastal Hydraulics* (Macmillan 1969)

**References**
Leopold, L. B. et al. *Fluvial Processes in Geomorphology* (Freeman 1964)

Leliavsky, S. *An Introduction to Fluvial Hydraulics* (Dover 1966)

Wiegel, R. L. *Oceanographical Engineering* (Prentice-Hall 1964)

524041 CE442 Water Resources Engineering

**Prerequisite**

CE241

**Hours**

1 lecture hour and ½ tutorial hour per week

**Content**

To be advised.

**Texts**

Nil

524042 CE443 Water Quality Management

**Prerequisite**

CE241

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

One 3-hour paper

**Content**


**Preliminary Reading**

Imhoff, K. et al. *Disposal of Sewage and Other Waterborne Wastes* 2nd edn (Butterworths 1971)

**Text**


**Reference**


524045 CE473 Engineering Surveying II

**Prerequisite**

CE171

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

One 3-hour paper

**Content**

Mathematical programming and optimisation techniques, applications to problems in structural design, engineering management, water resource systems and transportation.

**Texts**

Nil

**References**


524046 CE474 Transportation Planning

**Prerequisite**

CE372

**Hours**

1½ lecture hours per week

**Examination**

One 2-hour paper

**Content**

Transportation in the national economy; sociological, environmental and economic requirements of transportation systems; demands for travel; land use/transport interaction. Transportation planning; data collection, trip generation; trip distribution; traffic assignment; modal split; economic evaluation. Recent innovations in transportation systems.

**Text**

Bruton, M. J. *Introduction to Transportation Planning* (Hutchinson 1970)
524047 CE475 Highway Engineering

Prerequisite: CE372
Hours: 1½ lecture hours per week
Content: To be advised.
Texts: 

524048 CE490 Special Topic

524049 CE491 Special Topic

Hours: 1½ lecture hours per week

521110 SV111 Surveying I

Prerequisites: Nil

Hours:
Part A: Average 1½ lecture hours, ½ tutorial hour hour and 2½ fieldwork hours per week
Part B: 1 lecture hour and ½ tutorial hour per week

Examination: Two 3-hour papers

Content
Part A (Surveying)
Classes of surveys — nature, causes and classes of errors — elementary error propagation — linear measurement with tapes, ordinary differential levelling, angle measurement, plane table, tacheometry optical square, Abney level, Indian clinometer, magnetic compass.
Field notes — line ranging, chain surveys — traversing and traverse calculations — plane triangulation — contour surveys — plane table surveying.
Route Surveys — areas and volumes — horizontal (circular and transition) and vertical curves.
History of surveying and survey instruments.

Part B (Cartography)
Cartographic drawing — plotting and plan drawing for cadastral and engineering surveys.

Text
Bannister, A. & Raymond, S.

References
Clarke, D.
    Plane & Geodetic Surveying Vol. I 6th edn (Constable 1969)
Whyte, W. S.
    Basic Metric Surveying (Butterworths 1969)

521111 SV121 Survey Camp I

Prerequisite: CE171 Engineering Surveying (B.E. students only)
Corequisite: SV111 Surveying I (B.Surv. students only)
Duration: 5 days
Examination: Progressive assessment

Content
Extensive contour and detail survey, including horizontal and vertical control by traverse and differential levelling, plane tabling, stadia. A small engineering survey. Associated calculations and plans.

522404 SV212 Surveying II

Prerequisites: SV111 Surveying I
Corequisites: SV231 Survey Computations I

Hours:
Part A: Average 1½ lecture hours, 1 tutorial hour and 2½ fieldwork hours per week
Part B: 1 lecture hour and ½ tutorial hour per week

Examination: Two 3-hour papers

Content
Part A (Surveying)
Precise levelling, barometric levelling, trigonometrical levelling, reciprocal levelling-hydrographic surveying, underground surveying — gyrotheodolites — plane triangulation with single second theodolites.

Part B (Optics)
Reflection and refraction at plane and curved surfaces — prisms, thin lenses and spherical mirrors — lens combinations, thick lenses, "thick" mirrors — aberrations, parabolic reflectors — optical trains in surveying instruments, optical compensators, optical plumbing-Gauss collimation techniques.

Texts
Bannister, A. & Raymond, S.
    Surveying 3rd edn (Pitman 1972)
Clarke, D.
Whyte, W. S.
    Plane and Geodetic Surveying for Engineers Vol. II 6th edn (Constable 1973)
References

Cooper, M. A. R.
Hodges, D. J. & Greenwood, J. B.
Ingham, A. E.
Smith, J. R.

Admiralty Manual of Hydrographic Surveying Vols I & II (HMSO 1975)
Modern Theodolites and Levels (Crosby Lockwood 1971)
Optical Distance Measurement (Butterworths 1971)
Hydrographic Surveying for the Surveyor and Engineer (Crosby Lockwood 1974)
Optical Distance Measurement (Crosby Lockwood 1970)

522405 SV222 Survey Camp II

Prerequisite SV121 Survey Camp I
Corequisite SV212 Surveying II
Duration 5 days
Examination Progressive assessment

Content
Extensive engineering survey — control by plane triangulation and traversing — setting out road centrel ine, including transition and circular curves — calculation of grades and earthworks quantities, and associated drawings.

522406 SV231 Survey Computations I

Prerequisite SV111 Surveying I
Hours 2 lecture hours and 1 tutorial hour per week
Examination Progressive assessment

Content
Use of tables — plane trigonometrical formulae — calculation of triangles, areas, roadways, subdivisions. Use of calculating machines. Traverse computations including offsets and missing data problems. Areas from co-ordinates — transformations — resections and intersections, mathematical and semi-graphic. Spherical trigonometry and applications to survey problems. Elementary computer programming.

Texts
The University of Newcastle Computing Centre Handbook (University of Newcastle 1975)
The Manual of the N.S.W. Integrated Surveys Grid (N.S.W. Govt Printer)

523305 SV313 Surveying III

Prerequisites SV212 Surveying II and EE203 Introduction to Electrical Information
Hours Averaging 1 lecture hour and ½ fieldwork hour per week
Examination One 3-hour paper

Content
Electronic timing — frequency measurement and calibration — phase shift measurement of sinusoidal waves — propagation of electromagnetic waves — electromagnetic distance measurement — navigational aids, applications to hydrographic surveying.

Text
Burnside, D. C. Electromagnetic Distance Measurement (Crosby Lockwood 1971)
Hames, G. Sound Underwater (David & Charles 1974)
Laurila, S. H. Electronic Surveying and Mapping 2nd edn (Larrar 1966)
Saastamoinen, J. J. Surveyors Guide to Electromagnetic Distance Measurement (Toronto U.P. 1967)

523330 SV323 Survey Camp III

Prerequisite SV222 Survey Camp II
Corequisites SV313 Surveying III SV361 Photogrammetry I
Duration 12 days
Examination Progressive assessment

Content
Preparation of detail and topographical map from aerial photos, including:
Horizontal control by second-order triangulation and EDM traverse — vertical control by trigonometric levelling and precise levelling; extension of control by barometric levelling.
Stellar observations for latitude, longitude and azimuth.
### 523326 SV332 Survey Computations II

**Prerequisite**
SV231 Survey Computation I

**Hours**
½ lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper

**Content**
Revision and extension of error theory — adjustment by least squares — error ellipse calculations.

**Text**
Nil

**References**
- Rainsford, H. F. *Survey Adjustments and Least Squares* (Constable 1957)
- Richardus, P. *Project Surveying* (North Holland 1966)

### 523327 SV341 Astronomy I

**Prerequisite**
SV231 Survey Computations I

**Hours**
Average 2 lecture hours and 1 fieldwork hour per week

**Examination**
One 3-hour paper

**Content**
The celestial sphere and astronomic triangle — definitions, conventions and time — latitude by circum-meridian methods; longitude by ex-meridian methods; best position, balancing — azimuth by circum-longation, circumpolar and sun observations — optimum position, balancing — position line methods.

**Text**
To be advised

**References**
- Biddle, C. A. *Text Book of Field Astronomy* (HMSO 1958)

### 523328 SV351 Geodesy I

**Prerequisite**
SV231 Survey Computations I
SV212 Surveying II

**Hours**
Average 2 lecture hours and 1 fieldwork hour per week

**Examination**
One 3-hour paper

**Content**
Historical development of geodesy — differential geometry — the spheroid — Legendre’s Theorem — computation of geographical coordinates — geodetic surveying (horizontal control) — map projections — the Australian Map Grid and the N.S.W. Integrated Survey Grid.

**Texts**
- Clark, D. *Plane and Geodetic Surveying for Engineers* Vol. II 6th edn (Constable 1973)
- The Manual of the N.S.W. Integrated Survey Grid (N.S.W. Govt. Printer)
- Integrated Survey Grid Tables (N.S.W. Govt. Printer 1972)

**Reference**
Bomford, G. *Geodesy* 3rd edn (Oxford 1971)

### 523329 SV361 Photogrammetry I

**Prerequisite**
Nil

**Hours**
Average 1½ lecture hours and 1½ laboratory hours per week

**Examination**
One 3-hour paper

**Content**
Stereoscopic vision — geometry of single aerial photograph — stereoscopic pairs — fundamental mathematical relationships — radial triangulation. Inner, relative and absolute orientation with respect to direct optical projection. Cameras, physical properties of photographs.

**Text**
Wolf, P. R. *Elements of Photogrammetry* (McGraw-Hill 1974)

**Reference**
- The Manual of Photogrammetry Vols. I & II (Amer. Soc. of Photogrammetry)

### 524125 SV414 Surveying IV

**Prerequisites**
SV313 Surveying III

**Corequisites**
SV332 Survey Computations II Property and Survey Law
**524126 SV415 Surveying V (Elective)**

**Prerequisite**
SV313 Surveying III

**Corequisites**
SV314 Surveying IV
SV332 Survey Computations II

**Hours**
1 lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper

**Content**
Measurement of deflection and settlement of structures — survey methods in industry — relocation of lost marks — special surveying problems.

**Text** To be advised.

**References**
Clark, D. *Plane and Geodetic Surveying* Vol. II 6th edn (Constable 1973)

**524128 SV452 Geodesy II**

**Prerequisite**
SV351 Geodesy I

**Corequisite**
SV332 Survey Computations II

**Hours**
Average 1 lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper

**Content**
Least squares adjustment of control surveys — variance/covariance matrix, variance factor and weight coefficient matrix — elementary statistical testing of observations and adjusted values — precise levelling.

Relationship between geoid and ellipsoid — astro-geodetic levelling — ellipsoidal elevations — mean sea level and the geoid-gravity and its use in geodesy — methods for establishing a world geodetic system.

**Text**
Clark, D. *Plane and Geodetic Surveying* Vol. II 6th edn (Constable 1973)

**References**
Bomford, G. *Geodesy* 3rd edn (Oxford 1971)
Richardus, P. *Project Surveying* (North Holland 1966)

**524129 SV453 Geodesy III (Elective)**

**Corequisite**
SV452 Geodesy II

**Hours**
Average 1 lecture hour and ½ tutorial hour per week

**Examination**
One 3-hour paper
Calculations on the ellipsoid — conformal projection of an ellipsoid — atmospheric refraction and its effect on survey measurements — adjustment of control surveys, precision of adjusted measurements, error ellipses of adjusted co-ordinates. The permanence of geodetic position — long range goals of geodesy.

Text

References

SV462 Photogrammetry II

Prerequisite

SV361 Photogrammetry I

Hours

Average ¼ lecture hour and ¼ laboratory hour per week

Examination

One 3-hour paper

Content

Photogrammetric orientation. Design principles and practical application of exact and approximate restitution instruments. Flight and project planning — aerial mapping — aerial triangulation of strips.

Text

Wolf, P. R. 

Elements of Photogrammetry (McGraw-Hill 1974)

Reference

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Manual of Photogrammetry Vols I & II

(Amer. Soc. of Photogrammetry)

SV463 Photogrammetry III (Elective)

Corequisites

SV462 Photogrammetry II

SV332 Survey Computations II

Hours

Average ¼ lecture hours and ¼ laboratory hours per week

Examination

One 3-hour paper

Content


Text

References

SV471 Land Valuation

Prerequisite

Nil

Hours

1½ lecture hours per week

Examination

One 3-hour paper

Content

General principles of urban and rural land valuation — unimproved and improved capital values — valuation of leasehold and freehold land — subdivisional value of land — valuation of buildings — relevant Acts and Regulations — N.S.W. Land and Valuation Court proceedings and decisions.

Text

References

SV481 Project

Prerequisite & Corequisites

According to the nature of the topic.

Hours

Personal contact with supervisor as required. Minimum work load of 3 hours per week.

Examination

Assessment

Content

EITHER

A minor research project involving a literature review and/or analytical and/or experimental investigation

OR

A land studies project, involving selection of a site suitable for a specified purpose, investigation of title, zoning, site survey, environmental impact study, design for development.

SV482 Professional/Project Seminar

Corequisite

SV414 Surveying IV

Hours

1½ seminar hours per week

Examination

Assessment

Content

Each final year student gives a seminar on his project with other seminars led by members of the surveying, or an allied profession, on selected topics.
DEPARTMENT OF ELECTRICAL ENGINEERING

Electrical Engineering is a rapidly expanding branch of engineering. It includes such fields as computer and information science, switching theory, 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, electronics or communication 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.

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 ***.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year 1</th>
<th>Year II</th>
<th>Year III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics I</td>
<td>4***</td>
<td>1***</td>
<td>1**</td>
</tr>
<tr>
<td>Engineering I</td>
<td>4***</td>
<td>1***</td>
<td>1**</td>
</tr>
<tr>
<td>Physics IA</td>
<td>4***</td>
<td>1***</td>
<td>1**</td>
</tr>
<tr>
<td>ME131 Dynamics</td>
<td>1***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>Met182 Electronic Structure of Materials</td>
<td>3***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>Chemisty IS</td>
<td>2***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td>1***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>EE211 Energy Conversion</td>
<td>1**</td>
<td>1**</td>
<td>1**</td>
</tr>
<tr>
<td>EE221 Semiconductor Devices</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE232 Electrical Circuits</td>
<td>1***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>PH221 Electromagnetics &amp; Quantum Mechanics</td>
<td>2***</td>
<td>2***</td>
<td>2***</td>
</tr>
<tr>
<td>1Electives</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>EE313 Power Systems</td>
<td>1**</td>
<td>1**</td>
<td>1**</td>
</tr>
<tr>
<td>EE314 Electrical Machines</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE323 Linear Electronics</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE325 Introduction to Digital Systems</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE331 Circuits</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE341 Automatic Control</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE344 Communications</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>EE361 Computer Structure: Machines &amp; Assembly Languages</td>
<td>1***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>GE350 Seminar</td>
<td>1***</td>
<td>1***</td>
<td>1***</td>
</tr>
<tr>
<td>Two from EE300, EE400</td>
<td>2***</td>
<td>2***</td>
<td>2***</td>
</tr>
<tr>
<td>1Electives</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

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.
Subject

Year IV

EE480/491 Project/Seminar 4***
Seven from EE 300, EE 400, EE 500 7
Electives 4
Total Units 15

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 during the first term but not later than the last week of the term.

* First half year
** Second half year
*** Full year

1. See Elective Requirements—Appendix A.
2. The completion of this unit may be delayed to second year if desired.
3. Mathematics IIB may be taken in two parts each of three terms duration.
4. See Year I course details on page 27.

---

BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

By Part-time Study

(Recommended Programme)

Stage 1

Mathematics I 4***
Engineering I 4***
Met182 Electronic Structure of Materials 1***
Total Units 9

Stage 2

Physics IIA 4***
Mathematics II Part I (Topic C & E) 2***
ME121 Workshop Practice 1***
Chemistry IS 2***
Elective (Industrial Experience) 1
Total Units 10

Stage 3

ME131 Dynamics 1***
EE211 Energy Conversion 1***
EE221 Semiconductor Devices 1*
EE232 Electrical Circuits 1***
PH221 Electromagnetics & Quantum Mechanics 2***
Mathematics IIB Part 2 (Topic D & H) 2***
Elective (Industrial Experience) 1
Total Units 9

---

Subject

Year VI—Full-time

EE480/491 Project/Seminar 4***
Seven from EE 300, EE 400, EE 500 7
Electives 4
Total Units 15

* First half year
** Second half year
*** Full year

1. See Elective Requirements—Appendix A.
2. The timetable for Year VI is prepared on the basis that the student will attend the course full-time. Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.
3. ME 121 must be taken either in Stage 1 or 2.

---

SCHEDULE 3.3

BACHELOR OF SCIENCE (ENGINEERING) IN ELECTRICAL ENGINEERING

Stages 1-4 will not be offered after 1976

Subject

Stage 5

EE314 Electrical Machines 1*
EE325 Linear Electronics 1*
EE326 Introduction to Digital Systems 1*
EE341 Automatic Control 1*
EE344 Communications 1*
EE361 Computer Structure: Machines & Assembly Languages 1***
Total Units 10

Two from EE300, EE400
Elective (Industrial Experience) 1
Total Units 9

---

* First half year
** Second half year
*** Full year

** First half year
** Second half year
Subject | Units
--- | ---
Stage 6 | 
GE350 Seminar | 1***
Four of EE400 or EE500 | 4
Electives | 4***
| 9

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
1 See Elective Requirements — Appendix A.

**SCHEDULE 1.7**

**BACHELOR OF ENGINEERING IN COMPUTER ENGINEERING**

Years I and II of the degree of Bachelor of Engineering in Computer Engineering are common with Years I and II of the degree of Bachelor of Engineering in Electrical Engineering.

### Year III

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE331 Circuits</td>
<td>1*</td>
</tr>
<tr>
<td>EE341 Automatic Control</td>
<td>1*</td>
</tr>
<tr>
<td>EE361 Computer Structure: Machines &amp; Assembly Languages</td>
<td>1***</td>
</tr>
<tr>
<td>EE323 Linear Electronics</td>
<td>1*</td>
</tr>
<tr>
<td>EE324L Electronics Laboratory</td>
<td>1**</td>
</tr>
<tr>
<td>EE325 Introduction to Digital Systems</td>
<td>1*</td>
</tr>
<tr>
<td>EE362 Logic Design &amp; Switching Theory</td>
<td>1*</td>
</tr>
<tr>
<td>EM2F Numerical Analysis &amp; Computing</td>
<td>1**</td>
</tr>
<tr>
<td>CS Programming &amp; Algorithms</td>
<td>1*</td>
</tr>
<tr>
<td>CS Data Structures &amp; Programming</td>
<td>1**</td>
</tr>
<tr>
<td>GE350 Seminar</td>
<td>1***</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

### Year IV

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE421 Electronics</td>
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</tr>
<tr>
<td>EE423L Electronics Laboratory</td>
<td>1*</td>
</tr>
<tr>
<td>EE425 Digital Electronics</td>
<td>1**</td>
</tr>
<tr>
<td>EE463 Computer Operating Systems</td>
<td>1*</td>
</tr>
<tr>
<td>EE464 Compilers Assemblers &amp; Interpreters</td>
<td>1**</td>
</tr>
<tr>
<td>EE480EE491 Project/Seminar</td>
<td>4***</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

**LIST 1: FOURTH YEAR SUBJECTS FOR COMPUTER ENGINEERING**

- EE344 Communications
- EE345 Sample Data & Digital Control
- EE442 Modern Control
- EE443 Optimization Techniques
- EE445 Communication Systems
- EE447 Digital Communications
- EE462 Topics in Switching Theory
- EE565 Pattern Recognition
- EE566 Automata & Computing Machines
- EE567 Computer Process Control
- EE568 Advanced Computer Architecture
- EE569 Formal Languages & Automata
- ME401 Systems Analysis
- ME402 Systems Planning, Organization & Control
- ME404 Mathematical Programming
- ME405 Advanced Engineering Computations
- ME487 Operations Research: Deterministic Models
- ME488 Operations Research: Probabilistic Models
- ME489 Operations Research: Applications in Industry
- ME581G Mathematical Programming

**Commerce**

- Commercial Programming

**Mathematics III**

- Operations Research (Topic U)
- Mathematical Logic (Topic O)
- Mathematical Principles of Numerical Analysis (Topic Z)
- Topics in Finite Mathematics

**Mathematics IV**

- Combinatorial Designs
- Graph Theory

**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. programme. 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

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.

BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING
IN ELECTRICAL ENGINEERING

The course followed must meet the requirements for the degrees of Bachelor of Engineering and Bachelor of Commerce. The following programme has been approved by the two Faculty Boards.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year I</strong></td>
<td></td>
</tr>
</tbody>
</table>
| 1Mathematics I | 4*
| 1Engineering I | 4*
| ME131 Dynamics | 1*
| Met182 Electronic Structure of Materials | 1*
| Physics IA | 4*
| Chemistry IS | 2*
| ME121 Workshop Practice | 1*
| **Year II** | |
| EE211 Energy Conversion | 1*
| EE211 Semiconductor Devices | 1*
| EE232 Electrical Circuits | 1***
| 1Mathematics IIB | 4*
| PH221 Electromagnetics & Quantum Mechanics | 2*
| 1One Economics & Commerce subject Group A 4 | 1*
| 1One Economics & Commerce subject Group A 4 | 1*
| **Year III** | |
| EE313 Power Systems | 1**
| EE314 Electrical Machinery | 1*
| EE323 Linear Electronics | 1*
| EE325 Introduction to Digital Systems | 1*
| EE331 Circuits | 1*
| EE341 Automatic Control | 1*
| EE344 Communications | 1*
| EE361 Computer Structure: Machines & Assembly Languages | 1***
| One from EE300, EE400 | 1*
| 1One Economics & Commerce subject Group B 4 | 1*
| 1One Economics & Commerce subject Group B 4 | 1*
| **Year IV** | |
| Five from EE 300, EE 400, EE 500 | 5*
| 1One Economics & Commerce subject Group B 4 | 1*
| 1One Economics & Commerce subject Group B 4 | 1*
| 2Electives | 4*
| **Year V** | |
| EE480/491 Project/Seminar | 4*
| Three from EE 300, EE 400, EE 500 | 3*
| 1One Economics & Commerce subject Group C 4 | 1*
| 1One Economics & Commerce subject Group C 4 | 1*
| 2Electives | 2*
| * First half year | 1*
| ** Second half year | 1*
| *** Full year | 1*

1. The subjects which count towards the B. Com. degree are those marked 1 plus six Engineering units chosen from subjects normally taken in 3rd or 4th year of the full-time Engineering programme which may be counted as one Group C subject.
2. The six elective units must be taken in the Faculty of Engineering at least two must be from within the Department of Electrical Engineering.

Prerequisite List

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
</table>
| EE131 Circuit Fundamentals | Nil*
| EE203 Introduction to Electrical Information | Maths I
| EE204 Introduction to Electrical Energy | Physics IA or IB
| EE211 Energy Conversion | EE131
| EE221 Semiconductor Devices | Physics IA or IB
| EE232 Electrical Circuits | EE131
| EE313 Power Systems | EE211, EE232
| EE314 Electrical Machines | EE211

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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>
</tr>
</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>
</tr>
<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>
</tr>
<tr>
<td>EE-6</td>
<td>Computer Science or Automata Theory</td>
</tr>
<tr>
<td>EE-7</td>
<td>Project/Directed Reading</td>
</tr>
<tr>
<td>EE-8</td>
<td>Seminar</td>
</tr>
</tbody>
</table>

531203 EE131 Circuit Fundamentals***

Prerequisites Nil

Hours 1½ hours of lectures, tutorials and laboratory work per week.

Examination Progressive assessment and final examination


Text Baldwin, C. T. Electrical Measurements 2nd edn (Harrap)

References Balabanian, N. Fundamentals of Circuit Theory (Allyn & Bacon)


532103 EE203 Introduction to Electrical Information*

Prerequisites Maths I & Physics IA or IB

Hours 3 hours of lectures, tutorial and laboratory work per week
**Examination**

Progressive assessment and final examination

**Content**


Diodes and transistors as circuit elements (via characteristics and one equivalent circuit). Basic amplifier and oscillator circuits, including simple transistor switches, multivibrators, amplitude modulation and demodulation. A short description of pulse and frequency modulation (qualitative approach without amplifier frequency response). Fundamental principles of measuring non-electrical quantities by electrical means.

**Text**

Smith, R. G. *Circuits, Devices and Systems* 3rd edn (Wiley)

**References**


Lockwood, F. B. & Dunstan, R. *Electrical Engineering Principles* (Heinemann)

McKenzie-Smith, I. et al. *Basic Electrical Engineering Science* (Longman)

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<table>
<thead>
<tr>
<th><strong>Course</strong></th>
<th><strong>Prerequisite</strong></th>
<th><strong>Hours</strong></th>
<th><strong>Examination</strong></th>
<th><strong>Content</strong></th>
</tr>
</thead>
</table>

**Text**

Gourishanke, V. *Electromagnetic Energy Conversion* (Internat. Text)

**Reference**

Nil

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<table>
<thead>
<tr>
<th><strong>Course</strong></th>
<th><strong>Prerequisite</strong></th>
<th><strong>Hours</strong></th>
<th><strong>Examination</strong></th>
<th><strong>Content</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>EE211</td>
<td>EE131</td>
<td>3 hours of lectures and laboratory work per week</td>
<td>Progressive assessment and final examination</td>
<td>Magnets and electromagnets. Magnetic circuit laws. B.H. characteristics of ferromagnetic materials; hysteresis loss in magnetic materials. Faraday’s law; Lenz’s law; concept of motor and generator action. Eddy current losses in materials. Concept of flux linkage and inductance; self, mutual and leakage inductance of coupled circuits, voltage equations for coupled circuits, the air core transformer; the practical iron cored transformer, equivalent circuits, phasor diagrams. Transformer testing. Electro-mechanical energy conversion; electro-mechanical transducers, law of conservation of energy and its application to singly-excited and doubly-excited systems.</td>
</tr>
</tbody>
</table>

**Text**

Gourishanke, V. *Electromagnetic Energy Conversion* (Internat. Text)

**Reference**

Nil

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<table>
<thead>
<tr>
<th><strong>Course</strong></th>
<th><strong>Prerequisite</strong></th>
<th><strong>Hours</strong></th>
<th><strong>Examination</strong></th>
<th><strong>Content</strong></th>
</tr>
</thead>
</table>

**Text**

Gourishanke, V. *Electromagnetic Energy Conversion* (Internat. Text)

**Reference**

Nil
533111 EE315 Power Electronics**

Prerequisites EE232

Hours 3 hours of lectures, tutorials and laboratory work per week

Examination Progressive assessment and final examination

Content
Terminal characteristics of SCR power transistor and TRIAC. One, two and four quadrant converters and their use in the control D.C. machines. The cycloconverter and its application to the speed control of induction machines. Forced commutation in thyristor circuits. The series-commutated, parallel commutated, harmonic commutated and impulse-commutated inverter. AC/DC converters and their application to battery-electric vehicles.

Text
Pelly, B. R. Thyristor Phase Controlled Converters and Cycloconverters (Wiley)

Reference
Nil

533107 EE323 Linear Electronics*

Prerequisite EE221

Hours 3 hours of lectures and tutorials per week

Examination Progressive assessment and final examination

Content
Signal processing in electronic systems. Biasing requirements and techniques for BJTs and FETs. Single stage amplifier design, small signal and large signal effects. Multistage design, gain, frequency response, linearity, noise, impedance interaction. Stability and feedback. Directly coupled stages, the differential pair, frequency performance, design and cascading.

Text
Gray, P. E. & Searle, C. L. Electronic Principles (Wiley)

References
Chirlian, P. M. Electronic Circuits (McGraw-Hill)
Millman, J. & Halkias, C. C. Integrated Electronics (McGraw-Hill)

533108 EE324L Electronics Laboratory**

Prerequisite EE221, EE323

Hours 3 hours of laboratory work per week

Examination Progressive assessment

Content
An essential practical course implementing the work of EE323. The laboratory exercises require the application of active circuit theory to the solution of specific problems. A strong emphasis is placed on electronic circuit design.

Text
References As for EE323

533109 EE325 Introduction to Digital Systems*

Prerequisites Maths I, EE221

Hours 3 hours per week

Examination Progressive assessment and final examination

Content
Switching Theory—Number systems, coding, combinational circuits, truth table, Karnaugh Map, encoders, decoders, multiplexers, synchronous sequential circuits, flip-flops, description of sequential machines, counters, arithmetic unit.

Logic Families—MOS and bipolar logic families, their comparison, fanin, fanout, speed-power product, noise sensitivity. Integrated circuit functions and their applications.

Digital Circuits—Interconnection of digital logic circuits, line drivers, receivers, buffers, time skewing, time delay effect.

Programmed Logic Systems—μ processors and μ-programmed systems and their applications.

Text
Kohonen, T. Digital Circuits and Devices (Prentice-Hall)

References
Chu, Y. Computer Organization and Micro Programming (McGraw-Hill)
Mano, M. M. Computer Logic Design (Prentice-Hall)
### Course Descriptions

#### EE331 Circuits

**Prerequisite:** EE232  
**Hours:** 3 hours of lectures, tutorials and laboratory work per week  
**Examination:** Progressive assessment and final examination


**Text**  
References  
Skilling, H. H. *Electrical Engineering Circuits* (Wiley 1965)  

#### EE332 Circuits

**Prerequisites:** EE232  
**Hours:** 3 hours of lectures, tutorials and laboratory work per week  
**Examination:** Progressive assessment and final examination

**Content:** 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 line; impedance charts and matching with stubs.

**Text**  
Potter, J. I. & Fich, S. *Theory of Networks and Lines* (Prentice-Hall)

#### EE341 Automatic Control

**Prerequisites:** Maths II, Topics C, D, E  
**Hours:** 3 hours of lectures, tutorials and laboratory work per week  
**Examination:** Progressive assessment and final examination


**Text**  
Fortmann, T. E. & Hitz, K. L. *Introduction to Linear Control System Theory* (Dekker 1976)  
References  
Chen, C. T.  
Desoer, C. A.  
Gupta, S. C. & Hasdorff, L.  
Melsa, J. L. & Schultz, D. G.  
Ogata, K.  
Raven, F. H.

### References

- Moore, R. K. *Travelling Wave Engineering* (McGraw-Hill)  
- Ware, L. A. & Reed, H. R. *Communication Circuits* (Wiley)

#### EE342 Linear System Theory

**Prerequisite:** EE341  
**Hours:** 3 hours of lectures, tutorials and laboratory work per week  
**Examination:** Progressive assessment and final examination

**Content**

**Text**  
Potter, J. I. & Fich, S. *Theory of Networks and Lines* (Prentice-Hall)

**References**

- Chen, C. T. *Introduction to Linear System Theory* (Holt, Rinehart & Winston)  
- Desoer, C. A. *Notes for a Second Course in Linear Systems* (Van Nostrand Reinhold)  
- Ogata, K. *Modern Control Engineering* (Prentice-Hall)  
- Raven, F. H. *Automatic Control Engineering* (McGraw-Hill)

#### EE332 Circuits

**Prerequisites:** EE232  
**Hours:** 3 hours of lectures, tutorials and laboratory work per week  
**Examination:** Progressive assessment and final examination

**Content:** 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 line; impedance charts and matching with stubs.

**Text**  
Potter, J. I. & Fich, S. *Theory of Networks and Lines* (Prentice-Hall)

### References

- Moore, R. K. *Travelling Wave Engineering* (McGraw-Hill)  
- Ware, L. A. & Reed, H. R. *Communication Circuits* (Wiley)
Hours: 3 hours of lectures, tutorials and laboratory work per week

Examination: Progressive assessment and final examination

Content:

Text:
References: As for EE341

533113 EE344 Communications**

Prerequisites:
EE331, Maths II B

Hours:
3 hours per week

Examination:
Progressive assessment and final examination

Content:
Introduction to common forms of analog modulation as well as pulse modulation systems including pulse code modulation. Performance in the presence of noise is considered.

Text:

Reference:

533112 EE345 Sample Data and Digital Control**

Prerequisites:
EE341

Hours:
3 hours of lectures, tutorial and laboratory work per week

Examination:
Progressive assessment and final examination

Content:
Digital filtering and digital control systems, z-transforms, state-variable techniques, sampling and reconstruction, fast fourier transforms.

Text:
References:
Kuo, B. C. Discrete-Data Control Systems (Prentice-Hall 1970)

533211 EE361 Computer Structure: Machines and Assembly Languages***

Prerequisite:
Maths I

Hours:
3 hours of lectures and practical work per week

Examination:
Progressive assessment and final examination

Content:
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.

Texts:
Eckhouse, J. R. Minicomputer Systems Organization and Programming (PDP-11) (Prentice-Hall)
Processor Handbook (PDP 11/20) (DEC)

References:
Chu, Y. Computer Organization and Micro Programming (McGraw-Hill)
Donovan, J. J. Systems Programming (McGraw-Hill)
Stone, H. S. Introduction to Computer Organization and Data Structures (McGraw-Hill)

533212 EE362 Logical Design and Switching Theory*

Prerequisite:
Maths I

Hours:
3 hours of lectures, tutorials and practical work per week
Examination
Progressive assessment and final examination

Content
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.

Text
Friedman, A. D. Logical Design of Digital Systems (Computer Science Press)

References
Hill, F. J. & Peterson, G. R. Introduction to Switching Theory and Logical Design (Wiley)
Kohavi, Z. Switching and Finite Automata Theory (McGraw-Hill)
Mano, M. M. Computer Logic Design (Prentice-Hall)
Prather, R. E. Introduction to Switching Theory: A Mathematical Approach (Allyn & Bacon)

533208 EE380 Project/Directed Reading

Prerequisite
Nil

Hours
By arrangement

Examination
To be advised

Content
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.

534108 EE421 Electronics*

Prerequisite
EE323

Hours
3 hours of lectures and tutorial work taken in conjunction with EE423L

Examination
Progressive assessment and final examination

Content
Directly coupled stages design including the differential pair and the Norton amplifier. Power amplifier design. Operational amplifier analysis and design, performance assessment and limitations. High frequency amplifiers, wide band and band pass designs.
References
Chirlian, P. M. Electronics Circuits (McGraw-Hill)
Grebene, A. B. Analogue Integrated Circuit Design (Van Nostrand)
Hamilton, D. & Howard, W. Basic Integrated Circuit Engineering (McGraw-Hill)

534126 EE423L Electronics Laboratory*

Prerequisite EE324L
Corequisite EE421
Hours 3 hours of practical work per week
Examination Progressive assessment

Content
Complements EE421. Electronic circuits are designed and studied, including the differential pair, power amplifiers, an operational amplifier, applications circuits using operational amplifiers, high frequency circuits wide band and tuned bandpass.

Text Nil
Reference As for EE421

534113 EE425 Digital Electronics**

Prerequisite EE421
Hours 3 hours lectures, tutorial and laboratory work per week
Examination Progressive assessment and final examination

Content

Texts Nil

References
Kohonen, T. Digital Circuits and Devices (Prentice-Hall)

534115 EE442 Modern Control** (not offered in 1977)

534132 EE443 Optimization Techniques*

Prerequisites Maths II Topics C. D. E.
Hours 3 hours per week

Content
Mathematical background to optimization. Comparison of optimization methods; engineering applications — such as to problems of identification, control, pattern recognition and resource allocation.

Text Luenberger, D. G. Introduction to Linear and Non-Linear Programming (Addison-Wesley 1973)

References
Aoki, M. Introduction to Optimization Techniques (Macmillan 1971)
Luenberger, D. G. Optimization via Vector Space Methods (Wiley 1969)

534128 EE445 Communication Systems* (not offered in 1977)

534133 EE446 Advanced Topics in Control (not offered in 1977)

534134 EE447 Digital Communications**

Prerequisite Consent of Instructor
Hours 3 hours of lectures and tutorials per week
Examination Progressive assessment and final examination

Content
1. Noisy Memoryless M-ary channels
Orthogonal signalling on noisy memoryless channels. Optimum receivers, the matched filters, the correlation receiver. Shannons channel capacity theorem. Introduction to coding techniques; block, algebraic and convolution codes.
2. Noisy channels with memory
Optimal receiver and transmitter structures for dispersive channels.
The Viterbi algorithm. Linear and Nonlinear Adaptive Equalisers.
Base band Signal Design.

Text

References
Lucky, R. W. et al.  
Wozencraft, J. M. & Jacobs, I. M.

534129 EE451 Field Theory**

Prerequisites
Maths II Topics C, D, E and PH221

Hours
3 hours of lectures, tutorials and experimental work per week

Examination
Progressive assessment and final examination

Content
Revision of Maxwell's electromagnetic equations, solutions in various media. Propagation of electromagnetic waves in free space and in guided configurations (coaxial, waveguide etc.). Elementary antenna theory. Experimental work on field plotting and microwave measurement. The main emphasis of the course will be on high frequency electromagnetic wave properties.

Text
Jordan, E. C. & Balmain, K. G.

References
Ramo, S. et al.
Silvester, P.

534130 EE452 Microwave Measurements**
533114 EE462/562 Topics in Switching Theory  
(not offered in 1977)

534124 EE463 Computer Operating Systems*

Prerequisite
EE361 or consent of instructor

Hours
3 hours of lecture and tutorial work per week

Examination
Progressive assessment and final examination

Content
Views of an operating system. Multiprogramming, interacting concurrent processes, process control primitives. Processor management, memory management, name management. Protection.

Text
Shaw, A. C.

References
Coffman, E. G. & Denning, P. J.
Hansen, P. B.
Madnick, S. E. & Donovan, J. J.

534125 EE464 Compilers, Assemblers and Interpreters**

Prerequisite
EE361

Hours
3 hours per week

Examination
Progressive assessment and final examination

Content

Text
Gries, D.

References
Aho, A. V. & Ullman, J. D.
Donovan, J. J.

534102 EE480 Project/Directed Reading***

Content
Topics to be arranged in the field of interest during first term. Full time students are normally required to undertake a project.

534101 EE491 Seminar***

Content
Talks on various topics of general interest in engineering. EE480 and EE491 are taken together and counted as four units.
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.

The Bachelor of Engineering degrees in Mechanical and Industrial Engineering 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.

(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 reduction 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 planning, supervision and administration of industrial undertakings.

(iii) Bachelor of Engineering degree course in Naval Architecture
Years I and II of the course are identical with the full-time Bachelor of Engineering courses in Mechanical and Industrial Engineering.

Note
The last two years of the Naval Architecture course will be discontinued as those students who enrolled prior to 1975 complete the course. Students enrolling for the Naval Architecture course for the first time in 1975 or later years will have to transfer to the University of New South Wales after completing the first two years of the B.E. course in Mechanical Engineering.

Students proceeding by full-time study in (i), (ii) and (iii) above are required to gain as much industrial experience as possible by working in industry during long vacations.

(iv) Bachelor of Arts/Bachelor of Engineering degree course in Mechanical Engineering

(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.

These courses (iv & v) have 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

(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.

(viii) Bachelor of Commerce/Bachelor of Engineering degree course in Mechanical Engineering

(ix) Bachelor of Commerce/Bachelor of Engineering degree course in Industrial Engineering
comprising five years of full-time study in the Faculties of Economics and Commerce and Engineering.

Students are required to gain as much industrial experience as possible by working in Industry during long vacations.

(x) 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 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 course may, with the permission of the Faculty Board, be completed in one full-time year.

Note
The Bachelor of Science (Engineering) degrees are being phased out. No student is permitted to enrol or re-enrol in these courses unless he was enrolled in the course prior to 1st January, 1974.

A student is permitted to 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.
### Schedule 1.5

**BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year I</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Engineering I</td>
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</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Physics IA</td>
<td>2</td>
<td></td>
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<tr>
<td>Chemistry IS</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME122 Process Technology</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Met151 Microstructure of Materials</td>
<td>17</td>
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<td><strong>Total</strong></td>
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**Year II**

<table>
<thead>
<tr>
<th>Subject</th>
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<tbody>
<tr>
<td>EE203 <strong>Introduction to Electrical Information</strong></td>
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</tr>
<tr>
<td>EE204 <strong>Introduction to Electrical Energy</strong></td>
<td>1</td>
</tr>
<tr>
<td>ME201 <strong>Laboratory Measurements</strong></td>
<td>1</td>
</tr>
<tr>
<td>ME202 <em>Dynamics of Engineering Systems</em></td>
<td>1</td>
</tr>
<tr>
<td>ME212 <em>Engineering Design</em></td>
<td>1</td>
</tr>
<tr>
<td>ME213 <strong>Engineering Design</strong></td>
<td>1</td>
</tr>
<tr>
<td>ME214 Mechanics of Solids I</td>
<td>1</td>
</tr>
<tr>
<td>ME223 Mechanical Technology</td>
<td>1</td>
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<tr>
<td>ME233 Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME241 <strong>Properties of Materials</strong></td>
<td>1</td>
</tr>
<tr>
<td>ME251 <em>Fluid Mechanics</em></td>
<td>1</td>
</tr>
<tr>
<td>ME271 Thermodynamics</td>
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<tr>
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<td><strong>Total</strong></td>
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**Year III**

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<th>Subject</th>
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<tr>
<td>CE303 <em>Structural Design</em></td>
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<td>GE350 Seminar</td>
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<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
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<tr>
<td>ME313 Engineering Design</td>
<td>1</td>
</tr>
<tr>
<td>ME332 Dynamics of Machines</td>
<td>1</td>
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<tr>
<td>ME342 <strong>Properties of Materials</strong></td>
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<tr>
<td>ME343 <strong>Mechanics of Solids</strong></td>
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<tr>
<td>ME352 Fluid Mechanics</td>
<td>1</td>
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<tr>
<td>ME361 <em>Automatic Control</em></td>
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<tr>
<td>ME372 <strong>Heat Transfer</strong></td>
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<tr>
<td>ME373 Thermodynamics</td>
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<tr>
<td>Electives</td>
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<td><strong>Total</strong></td>
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</tbody>
</table>

---

1. With approval of Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and ME122.
2. Mathematics IIB may be taken in two parts each of three terms duration.
3. With the approval of Head of Department, CE313 Structural Analysis and Design I (4 units) may be taken in lieu of CE303 (2 units) and 2 units of the Year III Elective.
4. See Elective Requirements — Appendix A.

---

**Recommended Programme for the Bachelor of Engineering in Mechanical Engineering**

By Part-time Study

**Stage 1**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>Engineering I</td>
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<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
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**Stage 2**

<table>
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<td>Chemistry IS</td>
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<tr>
<td>Physics IA</td>
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<tr>
<td>ME092 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>ME122 Process Technology</td>
<td>1</td>
</tr>
<tr>
<td>Met151 Microstructure of Materials</td>
<td>1</td>
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<tr>
<td><strong>Total</strong></td>
<td>9</td>
</tr>
</tbody>
</table>

* First half year
** Second half year
Stage 3

Subject | Units
--- | ---
Mathematics IIB | 4
ME093 Industrial Experience | 1
ME202 *Dynamics of Engineering Systems | 1
ME214 Mechanics of Solids I | 1
ME223 Mechanical Technology | 1
ME241 **Properties of Materials | 1

Stage 4

Subject | Units
--- | ---
EE203 *Introduction to Electrical Information | 1
EE204 **Introduction to Electrical Energy | 1
ME094 Industrial Experience | 1
ME201 **Laboratory Measurements | 1
ME212 *Engineering Design | 1
ME213 **Engineering Design | 1
ME232 Dynamics of Machines | 1
ME251 *Fluid Mechanics | 1
ME271 Thermodynamics | 1

Stage 5

Subject | Units
--- | ---
GE350 Seminar | 1
ME095 Industrial Experience | 1
ME301 Engineering Computations | 1
ME313 Engineering Design | 1
ME342 *Properties of Materials | 1
ME343 **Mechanics of Solids | 1
ME352 Fluid Mechanics | 1
ME361 *Automatic Control | 1
ME372 **Heat Transfer | 1
ME373 Thermodynamics | 1

Year VI Full-time

Subject | Units
--- | ---
CE 303 Structural Design | 2
ME333 Dynamics of Machines | 1
ME481 Engineering Administration | 1
ME482 Engineering Economics | 1
ME496 Project/Seminar | 4
one unit selected from —
ME381 Methods Engineering | 
ME383 Quality Engineering | 
ME413 Design of Crankshafts, Flywheels & other Rotating Members | 
ME414 Design of Hydraulic & Pneumatic Power Systems | 1
ME419 Design of Conveyors & Materials Handling Equipment | 
ME449 Reliability Analysis of Mechanical Systems | 
ME487 *Operations Research — Deterministic Models | 6
2Electives | 16

1 Any student who is unable to complete Year VI as a full time student may do so in two part time years and may include ME096 in the programme if not previously taken.
2 See Elective Requirements — Appendix A.

SCHEDULE 3.5

BACHELOR OF SCIENCE (ENGINEERING) IN MECHANICAL ENGINEERING

Stage 5

Subject | Units
--- | ---
EE 203 *Introduction to Electrical Information | 1
EE 204 **Introduction to Electrical Energy | 1
ME301 Engineering Computations | 1
ME342 *Properties of Materials | 1
ME343 **Mechanics of Solids | 1
ME352 Fluid Mechanics | 1
ME361 *Automatic Control | 1
ME372 **Heat Transfer | 1

* First half year
** Second half year
<table>
<thead>
<tr>
<th>Subject</th>
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<tr>
<td><strong>Stage 6</strong></td>
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<tr>
<td>CE303 Structural Design</td>
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<td>CE313 Engineering Design</td>
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<td>ME481 Engineering Administration</td>
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<tr>
<td>ME482 Engineering Economics</td>
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<tr>
<td>ME491 Technical Seminar</td>
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<td><strong>One unit selected from</strong></td>
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<tr>
<td>ME381 Methods Engineering</td>
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<td>ME383 Quality Engineering</td>
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<tr>
<td>ME413 Design of Crankshafts, Flywheels &amp; other rotating members</td>
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<tr>
<td>ME414 Design of Hydraulic &amp; Pneumatic Power Systems</td>
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<tr>
<td>ME449 Reliability Analysis of Mechanical Systems</td>
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<tr>
<td>ME487 *Operations Research — Deterministic Models</td>
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</tbody>
</table>

**SCHEDULE 1.4**

**BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING**

**Year I**

Engineering I                      | 4     |
Mathematics I                      | 4     |
Physics IA                         | 4     |
Chemistry IS                       | 2     |
ME121 Workshop Practice            | 1     |
ME122 Process Technology           | 1     |
Met151 Microstructure of Materials | 1     |

**Year II**

EE203 *Introduction to Electrical Information | 1 |
EE204 **Introduction to Electrical Energy  | 1 |
ME201 **Laboratory Measurements      | 1 |
ME202 *Dynamics of Engineering Systems | 1 |
ME212 *Engineering Design            | 1 |
ME213 **Engineering Design           | 1 |
ME214 Mechanics of Solids I         | 1 |
ME223 Mechanical Technology         | 1 |
ME232 Dynamics of Machines           | 1 |
ME241 **Properties of Materials     | 1 |
ME251 *Fluid Mechanics               | 1 |
ME271 Thermodynamics                | 1 |
ME281 Mechanics IIB                 | 4    |

1 With approval of the Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and ME122.
2 Maths IIB may be taken in two parts each of three terms duration.
3 See Elective Requirements — Appendix A.

**RECOMMENDED PROGRAMME FOR THE BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING BY PART-TIME STUDY**

**Stage 1**

Engineering I                      | 4     |
Mathematics I                      | 4     |
ME121 Workshop Practice            | 1     |

**Stage 2**

Chemistry IS                       | 2     |
Physics IA                         | 4     |
ME092 Industrial Experience        | 1     |
ME122 Process Technology           | 1     |
Met151 Microstructure of Materials | 1     |

* First half year
** Second half year
### Schedule 3.4

**BACHELOR OF SCIENCE (ENGINEERING) IN INDUSTRIAL ENGINEERING**
Stages 1-4 not offered after 1976

<table>
<thead>
<tr>
<th>Stage 5</th>
<th>Units</th>
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<tbody>
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<td>EE203</td>
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<td>ME342</td>
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<td>ME385</td>
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<td>ME487</td>
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<table>
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<tr>
<th>Stage 6</th>
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<tbody>
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<td>ME313</td>
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<td>ME333</td>
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<td>ME491</td>
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<td>ME681</td>
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### Schedule 1.6

**BACHELOR OF ENGINEERING IN NAVAL ARCHITECTURE**
Years 1-2 not offered in 1977

<table>
<thead>
<tr>
<th>Year III</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE303</td>
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<tr>
<td>EE203</td>
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<tr>
<td>EE204</td>
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<td>ME301</td>
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<td>ME342</td>
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<td>ME343</td>
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<td>ME352</td>
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<td>NA311</td>
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<td>NA342</td>
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<tr>
<td>NA351</td>
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<tr>
<td>Electives</td>
<td>3</td>
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</tbody>
</table>

* First half year
** Second half year

---

1 Any student who is unable to complete Year VI as a full time student may do so in two part time years and may include ME096 in the programme if not previously taken.

2 See Elective Requirements — Appendix A.
Subject | Year IV | Units
---|---|---
GE350 Seminar | 1 | 
ME481 Engineering Administration | 1 | 
ME482 Engineering Economics | 1 | 
NA481 Shipyard Production and Management | 1 | 
ME453 Fluid Mechanics | 1 | 
NA402 Special Purpose Ships | 1 | 
NA452 Theoretical Naval Architecture | 4 | 
NA496 Project/Seminar | 3 | 

1 Electives | 15 | 

1 See Elective Requirements — Appendix A.
2 Mathematics IIB may be taken in two parts each of three terms duration.
3 See note on Page 118.

RECOMMENDED PROGRAMME FOR THE BACHELOR OF ENGINEERING IN NAVAL ARCHITECTURE BY PART-TIME STUDY

Stages 1-4 not offered in 1977

Stage 5

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>EE 203 *Introduction to Electrical Information</td>
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<tr>
<td>EE 204 **Introduction to Electrical Energy</td>
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<tr>
<td>ME095 Industrial Experience</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>
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<td>ME343 Mechanics of Solids</td>
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<td>ME352 Fluid Mechanics</td>
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<tr>
<td>NA311 Ship Design &amp; Construction</td>
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<td>NA351 Resistance &amp; Propulsion of Ships</td>
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* First half year
** Second half year

Stage 6

<table>
<thead>
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<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE 303 Structural Design</td>
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<tr>
<td>ME453 Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>NA342 Applied Naval Architecture</td>
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<tr>
<td>NA402 Special Purpose Ships</td>
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<tr>
<td>NA431 Ships Machinery</td>
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<tr>
<td>NA452 Theoretical Naval Architecture</td>
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<tr>
<td>NA481 Shipyard Production &amp; Management</td>
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</tbody>
</table>

* First half year
** Second half year
1 See Elective Requirements — Appendix A.
2 Mathematics IIB may be taken in two parts each of three terms duration.

1 A maximum of three Industrial Experience units may be claimed in this course.
2 See Elective Requirements — Appendix A.
3 Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.
4 See note on Page 118.

BACHELOR OF SCIENCE (ENGINEERING) IN NAVAL ARCHITECTURE

Stages 1-4 will not be offered after 1976

Stage 5

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<thead>
<tr>
<th>Subject</th>
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<tr>
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<td>EE 204 **Introduction to Electrical Energy</td>
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<td>ME301 Engineering Computations</td>
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<tr>
<td>ME342 Properties of Materials</td>
<td>1</td>
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<td>ME343 Mechanics of Solids</td>
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<td>ME352 Fluid Mechanics</td>
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<tr>
<td>NA311 Ships Design &amp; Construction</td>
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* First half year
** Second half year

Stage 6

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<th>Units</th>
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<tr>
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<td>NA342 Applied Naval Architecture</td>
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<tr>
<td>NA402 Special Purpose Ships</td>
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<td>NA431 Ships Machinery</td>
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<td>NA452 Theoretical Naval Architecture</td>
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<td>NA481 Shipyard Production &amp; Management</td>
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* First half year
** Second half year
1 See Elective Requirements — Appendix A.
2 Mathematics IIB may be taken in two parts each of three terms duration.
BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

The course followed must comply with Section 19 of the Requirements for the Degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme is recommended:

<table>
<thead>
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<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>Year I</strong></td>
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<tr>
<td>Engineering I</td>
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<tr>
<td>Mathematics I</td>
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<tr>
<td>Physics IA</td>
<td>4</td>
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<tr>
<td>Chemistry IS</td>
<td>2</td>
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<tr>
<td>ME121 Workshop Practice</td>
<td>1</td>
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<tr>
<td>ME122 Process Technology</td>
<td>1</td>
</tr>
<tr>
<td>Met151 Microstructure of Materials</td>
<td>17</td>
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</tbody>
</table>

With approval of Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, and Met151 and ME122.

| **Year II** | |
| 2Arts subjects Part I | 4 |
| **Laboratory Measurements** | 1 |
| ME201 *Dynamics of Engineering Systems | 1 |
| ME214 Mechanics of Solids I | 1 |
| ME223 Mechanical Technology | 1 |
| ME232 Dynamics of Machines | 1 |
| ME241 **Properties of Materials | 1 |
| ME251 *Fluid Mechanics | 1 |
| ME271 Thermodynamics | 4 |
| **Mathematics IIB** | 16 |

*First half year*

*Second half year*

| **Year IV** | |
| 2Arts subject Part III | 8 |
| 2Arts subject Part II or Part III | 6½ |
| ME352 Fluid Mechanics | 1 |
| ME372 **Heat Transfer | 1 |
| ME373 Thermodynamics | 1 |

| **Year V** | |
| CE303 Structural Design | 2 |
| ME313 Engineering Design | 1 |
| ME333 Dynamics of Machines | 1 |
| ME481 Engineering Administration | 1 |
| ME482 Engineering Economics | 1 |
| ME496 Project/Seminar | 4 |
| one unit selected from | |
| ME381 Methods Engineering | |
| ME383 Quality Engineering | |
| ME413 Design of Crankshafts, Flywheels and other Rotating Members | |
| ME414 Design of Hydraulic & Pneumatic Power Systems | 1 |
| ME419 Design of Conveyors & Materials Handling Equipment | |
| ME449 Reliability Analysis of Mechanical Systems | |
| ME487 *Operations Research — Deterministic Models | 3 |
| **Electives** | 14 |

1 Must be selected from departmental technical electives.
2 Approximate hours only. Refer to Arts Faculty Handbook for subject details.
3 Mathematics IIB may be taken in two parts each of three terms duration.

BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

The course followed must comply with Section 19 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme is recommended:

| **Year I** | |
| Engineering I | 4 |
| Mathematics I | 4 |
| Physics IA | 4 |
| Chemistry IS | 2 |
| ME121 Workshop Practice | 1 |
| ME122 Process Technology | 1 |
| Met151 Microstructure of Materials | 17 |

With approval of Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and ME122.

*First half year*

*Second half year*
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<th>Subject</th>
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<td>Physics II</td>
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<td>ME202</td>
<td>*Dynamics of Engineering Systems</td>
<td>1</td>
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<tr>
<td>ME251</td>
<td>*Fluid Mechanics</td>
<td>1</td>
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<tr>
<td>ME271</td>
<td>Thermodynamics</td>
<td>1</td>
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<td>Mathematics IIB</td>
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<tr>
<td>ME214</td>
<td>Mechanics of Solids I</td>
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<td>ME223</td>
<td>Mechanical Technology</td>
<td>1</td>
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<tr>
<td>ME232</td>
<td>Dynamics of Machines</td>
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<tr>
<td>ME241</td>
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<tr>
<td>GE350</td>
<td>Seminar</td>
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<tr>
<td>ME212</td>
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<tr>
<td>ME213</td>
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<tr>
<td>ME301</td>
<td>Engineering Computations</td>
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<td>**Mechanics of Solids</td>
<td>1</td>
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<tr>
<td>ME352</td>
<td>Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME361</td>
<td>*Automatic Control</td>
<td>1</td>
</tr>
<tr>
<td>ME372</td>
<td>**Heat Transfer</td>
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<td>Thermodynamics</td>
<td>1</td>
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<td>ME481</td>
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<td>ME482</td>
<td>Engineering Economics</td>
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<tr>
<td>ME381</td>
<td>Methods Engineering</td>
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<tr>
<td>ME383</td>
<td>Quality Engineering</td>
<td>1</td>
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<tr>
<td>ME413</td>
<td>Design of Crankshafts, Flywheels &amp; other Rotating Members</td>
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</tr>
<tr>
<td>ME414</td>
<td>Design of Hydraulic &amp; Pneumatic Power Systems</td>
<td>1</td>
</tr>
<tr>
<td>ME419</td>
<td>Design of Conveyors &amp; Materials Handling Equipment</td>
<td>1</td>
</tr>
<tr>
<td>ME449</td>
<td>Reliability Analysis of Mechanical Systems</td>
<td>1</td>
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<tr>
<td>ME487</td>
<td>*Operations Research — Deterministic Models</td>
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<thead>
<tr>
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<td>ME333</td>
<td>Dynamics of Machines</td>
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<tr>
<td>ME496</td>
<td>Project/Seminar</td>
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1 See Elective Requirements — Appendix A.

**BACHELOR OF ARTS/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING**

The course followed must comply with Section 19 of the Requirements for the Degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme is recommended:

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<thead>
<tr>
<th>Subject</th>
<th>Year I</th>
<th>Units</th>
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<tr>
<td>ME121</td>
<td>Workshop Practice</td>
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<tr>
<td>ME122</td>
<td>Process Technology</td>
<td>1</td>
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<tr>
<td>Met151</td>
<td>Microstructure of Materials</td>
<td>1</td>
</tr>
<tr>
<td>**</td>
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<td>17</td>
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With approval of Head of Department. Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met 151 and ME122.

<table>
<thead>
<tr>
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<td>ME214</td>
<td>*Dynamics of Engineering Systems</td>
<td>1</td>
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<tr>
<td>ME223</td>
<td>Mechanics of Solids I</td>
<td>1</td>
</tr>
<tr>
<td>ME232</td>
<td>Mechanical Technology</td>
<td>1</td>
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<tr>
<td>ME241</td>
<td>**Properties of Materials</td>
<td>1</td>
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<td>ME251</td>
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* First half year
** Second half year
BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

The course followed must comply with Section 19 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme is recommended:

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<td>ME251</td>
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* First half year
** Second half year

1 Approximate unit values. Refer to Arts Faculty Handbook for subject details.
2 See Elective Requirements — Appendix A.
3 Mathematics II B may be taken in two parts each of three terms duration.
<table>
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<th>Subject</th>
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<tbody>
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<tr>
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<td>EE204 **Introduction to Electrical Energy</td>
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<td>GE350 Seminar</td>
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<td>ME213 **Engineering Design</td>
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<td>ME342 *Properties of Materials</td>
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<tr>
<td>ME343 **Mechanics of Solids</td>
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<tr>
<td>ME381 Methods Engineering</td>
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<td>ME333 Dynamics of Machines</td>
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<td>ME361 *Automatic Control</td>
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<td>ME385 Accounting &amp; Financial Studies</td>
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<td>ME496 Project/Seminar</td>
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<td>ME681 Industrial Law</td>
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1 See Elective Requirements — Appendix A.

**BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

The course followed must comply with Section 19 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme has been approved by the two Faculty Boards:

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<td>ME122 Process Technology</td>
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<td>Met151 Microstructure of Materials</td>
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With approval of Head of Department Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and ME122.

* First half year
** Second half year

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<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<td><strong>Year II</strong></td>
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</tr>
<tr>
<td>EE203 *Introduction to Electrical Information</td>
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<td>EE204 **Introduction to Electrical Energy</td>
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<td>ME202 *Dynamics of Engineering Systems</td>
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<td>ME223 Mechanical Technology</td>
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<td>ME232 Dynamics of Machines</td>
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<td>ME251 *Fluid Mechanics</td>
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</tr>
<tr>
<td>ME342 *Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME343 **Mechanics of Solids</td>
<td>1</td>
</tr>
<tr>
<td>ME352 Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME361 *Automatic Control</td>
<td>1</td>
</tr>
<tr>
<td>ME372 **Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ME373 Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td>2One Economics &amp; Commerce subject Group B</td>
<td>4</td>
</tr>
<tr>
<td>2One Economics &amp; Commerce subject Group C</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

* First half year
** Second half year
Subject | Units
---|---
**Year V**
CE303 Structural Design | 2
One unit of—
ME381 Methods Engineering | 1
ME383 Quality Engineering | 1
ME413 Design of Crankshafts, Flywheels & other Rotary Members | 1
ME414 Design of Hydraulic & Pneumatic Power Systems | 1
ME419 Design of Conveyors & Materials Handling Systems | 1
ME449 Reliability Analysis of Mechanical Systems | 1
ME487 *Operations Research—Deterministic Models | 1
ME496 Project/Seminar | 4
1 Electives | 
2 One Economics & Commerce subject Group C | 16
1. 3 electives must be chosen from the list of Departmental Electives.
2. The subjects which count towards the B.Com. degree are those 2 plus 6 engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject.

**BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING**

The course followed must comply with Section 19 of the Requirements for the degrees of Bachelor of Engineering and Bachelor of Science (Engineering). The following programme has been approved by the two Faculty Boards.

**Year I**

2 Engineering I | 4
2 Mathematics I | 4
Physics IA | 4
Chemistry IS | 2
ME121 Workshop Practice | 1
ME122 Process Technology | 1
Met151 Microstructure of Materials | 1

With approval of Head of Department, Chemistry I (4 units), may be taken in lieu of Chemistry IS, Met151, and ME122.

* First half year

** Second half year

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**Year II**

EE203 *Introduction to Electrical Information | 1
EE204 **Introduction to Electrical Energy | 1
ME202 *Dynamics of Engineering Systems | 1
ME214 Mechanics of Solids | 1
ME223 Mechanical Technology | 1
ME241 **Properties of Materials | 1
ME245 Mathematics II | 4
2 One Economics & Commerce subject Group A | 4
2 One Economics & Commerce subject Group A | 4

**Year III**

ME201 **Laboratory Measurements | 1
ME212 *Engineering Design | 1
ME213 **Engineering Design | 1
ME232 Dynamics of Machines | 1
ME251 *Fluid Mechanics | 1
ME271 Thermodynamics | 1
2 One Economics & Commerce subject Group A or B | 4
2 One Economics & Commerce subject Group B | 4
2 One Economics & Commerce subject Group B | 4

**Year IV**

ME301 Engineering Computations | 1
ME313 Engineering Design | 1
ME333 Dynamics of Machines | 1
ME342 *Properties of Materials | 1
ME343 **Mechanics of Solids | 1
ME361 *Automatic Control | 1
ME381 Methods Engineering | 1
ME383 Quality Engineering | 1
ME384 Design for Production | 1
ME487 *Operations Research—Deterministic Models | 1
ME488 **Operation Research—Probabilistic Models | 1
2 One Economics & Commerce subject Group C | 4

* First half year

** Second half year

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15
5. Three elective units in the B.Com. degree are those marked 2 plus 6 units taken outside the Faculty. Not more than 6 units may be taken outside the Faculty.

5. Three elective units taken in Year IV must be selected from the departmental list of technical electives.

Conditions as to Selection of Electives

1. At least 2 units of 4-unit elective in Year III must be taken outside the Faculty.
2. Not more than 6 units may be taken outside the Faculty.
3. At least 3 of the 6 elective units taken in Year IV must be selected from the departmental list of technical electives.
4. For students in full employment proceeding as part-time students, each year of appropriate employment that is supervised and approved by the Head of Department is credited as 1 unit of elective. A maximum of 5 such units is allowed, described as:

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 1 and 2 above, except the departmental technical elective requirement in Clause 3.

5. Three elective units in the B.A./B.E. courses and in the B.Sc./B.E. courses must be selected from the list of Departmental Technical Electives on page 142.

List of Prerequisites

**Mechanical and Industrial Engineering**

<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>*ME212</td>
</tr>
<tr>
<td>ME213 Engineering Design**</td>
<td>*ME121, ME111/2, CE111, *Maths I, *ME214</td>
</tr>
<tr>
<td>ME214 Mechanics of Solids</td>
<td>*ME111, ME131, CE111, Maths I</td>
</tr>
<tr>
<td>ME223 Mechanical Technology</td>
<td>*ME111, ME131, CE111, Maths I</td>
</tr>
<tr>
<td>ME224 Dynamics of Machines</td>
<td>*ME111, ME131, CE111, Maths I</td>
</tr>
<tr>
<td>ME241 Properties of Materials**</td>
<td>*ME111, ME131, CE111</td>
</tr>
<tr>
<td>ME251 Fluid Mechanics*</td>
<td>*ME111, ME131, Maths I</td>
</tr>
<tr>
<td>ME271 Thermodynamics</td>
<td>*Physics IA or IB</td>
</tr>
<tr>
<td>ME301 Engineering Computations</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME313 Engineering Design</td>
<td>Maths II</td>
</tr>
<tr>
<td>ME333 Dynamics of Machines</td>
<td>ME241</td>
</tr>
<tr>
<td>ME342 Properties of Materials*</td>
<td>ME241 or CE212</td>
</tr>
<tr>
<td>ME343 Mechanics of Solids*</td>
<td>ME251</td>
</tr>
<tr>
<td>ME352 Fluid Mechanics</td>
<td>*Maths IIB</td>
</tr>
<tr>
<td>ME361 Automatic Control*</td>
<td>ME271</td>
</tr>
<tr>
<td>ME372 Heat Transfer**</td>
<td>Maths I, ME112, ME223</td>
</tr>
<tr>
<td>ME373 Thermodynamics</td>
<td>Maths I, ME112, ME223</td>
</tr>
<tr>
<td>ME381 Methods Engineering</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME383 Quality Engineering</td>
<td>Maths II, ME361</td>
</tr>
<tr>
<td>ME384 Design for Production</td>
<td>Maths II, ME361</td>
</tr>
<tr>
<td>ME385 Accounting &amp; Financial Studies</td>
<td>Maths II, ME361</td>
</tr>
<tr>
<td>ME401 Systems Analysis*</td>
<td>Maths II, ME361</td>
</tr>
<tr>
<td>ME402 Systems Planning, Organization &amp; Control**</td>
<td>Maths II, ME361</td>
</tr>
<tr>
<td>ME404 Mathematical Programming*</td>
<td>ME301</td>
</tr>
<tr>
<td>ME405 Advanced Engineering Computations</td>
<td>Completed Year II of Course</td>
</tr>
<tr>
<td>ME407 Environmental Engineering</td>
<td>*ME313, *ME333</td>
</tr>
<tr>
<td>ME413 Design of Crankshafts, Flywheel &amp; other Rotating Members</td>
<td>ME251, *ME352</td>
</tr>
<tr>
<td>ME414 Design of Hydraulic &amp; Pneumatic Power Systems</td>
<td>*CE303, ME213, ME232</td>
</tr>
<tr>
<td>ME415 Design of Crane &amp; Hoist Equipment</td>
<td>ME313, ME342/3</td>
</tr>
<tr>
<td>ME416 Design of Pressure Vessels, High Pressure Pipelines, Flats &amp; Shells</td>
<td>ME213, ME232</td>
</tr>
<tr>
<td>ME417 Design of Worm &amp; Special Purpose Gear Reduction Units</td>
<td>*ME313, ME232</td>
</tr>
<tr>
<td>ME419 Design of Conveyors &amp; Materials Handling Equipment</td>
<td>ME333</td>
</tr>
<tr>
<td>ME434 Advanced Kinematics &amp; Dynamics of Machines</td>
<td>ME342</td>
</tr>
<tr>
<td>ME444 Properties of Materials</td>
<td>ME343</td>
</tr>
<tr>
<td>ME445 Mechanics of Solids</td>
<td>ME342/3</td>
</tr>
<tr>
<td>ME448 An Introduction to Photomechanics</td>
<td>ME313, Maths IIB</td>
</tr>
<tr>
<td>ME449 Reliability Analysis of Mechanical Systems</td>
<td>ME352</td>
</tr>
<tr>
<td>ME453 Fluid Mechanics</td>
<td>ME352</td>
</tr>
<tr>
<td>ME454 Turbomachinery</td>
<td>ME372</td>
</tr>
<tr>
<td>ME474 Heat Transfer</td>
<td>ME271, ME372</td>
</tr>
<tr>
<td>ME476 Developments in the Use of Solar Energy</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME481 Engineering Administration</td>
<td>Maths I</td>
</tr>
<tr>
<td>ME482 Engineering Economics</td>
<td></td>
</tr>
</tbody>
</table>

* First half year
** Second half year

These elective units may be used to meet any elective requirement in Clauses 1 and 2 above, except the departmental technical elective requirement in Clause 3.

A maximum of 5 such units is allowed, described as:

- 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 1 and 2 above, except the departmental technical elective requirement in Clause 3.

5. Three elective units in the B.A./B.E. courses and in the B.Sc./B.E. courses must be selected from the list of Departmental Technical Electives on page 142.
Subject Unit

ME483 Production Engineering
ME487 Operations Research - Deterministic Models*
ME488 Operations Research - Probabilistic Models**
ME489 Operations Research - Applications in Industry

Prerequisite

Maths I, ME122, ME223
Maths IIB
Maths IIB
Maths IIB

Naval Architecture

NA311 Ship Design & Construction
NA342 Applied Naval Architecture
NA351 Resistance & Propulsion of Ships
NA402 Special Purpose Ships
NA431 Ships’ Machinery
NA452 Theoretical Naval Architecture
NA481 Shipyard Production & Management

*Prerequisites thus indicated may, with the consent of the Head of the Department, be read concurrently with the subject unit named.

Departmental Technical Electives

Each Elective is to consist of three subject units chosen from the following list.

1 SUBJECT UNITS (42 hrs/unit)

ME401 Systems Analysis
ME402 Systems Planning, Organization & Control
ME404 Mathematical Programming
ME405 Advanced Engineering Computations
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
ME419 Design of Conveyors & Materials Handling Equipment
ME434 Advanced Kinematics & Dynamics of Machines
ME444 Properties of Materials
ME445 Mechanics of Solids
ME448 An Introduction to Photomechanics
ME449 Reliability Analysis for Mechanical Systems
ME453 Fluid Mechanics
ME454 Turbomachinery
ME474 Heat Transfer
ME476 Developments in the Use of Solar Energy
ME483 Production Engineering
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 Department.

Availability of individual subject units will depend on student demand.

DESCRIPTION OF SUBJECT ENTRIES

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 & Seminar

Naval Architecture

NA-0- General courses
NA-1- Analysis and Design
NA-2- Shipbuilding practice
NA-3- Machines
NA-4- Applications
NA-5- Resistance & Propulsion
NA-6- Industrial Engineering
NA-7- Project & Seminar

ME092 to ME096 Industrial Experience Units  See page 179.

Examination  Progressive assessment

541101 ME111 Graphics

Prerequisites  Nil

Hours  42

Examination  One 2 hour paper
One 3½ hour paper

Content

Orthographic projection: Fundamentals, auxiliary planes projections of the straight line, of lines inclined to lines, of lines contained by planes, of lines inclined to planes, of planes inclined to planes, section planes, lines of intersection and developments of surfaces.
Text

References
Levens, A. S.
Luzadder, W. J.

541102 ME112 Engineering Drawing and Elementary Design

PrerequisitesNil

Hours42

ExaminationOne 3 hour paper

Content
Orthographic drawings of complete designs. Philosophy and fundamentals of engineering design.

Text
Australian Standard Engineering Drawing Practice CZ1 1976 (Institution of Engineers, Australia)

References
Levens, A. S.
Luzadder, W. J.

541202 ME122 Process Technology

PrerequisiteNil

Hours42

ExaminationProgressive assessment

Content

Text
DeGarmo, E. P.

References
Campbell, J. S.

541201 ME121 Workshop Practice

PrerequisitesNil

Hours54

ExaminationProgressive assessment

Content
A study of basic methods and processes used in the engineering trades with instruction, practice and assignments related to fitting and machining, welding processes, boilermaking and steel fabrication, and the engineering inventory of materials and components.

Text
Trade Technology Notes

References
DeGarmo, E. P.

541103 ME131 Dynamics

PrerequisitesNil

Hours42

ExaminationProgressive assessment and examination

Content
Basic concepts required for study of motion: length, time, face and mass; Newton's laws of motion; systems of units; friction. Motion of point masses, rigid bodies and connected bodies in straight or curved paths, or in simple rotation. Relative motion using translating reference frames. General plane motion of rigid bodies.

Doyle, L. E. et al. Manufacturing Processes and Materials for Engineers (Prentice-Hall)


H. Ford Trade School Shop Theory (McGraw-Hill)

Trade Catalogues

DeGarmo, E. P. Materials and Processing in Manufacturing (Macmillan)

Doyle, L. E. et al. Manufacturing Processes and Materials for Engineers (Prentice-Hall)

References
Campbell, J. S.

Datsko, I. Materials, Properties and Manufacturing Processes (Wiley)
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 and friction “losses,” for particles and rigid bodies.

Text
Meriam, J. L.  
*Dynamics* 2nd edn S.I. Version (Wiley 1975)

Reference
Beer, F. P. & Johnston, E. R.  

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### 542201 ME201 Laboratory Measurements**

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>*Maths I &amp; *Physics IA or IB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>42</td>
</tr>
<tr>
<td>Examination</td>
<td>Progressive assessment and examination</td>
</tr>
</tbody>
</table>

**Content**

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.

Text
Holman, J. P.  
*Experimental Methods for Engineers* (McGraw-Hill 1966)

References
Beckwith, T. G. & Buck, W. L.  
*Mechanical Measurements* (Addison-Wesley)

Brinkworth, B. J.  
*An Introduction to Experimentation* (English U.P.)

Volk, W.  
*Applied Statistics for Engineers* (McGraw-Hill)

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### 542104 ME202 Dynamics of Engineering Systems*

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Maths I, *ME131, *CE111</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>42</td>
</tr>
<tr>
<td>Examination</td>
<td>Progressive assessment and examination</td>
</tr>
</tbody>
</table>

Content

System Classification — Lumped parameter and distributed systems; discrete systems. Examples commonly occurring in engineering problems.

Linear Graph Analysis and Network Analysis; Block diagrams.

Circuit diagrams for mechanical systems — “through” and “across” variables; equilibrium and compatibility analysis; system modelling; system function.

Concept of “state”; free and forced response; stability.

Classical time domain analysis; frequency domain analysis of linear lumped and continuous systems.

Text
Cannon, R. H.  
*Dynamics of Physical Systems* (McGraw-Hill)

References
Haberman, C. M.  
*Engineering Systems Analysis* (Merril)

Raven, F. H.  

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### 542302 ME212 Engineering Design*

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>*ME121, ME111/2, *ME214 or CE212 CE111, *Maths I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>42</td>
</tr>
<tr>
<td>Examination</td>
<td>Progressive assessment</td>
</tr>
</tbody>
</table>

Content

Design procedures for mechanical components. Load estimation. Typical allowable stress and factor of safety values. Stress calculations. Detail considerations of the design of shafts, bearings, couplings, bolted joints, welded connections, wall brackets, eccentric connections, levers, flat and vee belts, drives and springs. Horsepower, calculations for straight and helical spur gear reductions.

Text
Hall, A. S. et al.  
*Theory and Problems of Machine Design* (Schaum)
References
Black, P. H. & Adams, O. E.
Doughtie, V. L. & Vallance, A.
Faires, V. M.
Kent, W.
Phelan, R. M.
Shigley, J. E.

Machine Design (McGraw-Hill)
Design of Machine Members (McGraw-Hill)
Design of Machine Elements (Macmillan)
Mechanical Engineers' Handbook Design and Production (Wiley)
Fundamentals of Mechanical Design (McGraw-Hill)
Mechanical Engineering Design (McGraw-Hill)
Machine Cut Gears Helical and Straight Spur
A.S.B. 61 — 1941

542303 ME213 Engineering Design**

Prerequisite
*ME212

Hours
42

Examination
Progressive assessment

Content
The design of brakes, clutches, gear box reduction units and power screws for industrial applications. Modern developments in this area will be discussed.

Text
Stephenson, J. & Callander, R. A.

Engineering Design (Wiley)

References
Black, P. H. & Adams, A. F.
Doughtie, V. L. & Vallance, A.
Faires, V. M.
Hall, A. S. et al.
Phelan, R. M.
Shigley, J. E.
Siegal, W. J. et al.

542105 ME214 Mechanics of Solids*

Prerequisites
Maths I, ME111/112, ME131, CE111

Hours
42

Examination
Progressive assessment and examination

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

Text
Hall, A. S.

An Introduction to the Mechanics of Solids
Internat. Student edn (Wiley 1973)

References
Crandall, S. H. et al.

An Introduction to the Mechanics of Solids
2nd edn (McGraw-Hill 1972)

Higdon, A. et al.

Mechanics of Materials (Wiley)

Popov, E. P.

Introduction to Mechanics of Solids
(Prentice-Hall 1968)

Shanley, F. R.


542304 ME223 Mechanical Technology

Prerequisite
*ME121

Hours
42

Examination
Progressive assessment

Content

Texts
Campbell, J. S.

Processes and Materials in Manufacturing
(Wiley)

DeGarmo, E. P.

Materials Processes in Manufacturing
(Macmillan)

Reference
Doyle, L. E. et al.

Manufacturing Processes and Materials for Engineers (Prentice-Hall)
542301 ME232 Dynamics of Machines

**Prerequisites**
Maths I, ME131, ME111/2, CE111

**Hours**
42

**Examination**
One 3-hour paper

**Content**
Description of plane and three-dimensional motion of particles in inertial, translating and rotating reference frames. Kinematics of plane mechanisms. General three-dimensional motion of systems of particles and rigid bodies.

**Text**
Meriam, J. L.  
*Dynamics* 2nd edn SI Version (Wiley 1975)

**References**
Hirschhorn, J.  
*Kinematics and Dynamics of Plane Mechanisms* (McGraw-Hill)

Hirschhorn, J., Holowenko, A. R. C.  
*Kinematics and Dynamics of Plane Mechanisms* (Wiley)

Syng, J. L. & Griffith, B. A.  

542102 ME241 Properties of Materials**

**Prerequisites**
Maths I, ME111, ME112, CE111

**Hours**
42

**Examination**
To be advised

**Content**

**Text**
Nil

**References**
Whyatt, O. H. & Dew-Hughes, D.  

Polakowski, N. H. & Ripling, E. M.  
*Strength of Structural and Engineering Materials* (Prentice-Hall 1966)

542202 ME251 Fluid Mechanics*

**Prerequisites**
Maths I, ME131

**Hours**
42

**Examination**
Progressive assessment and examination

**Content**
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. Bernoulli 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.

**Text**
Streeter, V. L. & Wylie, E. B.  

**References**
Dougherty, R. L. & Franzini, J. B.  
*Fluid Mechanics with Engineering Applications* (McGraw-Hill)

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

542203 ME271 Thermodynamics

**Prerequisites**
Maths I, Physics IA or IB

**Hours**
42

**Examination**
Progressive assessment

**Content**

D'Isa, F.  
*Mechanics of Metals* (Addison-Wesley 1968)

McClintock & Argon  
*Mechanical Behaviour of Materials* (Addison-Wesley 1966)

Marin, J.  
Calculation of property changes and energy flows for non-flow, steady flow and unsteady flow processes using various working substances. Examination of various energy conversion systems as examples of the above calculations — Carnot cycle, Rankine cycle, reheat cycle, regenerative feed heating, Otto cycle, Diesel and mixed cycles, Stirling and Ericsson cycles, gas turbine cycles, refrigeration cycles. Introduction to combustion processes.

Texts
Haywood, R. W. *Thermodynamic Tables in S I (Metric) Units* (Cambridge U.P. 1972)

References
Cole, E. H. *Engineering Thermodynamics* (Edward Arnold 1973)
Wallace, F. J. & Linning, W. A. *Basic Engineering Thermodynamics (S I Units)* (Pitman 1970)

543101 ME301 Engineering Computations

Prerequisite  Maths I

Hours  42

Examination  Progressive assessment

Content

Texts
Duncan, A. K. *Fortran* (Dataset 1973)

References
Forsythe, G. & Moler, C. B. *Computer Solution of Linear Algebraic Systems* (Prentice-Hall 1967)

543302 ME313 Engineering Design

Prerequisites  ME213, ME214, ME232, Maths I, *ME343

Hours  42

Examination  Progressive assessment and examination

Content
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.

Text

References
Howarth, M. H. *Design of High Speed Diesel Engines* (Constable)
Lipson & Juvinall *Handbook of Stress and Strength* (Macmillan)
Matousek, R. *Engineering Design* (Blackie)
Purdy *Diesel Engine Design* (Constable)
Seely & Smith *Advanced Mechanics of Materials* (Wiley)
Shigley, J. E. *Mechanical Engineering Design* (McGraw-Hill)
Walshaw *Diesel Engine Design* (Newnes)

543301 ME333 Dynamics of Machines

Prerequisites  Maths IIB, ME202, ME232.

Hours  42

Examination  Progressive assessment and examination

Content
543102 ME342 Properties of Materials*

Prerequisite
ME241

Hours
42

Examination
Progressive assessment and examination

Content
Elasticity of a network of long chain molecules — general stress-strain relations for rubber-like materials — Mooney's theory for large deformations — Rivlin — Sanders and Carmichael — Holderway applications to natural rubbers.


Basic course in fracture mechanics — temperature approach and the stress analysis approach — stress intensity factor; thickness, temperature and fatigue effects — fracture toughness. Applications to design — testing methods — C.O.D. (crack opening displacement) testing — relation of various tests to fracture toughness.

Text
Nil

References
Broek, D.
Christensen, R. M.
Knott, J. F.
Lawn, B. R. & Wilshaw, T. R.
Trelbar, L. R. G.

Elementary Engineering Fracture Mechanics
Theory of Viscoelasticity — An Introduction (Academic 1971)
Fundamentals of Fracture Mechanics (Butterworths 1973)
Fracture of Brittle Solids (Cambridge U.P. 1975)
The Physics of Rubber Elasticity 2nd edn (Oxford U.P. 1958)
543204 ME361 Automatic Control*

Prerequisite
Maths IIB

Hours
42

Examination
Progressive assessment and examination

Content

Description of components of servo-mechanisms and process control systems.

Text
Fortmann, T. E. & Hitz, K. L. *Introduction to Linear Control Systems Theory* (Dekker 1976)

References
Desoer, C. A. *Notes for a Second Course in Linear Systems* (Van Nostrand Reinhold)
Gupta & Hasdorff *Fundamentals of Automatic Control* (Wiley)
Melsa & Schultz *Linear Control Systems* (McGraw-Hill)
Raven, F. H. *Automatic Control Engineering* (McGraw-Hill)

543202 ME372 Heat Transfer

Prerequisite
*Maths IIB

Hours
42

Examination
Progressive assessment and examination

Content
Conduction; steady and unsteady, one and two dimensional, with and without internal heat generation and including convection boundaries. Numerical and analogue solutions.
Convection; laminar and turbulent. Analytical and empirical solutions. Analogy between momentum and heat transfer.

Text

References
Jakob, M. *Heat Transfer Vols 1 & 2* (Wiley)

543505 ME373 Thermodynamics

Prerequisite
ME271

Hours
42

Examination
Progressive assessment

Content
General thermodynamic relations, equations of state, compressibility factor.
Non-reactive gaseous mixtures, gas and vapour mixtures, psychrometry.
First and second law analysis of energy systems including power plants, gas turbines, transportation prime movers, air compressors, refrigeration and air conditioning.
Reactive mixtures, enthalpy and internal energy of reaction, equilibrium constant.
Thermodynamics of irreversible processes, entropy production.
Introduction to statistical thermodynamics, entropy and probability, the energy partition function, use in determining thermodynamic properties.
Introduction to direct energy conversion systems such as thermoelectric devices, fuel cells, thermionic devices, magnetohydrodynamic power.

Text
Wood, B. D. *Applications of Thermodynamics* (Addison-Wesley 1969)
543501 ME381 Methods Engineering

**Prerequisites**  Maths I, M223, ME122

**Hours**  42

**Examination**  Progressive assessment

**Content**

**Text**
Niebel, B. W.  *Motion and Time Study* (Irwin)

**References**
Barnes, R. M.  *Motion and Time Study* (Wiley)
Krick, E. V.  *Methods Engineering* (Wiley)

543502 ME383 Quality Engineering

**Prerequisites**  Maths IIB, ME223, ME122

**Hours**  42

**Examination**  Progressive assessment and examination

**Content**

**Texts**
Nil

**References**
Amer. Soc. of Tool & Mfg Engs  *Handbook of Industrial Metrology* (Prentice-Hall)
Duncan, A. J.  *Quality Control and Industrial Statistics* (Irwin)
Grant, E. L.  *Statistical Quality Control* (McGraw-Hill)
Juran, J. M. & Gryna, F. M.  *Quality Planning and Analysis* (McGraw-Hill)
Clasical time and frequency domain analysis of continuous and
discrete systems; Matrix methods in systems modelling and analysis.
Stochastic Processes — Random data and signal analysis; Response of
systems to random excitation; Systems identification.

Texts
Nil

References
Bendat, J. S. &
Piersol, A. G.
Busacker, R. G. &
Saaty, T. L.
De Russo, P. M. et al.
Machol, R.
McMillan, C. &
Gonzalez, R. F.
Meredith, D. D. et al.
Raven, F. H.

Measurement and Analysis of Random Data
(Wiley 1968)
Finite Graphs and Networks (McGraw-Hill 1965)
State Variables for Engineers (Wiley 1965)
Mathematics of Engineering Systems
(McGraw-Hill 1966)

544417 ME404 Mathematical Programming*
Prerequisite Mathematics IIB
Hours 42
Examination Progressive assessment
Content
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. Trans­
portation and assignment problems.

Texts
Gass, S. I.
Nemhause, G. L.
Bellman, R. E. &
Dreyfus, S. E.
Kunzi, H. P. et al.
McMillan, C.
Taha, H. A.

Linear Programming 3rd edn Internat. Student
(McGraw-Hill) 1969)
Introduction to Dynamic Programming
(Wiley 1966)
Applied Dynamic Programming
Non-Linear Programming (Blaisdell 1966)
Mathematical Programming (Wiley 1970)
Operations Research (Macmillan 1971)

544452 ME402 Systems Planning, Organization and Control**
Prerequisites Maths IIB, ME361
Hours 42
Examination Progressive assessment and examination
Content
Goals and structures of systems. Mathematical modelling and system
simulation. Control functions and control systems. Hierarchical control
Formal organisation and decision theory. Application of systems
techniques to organisational analysis and design. Examples of industrial
and business systems.

Texts
Nil

References
Acknoff, R. L.
Battersby, A.
Carzo, R. &
Yanouzas, J. V.

A Concept of Corporate Planning (Wiley 1970)
Network Analysis for Planning Scheduling
(MacMillan 1970)
Formal Organisation, A Systems Approach
(Irwin Dorsey 1965)

544462 ME405 Advanced Engineering Computations
Prerequisite ME301
Hours 42
Examination

Progressive assessment

Content

Advanced FORTRAN programming

Variable formats, relational and logical expressions, complex algebra, multiple entry and return points for subroutine and function segments, use of disc and magnetic tape files, compounding of programs from segments stored in separate files, direct access files and backing stores, dump and overlay programs for large jobs, use of library subroutines for a number of problems, e.g. matrix manipulations.

Some advanced computing techniques. For example:

(a) The Nachtsheim-Swigert iteration scheme for solving end value differential equations.
(b) Use of "out-of-core" solver of large sets of banded equations using Gauss elimination.

Introduction to the solution of heat, mass and momentum transfer problems using:

(a) The marker-and-cell finite difference technique.
(b) Finite element techniques.

Text

Extended Fortran — ICL Technical Publication No. 4269 (ICL 1971)

References

Alder, B. et al. (eds) Methods of Computational Physics (Academic 1964)

Various articles from —

Journal of Computational Physics
Mathematics of Computations
International Journal for Numerical Methods in Engineering

544453 ME407 Environmental Engineering

Prerequisite

Completed Year II of Course

Hours

42

Examination

To be advised

Content

The role of the engineering in environmental pollution and control is examined through interaction of man with air, water, and land masses which comprise the environment in which he lives.

Effects of air and noise pollution on man, vegetation, and other materials will be considered.

Methods of reducing pollution to acceptable levels will be studied through consideration of physical diffusion models and the examination of existing quality standards, control legislation and various forms of measuring and control hardware.

Texts

Perkin, H. C. Air Pollution (McGraw-Hill)
Taylor, R. Noise (Penguin)

References

Batton, L. J. The Unclean Sky (Anchor)
Beranek, L. L. Air Pollution Vols I II & III (Academic)
Lund, H. F. Industrial Pollution Control Handbook (McGraw-Hill)
Stern, A. C. Noise Reduction (McGraw-Hill)
Treshow, M. Fresh Air (Utah U.P.)

544404 ME413 Design of Crankshafts, Flywheels and other Rotating Members

Prerequisites

*ME313, *ME333

Hours

42

Examination

To be advised

Content

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.


Texts

References

Howarth, M. H. Design of High Speed Diesel Engines (Constable)
Lipson & Juvinall Handbook of Stress and Strength (Macmillan)
Purday Diesel Engine Design (Constable)
Seely & Smith Advanced Mechanics of Materials (Wiley)
Shigley, J. E. Mechanical Engineering Design (McGraw-Hill)
Siegel, W. J. et al. Mechanical Design of Machines (Internat. Textbook)
Walshaw Diesel Engine Design (Newnes)
544403 ME414 Design of Hydraulic and Pneumatic Power Systems

**Prerequisites**
ME251, *ME352

**Hours**
42

**Examination**
Progressive assessment

**Content**
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.

**Texts**
Nil

**References**
Kay, F. X. *Pneumatics* (Machinery Reference Series)
Molloy, E. *Hydraulic Machinery* (Newnes)
Morris, H. M. *Applied Hydraulics in Engineering* (Ronald Peers)
War, W. G. *Hydraulics in Mechanical Handling* (Trade & Technical)
— *Hydraulic Handling* (Trade & Technical)
— *Principles of Hydraulics* (Trade & Technical)

544405 ME415 Design of Crane and Hoist Equipment

**Prerequisites**
*CE303, ME213, ME232

**Hours**
42

**Examination**
Progressive assessment

**Content**
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.

**Texts**
Nil

**References**
Broughton, H. H. *Electric Cranes* (Spon)
S.A.A. *CB2 Crane and Hoist Code*

544406 ME416 Design of Pressure Vessels, High Pressure Pipelines, Plates and Shells

**Prerequisites**
*ME313, ME342/3

**Hours**
42

**Examination**
To be advised

**Content**

**Texts**
Nil

**References**
Harvey, J. F. *Pressure Vessel Design* (Van Nostrand)
Littleton, C. T. *Industrial Piping* (McGraw-Hill)
Marton, W. L. *Handbook of Industrial Pipework* (Pitman)
Timoshenko, S. *Theory of Plates and Shells* (McGraw-Hill)
— *Flanges and Bolting for Pipes, Valves and Shells* A.S.B. 52-1971
S.A.A. *Boiler Code* AS 1200—1972
— *Unfired Pressure Vessels* AS 1210—1972
— *Water Tube Boilers* AS 1228—1972
S.A.A. *Pressure Piping Code* CB 18

544407 ME417 Design of Worm and Special Purpose Gear Reduction Units

**Prerequisites**
ME213, ME232

**Hours**
42

**Examination**
Progressive assessment

**Content**
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.
544409 ME419 Design of Conveyors and Materials Handling Equipment

Prerequisites ME313, ME232

Hours 42

Examination Progressive assessment

Content
Types of conveyors and materials handling equipment. Design features and performance characteristics. Design of components.
Bin wall pressure distributions.
Introduction to pneumatic and hydraulic conveying systems.

Texts Nil

References
Brook, N.
Brown, R. L. & Richards, J. C.
Hawk, M. C.
Jenike, A. W.
Hudson, E. G.
Rudenko, N.
Spivakovsky & Dyackkov
Stocker, H. E.

544419 ME434 Advanced Kinematics and Dynamics of Machines

Prerequisite ME333

Hours 42

Examination To be advised

Content
Dynamic Motion Analysis; energy distribution method, equivalent mass-and-force method, the rate-of-exchange-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.

Text
Hirschhorn, J. Kinematics and Dynamics of Plane Motion (McGraw-Hill)

References
Hall, A. S. Kinematics and Linkage Design (Prentice-Hall 1960)
Holowenko, A. R. Dynamics of Machines (Wiley)

544401 ME444 Properties of Materials

Prerequisite ME342

Hours 42

Examination To be advised

Content
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.

Texts Nil

References
Broutman & Krock Modern Composite Materials (Addison-Wesley)
Holister, G. S. & Thomas, C. Fibre Reinforced Materials (Elsvier)
McClintock & Argon Mechanical Behaviour of Materials (Addison-Wesley)
Richards Engineering Materials Science (Wadsworth)
### 544402 ME445 Mechanics of Solids

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**Content**

An introduction to the theory of plates and shells with extensions to thick pressure vessels and creep effects. Application of numerical (approximate) methods.

**Refs**

- Nil
- Zienkiewcz & Holister, *Stress Analysis* (Wiley)

### 544416 ME448 An Introduction to Photomechanics

<table>
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**Content**


**Refs**


### 544418 ME449 Reliability Analysis for Mechanical Systems

<table>
<thead>
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**Content**


**Text**


### 544411 ME453 Fluid Mechanics

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<th>Prerequisite</th>
<th>*ME352</th>
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<tr>
<td>Examination</td>
<td>To be advised</td>
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</tbody>
</table>

**Content**

Lectures and laboratory work dealing with a selection from the following topics:—
- Application of hydrodynamics
- Hydraulic transients
- Fractional analysis applications
- Cavitation studies
- Topics in turbomachinery
- One-dimensional compressible flow.
References
Brown, J. H.
Streeter, V. L. & Wylie, E. B.
Vallentine, H. R.

544461 ME454 Turbomachinery

Prerequisite *ME352
Hours 42
Examination To be advised

Content

Texts
Nil

References
Horlock, A. & Desmur, G.

544412 ME473 Thermodynamics

Prerequisite ME271
Hours 42
Examination To be advised

Content
Thermodynamic relations; the Maxwell relations; general equations for enthalpy, internal energy and entropy, compressibility factor, equations of state, generalised charts for enthalpy and entropy. Irreversibility and availability: reversible work and irreversibilities, availability concepts and applications.

Texts
Nil

References
Hatsopoulos, G. N. & Keenan, J. H.
Jennings, B. H. & Lewis, S. R.
Threlkelo, J. L.
Van Wylen, G. J. & Sonntag, R. E.

544413 ME474 Heat Transfer

Prerequisite ME372
Hours 42
Examination To be advised

Content
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.

Texts
Hughes, W. F. & Gaylord, E. W.
Knudsen, J. G. & Katz, D. L.

References
Bagley, F. J. et al.
Kays, W. M.

544423 ME476 Development in the Use of Solar Energy

Prerequisites ME271, ME372
Examination To be advised
Content
The flat-plate and concentrating solar energy collectors.
Solar engines, refrigeration and air-conditioning.
Solar stills, water heaters and furnaces.
Solar batteries, Solar architecture.
Solar energy and photosynthesis.

Texts
Nil

References
Threlkeld, J. L.  *Thermal Environmental Engineering* (Prentice-Hall 1970)
*Journal of the Solar Energy Society*

544101 ME481 Engineering Administration

Prerequisite
Maths I

Hours
42

Examination
Progressive assessment and examinations

Content
The nature and functions of an industrial enterprise. Theories of organization. Behavioural aspects of work. Production management.

Text
Nil

References
Buffa, E. S.  *Modern Production Management* (Wiley 1973)
Bynt, W. J.  *People and Organizations* (McGraw-Hill 1971)

544102 ME482 Engineering Economics

Prerequisite
Maths I

Hours
42

Examination
To be advised

Content
The time value of money, economic criteria for decision making, purchase and replacement economics, cost benefit analysis, evaluation of accounting data for decision making.
Introduction to demand, supply, price and the policy of the firm in various operating environments.
Decision making under risk and uncertainty.

Texts

References

544463 ME483 Production Engineering

Prerequisites
Maths I, ME122, ME223

Hours
42

Examination
Progressive assessment and examination

Content
Production planning and control, Forecasting, inventory, scheduling. Dynamics of production-inventory systems. Simulation of production systems.

Text
Nil

References
Box, G. E. & Jenkins, G. M.  *Time Series Analysis, Forecasting and Control* (Holden Day)
Forrester, J.  *Industrial Dynamics* (M.I.T. Press 1961)
544841 ME487 Operations Research — Deterministic Models*

Prerequisite
Maths IIB

Hours
42

Examination
Progressive assessment and examination

Content
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.

Texts
Hillier, I. S. & Lieberman, G. J. Introduction to Operations Research (Holden-Day)
Taha, H. A. Operations Research (Macmillan)

References
McMillan, C. Mathematical Programming (Wiley)
Wagner, H. W. Principles of Operations Research (Prentice-Hall)

544842 ME488 Operations Research — Probabilistic Models**

Prerequisite
Maths IIB

Hours
42

Examination
Progressive assessment

Content
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.

Text
Saaty, T. L. Elements of Queueing Theory (Prentice-Hall)

References
Brown, R. G. Smoothing, Forecasting and Prediction of Time Series (Prentice-Hall)
Dychman, T. R. et al. Management Decision Making under Uncertainty (Macmillan)
Hadley, G. & Whitin, T. M. Analysis for Inventory Systems (Prentice-Hall)
Taha, H. A. Operations Research (Macmillan)

544843 ME489 Operations Research — Applications in Industry

Prerequisite
Maths IIB

Hours
42

Examination
To be advised

Content
The case study approach to industrial cases. The application of operations research to industrial problems.

Texts
Nil

References
Duckworth, E. A Guide to Operation Research (Methuen 1965)
Eilon, S. et al. Exercises in Industrial Management (Macmillan 1966)
McKenny, J. L. & Rosenbloom, R. S. Cases in Operations Management (Macmillan 1966)
Schnelle, K. E. Case Analysis and Business Problem Solving (McGraw-Hill 1967)

544103 ME491 Technical Seminar

Hours
42

Examination
Progressive assessment
544203  ME496 Project/Seminar

Hours  126
Examination  Progressive assessment

543602  NA311 Ship Design and Construction

Prerequisites  NA201, NA221, NA241
Hours  42
Examination  One 3-hour paper

Content
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.

Texts
Harrington, R. L. (ed.)  *Marine Engineering* (Soc. of Naval Architects)
Rules and Regulations for the Construction and Classification of Steel Ships (Lloyds Register of Shipping)

References
Muckle, W.  *Strength of Ships' Structures* (Edward Arnold)
Principles of Naval Architecture (Soc. of Naval Architects & Marine Engineers)

543603  NA342 Applied Naval Architecture

Prerequisites  ME251, NA201, NA221, NA241
Hours  84
Examination  Progressive assessment

Content
Design and drawing practice relating to ship design and construction and resistance and propulsion of ships.

Texts  Nil

Reference  Principles of Naval Architecture (The Society of Naval Architects & Marine Engineers)

543601  NA351 Resistance and Propulsion of Ships

Prerequisites  ME251, NA201, NA221, NA241
Hours  42
Examination  One 3-hour paper

Content

References
Robb, A. M.  *Theory of Naval Architecture* (Griffin)
Taylor, D. W.  *The Speed and Power of Ships* (U.S. Maritime Administration)

544602  NA402 Special Purpose Ships

Prerequisites  NA311, NA351
Hours  42
Examination  One 3-hour paper

Content
Ships for special cargoes, dredges, tugs, submersibles, offshore structures, supply tenders etc. Design criteria.

Text

544604  NA431 Ship's Machinery

Prerequisites  NA311, NA351
Hours  42
Examination  One 3-hour paper

Content
Propulsion machinery, auxiliary machinery, deck machinery, rigging, navigational aids.
Text
Harrington, R. L. (ed.) *Marine Engineering* (Soc. of Naval Architects)

544601 \textbf{NA452 Theoretical Naval Architecture}

<table>
<thead>
<tr>
<th>Prerequisites</th>
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<tbody>
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<td>42</td>
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<tr>
<td>Examination</td>
<td>One 3-hour paper</td>
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</table>

\textbf{Content}
Wave theory, ships dynamics, stabilisers. Sea-going qualities, dynamic positioning.

\textbf{Texts}
Nil

\textbf{References}
Robb, A. M.
- *Theory of Naval Architecture* (Griffin)
- *Principles of Naval Architecture* (Soc. of Naval Architects & Marine Engineers)

544801 \textbf{NA481 Shipyard Production and Management}

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Nil</th>
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<td>Hours</td>
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<td>Examination</td>
<td>One 3-hour paper</td>
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\textbf{Content}
Pre-fabrication techniques, standardisation, yard lay-out, production planning, contract law, launching arrangements.

544504 \textbf{NA496 Project/Seminar}

<table>
<thead>
<tr>
<th>Hours</th>
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<td>Progressive assessment</td>
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\textbf{ME092 to ME096 Industrial Experience Units}

\textbf{Examination}
Progressive assessment

\textbf{Content}
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 ME092-096 in lieu of elective units will be required to attend nominated 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 report detailing 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 18, or vice-versa.
DEPARTMENT OF METALLURGY

Two degrees at Bachelor level in Metallurgy are available in the Faculty of Engineering.

The B.Sc. (Met.) is a three year course for candidates with an approved level of industrial experience. This industrial experience may be attained concurrently with the course which then usually takes six years.

The B.Met. is a four year course which may be awarded with honours. Candidates for the B.Met. degree are required to complete a minimum of four months approved industrial experience before completion of their course. Various combinations of full and part-time study are available for both these degree courses. Details may be obtained from the Student Advisor.

Facilities exist for studies and/or research leading to the degrees of M.Eng.Sc., M.Sc., M.E. and Ph.D.

SCHEDULE 2.1

BACHELOR OF METALLURGY

AND

BACHELOR OF SCIENCE (METALLURGY)

<table>
<thead>
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<th>Units</th>
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<td><strong>Mathematics I</strong></td>
<td>1</td>
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<tr>
<td><strong>Physics I</strong></td>
<td>2</td>
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<tr>
<td><strong>ME121 Workshop Practice</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>ChE101 Industrial Process Principles</strong></td>
<td>1</td>
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<tr>
<td><strong>Met141 Mechanical Properties of Materials</strong></td>
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<tr>
<td><strong>Met151 Microstructure of Materials</strong></td>
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<td><strong>Met181 Atomic Structure of Materials</strong></td>
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<td><strong>Met182 Electronic Structure of Materials</strong></td>
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<td><strong>Met121 Chemical Metallurgy</strong></td>
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<td><strong>Met122 Dynamics</strong></td>
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<td><strong>ME111 Graphics</strong></td>
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<tr>
<td><strong>ME112 Engineering Drawing &amp; Elementary Design</strong></td>
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Year I

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<td><strong>ChE101 Industrial Process Principles</strong></td>
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<td><strong>Met141 Mechanical Properties of Materials</strong></td>
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<td><strong>Met122 Dynamics</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>ME111 Graphics</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>ME112 Engineering Drawing &amp; Elementary Design</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

Year II

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ME211 Metallurgical Computations</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Met221 Metallurgical Thermodynamics</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met232 Metallurgical Stoichiometry</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met233 Applied Statistics</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met234 Rate Processes</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met252 Metallography</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met261 Microplasticity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met241 Extraction Metallurgy</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Met271 Fabrication Metallurgy</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Elective I</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Elective II</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

To qualify for admission to the Bachelor of Science (Metallurgy) the candidate must satisfy the requirements for the first three years of the course and the industrial experience requirements prescribed by the Faculty Board (see page 30).

B.Met.

To qualify for admission to the Bachelor of Metallurgy the candidate must satisfy all the requirements of Schedule 2.1 and the industrial experience requirements prescribed by the Faculty Board.

* First half year
** Second half year
1 See Elective Requirements—Appendix A.
2 See description of subjects on page 183.

List of Met300 Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met311 Applied Statistics</td>
<td>1</td>
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<tr>
<td>Met312 Optimisation &amp; Control</td>
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</tr>
<tr>
<td>Met321 Metallurgical Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td>Met322 Electrochemistry &amp; Corrosion</td>
<td>1</td>
</tr>
<tr>
<td>Met331 Transport Processes in Metallurgical Systems</td>
<td>1</td>
</tr>
<tr>
<td>Met332 Fluid Mechanics of Metallurgical Processes</td>
<td>1</td>
</tr>
<tr>
<td>Met341 Fracture &amp; Failure Analysis</td>
<td>1</td>
</tr>
<tr>
<td>Met351 Metallography</td>
<td>1</td>
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<tr>
<td>Met352 Physical Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met333 Solidification Processes</td>
<td>1</td>
</tr>
<tr>
<td>Met334 X-ray &amp; Electron Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met362 Hydro- Electro-Extraction Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met363 Metallurgical Reactor Analysis</td>
<td>1</td>
</tr>
<tr>
<td>Met364 Refractories</td>
<td>1</td>
</tr>
<tr>
<td>Met371 Materials Selection</td>
<td>1</td>
</tr>
<tr>
<td>Met372 Fabrication Processes</td>
<td>1</td>
</tr>
</tbody>
</table>
The details of the combined course in Mathematics and Metallurgy follow simply from the requirements for each degree. The combined degree should contain Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA, Mathematics IIIIB or a Part III subject from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics, and all the subjects satisfying the Requirements for the degree of Bachelor of Metallurgy, except that

(a) Mathematics I shall be replaced by Chemistry I or Geology I or any other subject approved by the Deans;

(b) Metallurgical Computations shall be replaced by Mathematics II B, which may be taken in two parts, each of three terms duration;

(c) No Mathematics subjects may be taken as electives.

The course could be pursued in the following manner:

**Year I**
- Mathematics I, Physics IA, ME121, ChE101, Met141, Met151, Met181, Met182, Met121 and two of ME131, ME111 & ME112

**Year II**
- Mathematics IIA, Mathematics IIB Part II, Met221, Met212, Met213, Met231, Met252, Met241, Met261, Met271 and one of Chemistry I, Geology I or any other subject approved by the Deans

**Year III**
- Mathematics IIC, Mathematics IIB Part III, Met301, Met361, ChE331, six of Met300 subjects, Elective I and two units of Elective II

**Year IV**
- Mathematics IIIA and either Mathematics IIIIB, or a Schedule B Part III subject from the Requirements for the degree of Bachelor of Mathematics and four units of Elective II

**Year V**
- Met401, Met402 and two units of Elective II

1 Mathematics IIA — Topics A, C, D, E
2 Mathematics IIB Part I — Topics F, G
3 Mathematics IIB Part II — Topics B, J
4 Mathematics IIC — Topics H, I, K, L

2 No Mathematics subject may be taken as an elective.

**ELECTIVE I**

The four elective units in the second year programme must be chosen from:
- Physics II (4)
- Maths II Topics (1 each)
- Electronics & Instrumentation (4)

**ELECTIVE II**

The six elective units in the third year programme may be selected from:

(a) Any third or fourth year subjects offered by other Engineering Departments or the Faculty of Mathematics or the Faculty of Science subject to the approval of Head of Department.

(b) Up to two units selected from the list of second year electives not already taken.

(c) Any other appropriate subject approved by the Head of Department.

**DESCRIPTION OF SUBJECT ENTRIES**

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>General</td>
</tr>
<tr>
<td>Computations</td>
<td>Computations</td>
</tr>
<tr>
<td>Physical Chemistry</td>
<td>Physical Chemistry</td>
</tr>
<tr>
<td>Transport</td>
<td>Mechanical</td>
</tr>
<tr>
<td>Extraction</td>
<td>Fabrication &amp; Materials</td>
</tr>
<tr>
<td>Structure &amp; Metal Physics</td>
<td>Laboratory</td>
</tr>
</tbody>
</table>

**E1122 Met121 Chemical Metallurgy**

1 unit

**Prerequisites**

Nil

**Hours**

About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination

Content
Introduction to chemical thermodynamics and the rates of homogeneous and heterogeneous chemical reactions.
Extension to electrochemical and photochemical reactions, thermodynamics and kinetics of chemical change illustrated by reference to the environmental degradation of materials. Wet and dry corrosion of metals. Chemical attack on refractories, ceramics and cement. Photochemical breakdown of polymers, Stress corrosion of metals and plastics. Internal chemical breakdown of materials.

Texts
Chitto, J. P. Principles of Metallic Corrosion (Chem. Soc.)
Guggenheim, E. A. Elements of Chemical Thermodynamics (Chem. Soc.)
Ives, D. J. G. Principles of Extraction of Metals (Chem. Soc.)

Reference
Guy, A. G. Introduction to Materials Science

111141 Met141 Mechanical Properties of Materials 1 unit

Prerequisites Nil

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination One 1½ hour paper

Content

Macroplasticity. The tension test, engineering stress and strain, true stress and strain, theories of strength, complex stresses, yielding, flow and fracture, effect of metallurgical variables. Visco-elastic behaviour of materials, classical models. Heating a cold worked metal, recrystallization, hot working.

Microplasticity. Slip in single crystals, work hardening, multiple slip, deformation bands in polycrystals. Theoretical strength anomaly and dislocations, edge and screw types, their interaction, multiplication and pile ups.


Text

References
Dieter, G. Mechanical Metallurgy (McGraw-Hill)
Polakowski, N. H. & Ripling, E. Strength and Structure of Engineering Materials (Prentice-Hall)
Wyatt, O. H. & Dew-Hughes, D. Metals, Ceramics and Polymers (Cambridge U.P.)

111151 Met151 Microstructure of Materials 1 unit

Prerequisites Nil

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination One 1½ hour paper

Content
The generation of microstructure and its relationship with material properties. States of matter, bonding in solids, crystal structure, phases, surfaces, grain boundaries and interfaces, atom movement. Phase rules and microstructures in binary systems for equilibrium conditions and for near equilibrium transformations including: isomorphous, eutectic, peritectic and eutectoid types, the lever rule. Microstructures of ceramics and polymers. Technically important systems including iron-carbon, copper-zinc, aluminium-silicon, aluminium-copper. Modification of eutectics, normalizing and annealing. Non-equilibrium microstructures, quenching, martensite and bainite. TTT diagrams, age hardening and tempering.

Text

References
Rhines, F. N. Phase Diagrams in Metallurgy (McGraw-Hill)
Rollason, E. C. metallurgy for Engineers (Arnold)
Van Viack, L. H. Elements of Materials Science (Addison Wesley)
Wyatt, O. H. & Dew-Hughes, D. Metals, Ceramics and Polymers (Cambridge U.P.)

111181 Met181 Atomic Structure of Materials 1 unit

Prerequisites Nil

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Text
Examination
One 1½ hour paper

Content

Text

References
Cracknell, A. P. Crystals and their Structure (Pergamon)
Van Vlack, L. H. Elements of Materials Science (Addison Wesley)

111182 Met182 Electronic Structure of Materials 1 unit

Prerequisites
Nil

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content

Text

References
To be advised

112212 Met212 Metallurgical Stoichiometry 1 unit

Prerequisites
Nil

Hours
About 21 lecture hours and 21 tutorial hours

Examination
One 1½ hour paper

Content

Text
References
To be advised

112213 Met213 Applied Statistics 1 unit

Prerequisites
Nil

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content

Text
References
As for ME582D
To be advised

112221 Met221 Metallurgical Thermodynamics 1 unit

Prerequisite
Met121

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Text
Oates, W. A.  
*Introduction to Chemical Thermodynamics for Metallurgy Students*

Reference
Gaskell, D.  
*Introduction to Metallurgical Thermodynamics*

112231 Met231 Rate Processes  1 unit

Prerequisite
Met121

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content

Text
To be advised

References
Burke, J.  
*Kinetics of Phase Transformations*
Welty, J. R. et al.  
*Fundamentals of Momentum, Heat and Mass Transfer* (Wiley)

112241 Met241 Microplasticity  1 unit

Prerequisites
Met141, Met151, Met181

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Metallography of the plastic deformation of single crystals, slip, twinning and clearage, stress strain curves of metal crystals. Dislocation theory, cross slip, climb, dissociation into partials, sessile dislocations, jogs. Theories of work hardening, deformation bands, kink bands, dislocation interactions with solutes and particles. Deformation and annealing of polycrystalline metals.

Text
Honeycombe, R. W. K.  
*The Plastic Deformation of Metals* (Arnold)

References
Hall, E. O.  
*Yield point phenomena* (Macmillan)
Tegart, W. J. McG.  
*Elements of Mechanical Metallurgy* (Macmillan)

112252 Met252 Metallography  1 unit

Prerequisites
Met121, Met151, Met181

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content

Texts
Reed-Hill, R.  
*Physical Metallurgy Principles* (Van Nostrand)
Azaroff, L. V.  
*Elements of X-rays Crystallography* (McGraw-Hill)
Cullity, B. D.  
*Elements of X-ray Diffraction* (Addison Wesley)

References
Cottrell, A. H.  
*Theoretical Structural Metallurgy* (Arnold)
Gifkins, R. C.  
*Optical Microscopy of Metals* (Pitman)
de Hoff, R. T.  
*Quantitative Microscopy* (McGraw-Hill)
Kehl, G. H.  
*Metallographic Laboratory Practice* (McGraw-Hill)
Samuels, L. H.  
*Metallographic Polishing by Mechanical Methods* (Pitman)
Taylor, A.  
*X-ray Metallography* (Wiley)

112261 Met261 Extraction Metallurgy  1 unit

Prerequisites
Nil

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination
One 1½ hour paper

Content

Text
Rosenqvist, T. *Principles of Extraction Metallurgy* (McGraw-Hill)

References
Gilchrist, J. D. *Extraction Metallurgy* (Pergamon)
Pehlke, R. D. *Unit Processes in Extraction Metallurgy* (Elsevier)

112271 Met271 Fabrication Metallurgy

Prerequisites
Met141, Met151, Met181

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
An introduction to and a study of the common metal-working techniques. Rolling, forging, deep drawing, wire and tube drawing, casting, extrusion and powder metallurgy.

Text
Dieter, G. E. *Mechanical Metallurgy* (McGraw-Hill)

Reference
Flinn, R. A. *Fundamentals of Metal Casting* (Addison Wesley)

113301 Met301 Communication Skills

Prerequisites
Nil

Hours
About 21 lecture hours and a student seminar

Examination
Progressive assessment

Content
Preparation of written and oral reports.

Text

References
Mitchell, J. H. *A first course in technical writing* (Chapman & Hall)
Swanson, R. *For your information* (Prentice-Hall)

113311 Met311 Applied Statistics

Prerequisite
Met213

Hours
About 21 lecture hours and 21 tutorial hours

Examination
One 1½ hour paper

Content

Text
To be advised

Reference
<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>113321</td>
<td>Met321 Metallurgical Thermodynamics</td>
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<tr>
<td></td>
<td><strong>Hours</strong></td>
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<td><strong>Examination</strong></td>
<td>One 1½ hour paper</td>
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<td><strong>Text</strong></td>
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<td><strong>Reference</strong></td>
<td>Problems in Applied Thermodynamics (Longmans)</td>
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<td>Met322 Electrochemistry and Corrosion</td>
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<td></td>
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<td></td>
<td><strong>Examination</strong></td>
<td>One 1½ hour paper</td>
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<td><strong>Text</strong></td>
<td>To be advised</td>
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<tr>
<td></td>
<td><strong>References</strong></td>
<td>Elementary Electrochemistry (Butterworth)</td>
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<td>Corrosion Engineering (McGraw-Hill)</td>
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<td></td>
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<td>Electrochemistry: Principles and Applications (Clever-Hume)</td>
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<td>Corrosion and Corrosion Control (Wiley)</td>
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<td>Electrodeposition and Corrosion Processes (Van Nostrand)</td>
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<td>113331</td>
<td>Met331 Transport Processes in Metallurgical Systems</td>
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<td></td>
<td><strong>Prerequisites</strong></td>
<td>Nil</td>
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<tr>
<td></td>
<td><strong>Hours</strong></td>
<td>About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes</td>
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<td></td>
<td><strong>Examination</strong></td>
<td>One 1½ hour paper</td>
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<tr>
<td></td>
<td><strong>Content</strong></td>
<td>Viscosity and viscous flow with liquid metals and slags. Heat transfer with phase change. Mass transfer in heterogeneous metallurgical systems. Simultaneous transfer processes, coupled transport phenomena. Single particle reaction systems.</td>
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<tr>
<td></td>
<td><strong>Text</strong></td>
<td>To be advised</td>
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<td><strong>References</strong></td>
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<td>113332</td>
<td>Met332 Fluid Mechanics of Metallurgical Processes</td>
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<td>Nil</td>
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<td></td>
<td><strong>Text</strong></td>
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<td><strong>References</strong></td>
<td>To be advised</td>
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<tr>
<td>113341</td>
<td>Met341 Fracture and Failure Analysis</td>
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<td></td>
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<td>Met241</td>
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<tr>
<td></td>
<td><strong>Hours</strong></td>
<td>About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes</td>
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<td><strong>Examination</strong></td>
<td>One 1½ hour paper</td>
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<tr>
<td></td>
<td><strong>Content</strong></td>
<td>The unique features of various modes of failure are described and explained from a metallurgical and metallographic view point.</td>
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<tr>
<td></td>
<td><strong>Text</strong></td>
<td>To be advised</td>
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<td></td>
<td><strong>References</strong></td>
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</tbody>
</table>
The stress-strain situation at a stationary crack tip is explored and the Griffith's criterion developed.

**Text**
Nil

**Reference**
I.S.I. Publication No. 121 (1969)

113351 Met351 Metallography

**Prerequisite**
Met252

**Hours**
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**
One 1½ hour paper

**Content**
A practically oriented course of modern metallographic methods. Theory of operation, application and quantitative treatment of data from modern metallographic equipment. Transmission electron microscopy; scanning electron microscopy, field ion microscopy, quantimetry, classimat. Element and compound identification and analysis from X-ray spectroscopy, microprobe analysis and X-ray diffraction methods. Particle size and texture analysis.

**Texts**
Smallman, R. E. & Ashbee, K. H. G.
Azaroff, L. V.
or
Cullity, B. D.

**References**
Andrews, K. W.
Belk, J. A. & Davies, A. L.
Brandon, D. G.
Taylor, A.
Thomas, G.

113352 Met352 Physical Metallurgy

**Prerequisites**
Met241, Met252

**Hours**
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**
One 1½ hour paper

**Content**
Physical metallurgy of alloy steels, effect of alloying elements, hardenability of alloy steels. Tempering and temper brittleness.

Further topics in dislocation theory, yield point phenomena, fracture, age hardening, creep.

**Texts**
Bain, E. C. & Paxton, H. W.
Honeycombe, R. W. K.

**References**
Cottrell, A. H.
Smallman, R. E.
Wyatt, O. H. & Dew-Hughes, D.

113353 Met353 Solidification Processes

**Prerequisites**
Met151, Met181

**Hours**
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**
One 1½ hour paper

**Content**
The structure of liquid metals and the solid-liquid interface.


Effect of cast structures and inclusions on mechanical properties.

**Text**
Flemings, M. C.

**Modern Metallography**

**Elements of X-ray crystallography**
(McGraw-Hill)

**Elements of X-ray diffraction**
(Addison Wesley)

**Physical metallurgy. Techniques and application**
(Allen & Unwin)

**Electron microscopy and microanalysis of metals**
(Elsener)

**Modern techniques in metallography**
(Butterworths)

**X-ray metallography**
(Wiley)

**Transmission electron microscopy of metals**
(Wiley)
References
Chadwick, G. A. Metallography of Phase Transformations (Butterworths)
Davies, G. J. Solidification and Casting (Halsted Press)

113354 Met354 X-ray and Electron Metallography 1 unit

Prerequisites Met241, Met252
Hours About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination One 1½ hour paper

Content

Texts
Azaroff, L. V. Elements of X-ray crystallography (McGraw-Hill)
Thomas, G. Transmission electron microscopy in metals (Wiley)
Thomas, G. & Washburn, J. eds.) Electron microscopy and the strength of crystals (Interscience)

113365 Met361 Extraction Metallurgy

Prerequisite Met261
Hours About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination One 1½ hour paper

Content
Review of current technology in the metallurgy of ferrous and non-ferrous processes.

Text To be advised

References
Jones, M. J. (ed.) Copper Metallurgy (I.M.M.)
Pehlke, R. D. (ed.) B.O.F. Steelmaking (A.I.M.E.)

113362 Met362 Hydro- and Electro- Extraction Metallurgy 1 unit

Prerequisite Met261
Hours About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination One 1½ hour paper

Content
Review of current technology in the hydro- and electro- metallurgy of ferrous and non-ferrous processes.

Text To be advised

References
To be advised

113363 Met363 Metallurgical Reactor Analysis 1 unit

Prerequisite Met261
Hours About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination One 1½ hour paper

Content
Mixing theory applied to batch and semi-continuous pyrometallurgical reactors.
Models of continuous steelmaking processes.
Computer simulation of pyrometallurgical processes.
Analysis of experimental residence time data.

Texts
References
To be advised

113364 Met364 Refractories 1 unit

Prerequisite Met231
Hours About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Content
Techniques for the investigation and testing of refractories. Phase equilibria and rates of reaction in complex oxide systems. The clay-water system and alumino-silicate refractories. The structure, properties and industrial applications of silica, magnesite, dolomite, chrome, alumina and carbon refractories. Special refractories, including insulating materials.

Text
Nil

References
Chesters, J. H.  
Grimshaw, R. W.  

Refractories: Production and Properties  
Refractories in Iron & Steelmaking  
(Iron and Steel Inst.)  
The Chemistry and Physics of Clays (Benn)

113371 Met371 Materials Selection  

1 unit

Prerequisites
Met241, Met252

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Discussion of the important properties of common commercial metals and polymers and the relation of these to their structures and microstructures. The application of criteria to aid in the selection of the correct material for a specific application.

Text
Rollason, E. C.  
Metallurgy for Engineers (Arnold)

Reference
A.S.M.  
Metals Handbook Vol. 1, 8th edn

113372 Met372 Fabrication Processes  

1 unit

Prerequisite
Met271

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Detailed examination of selected metal working processes from a fundamental and from a practical viewpoint.

Text
To be advised

References

113373 Met373 Polymer Technology  

1 unit

Prerequisites
Met141, Met151

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
A description and analysis of the techniques for the production and forming of commercially important polymers.

Text
Seymour, R. B.  
Modern Plastics Technology (Prentice-Hall)

Reference

113374 Met374 Welding and Non Destructive Testing  

1 unit

Prerequisites
Met141 & Met151 or Engineering I

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
The basic principles and the techniques are introduced for the modern joining methods of: fusion welding brazing and soldering. The metallurgical changes which accompany these joining processes are discussed. However the main emphasis is on the arc welding of steels. Non destructive testing techniques and their applications are introduced.

Text
Lancaster, J. F.  
The metallurgy of welding, brazing and soldering (Elsevier)

References
Jackson, M. D.  
Welding methods and metallurgy (Griffin)
Kennedy, G. A.  
Welding Technology (Sams)
A.S.M.  
Metals Handbook Vol. 6, 8th edn
113381 Met381 Metal Physics 1 unit

**Prerequisite**
Met182

**Hours**
About 21 elective hours and 21 hours of tutorial, demonstration and practical classes

**Examination**
1½ hour paper

**Content**
The topic will be introduced by consideration of the Brillouin zone theory and the reciprocal space representation of lattice and electron waves. The course will be completed by considering such topics as: Stability of metallic phases, electrical properties of materials. Magnetism. Magnetic properties of materials. Semiconductors.

**Text**
To be advised

**References**
Altmann, S. L. *Bland theory of metals* (Pergamon)
Elliott, R. J. & Gibson, A. E. *An introduction to Solid State Physics and its Applications* (Macmillan)
Kittel, C. *Introduction to Solid State Physics* (Wiley)

113391 Met391 Physical Metallurgy Laboratory 4 units

**Prerequisites**
Nil

**Hours**
3 hours per week

**Examination**
Progressive assessment

**Content**
The practices of optical, X-ray and electron metallography and the mechanical and physical testing of metal components.

**Texts**
To be advised

**References**

113392 Met392 Chemical Metallurgy Laboratory 2 units

**Prerequisites**
Nil

**Hours**
3 hours per week

**Examination**
Progressive assessment

**Content**
Experimental work in chemical and electrochemical equilibria and kinetics. Transport processes. Pyrometallurgical and hydrometallurgical experiments.

114402 Met402 Metallurgy III

Will consist of eight units selected from the following list. The subjects will be offered subject to sufficient enrolment and staff availability and not all subjects will be offered in any one year.

**Subject**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Met403 Metallurgy Project/Directed Reading</td>
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<tr>
<td>Met404 Metallurgy Seminar</td>
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<td>Met411 Metallurgy Project/Computations</td>
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<td>Met421 Metallurgical Thermodynamics</td>
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<td>Met431 Heat Transfer</td>
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<tr>
<td>Met432 Fluid Mechanics</td>
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<tr>
<td>Met433 Metallurgical Rate Processes</td>
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<tr>
<td>Met441 Applications of Fracture Mechanics</td>
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<tr>
<td>Met451 Electron Metallograph</td>
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<tr>
<td>Met452 Physical Metallurgy</td>
<td>1</td>
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<tr>
<td>Met453 Metallograph</td>
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<tr>
<td>Met461 Extraction Metallurgy</td>
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<tr>
<td>Met462 Reactor Analysis</td>
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<tr>
<td>Met471 Materials Selection</td>
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<tr>
<td>Met472 Welding &amp; Non-Destructive Testing</td>
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<tr>
<td>Met481 Dislocation Theory</td>
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<tr>
<td>Met482 Metal Physics</td>
<td>1</td>
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</tbody>
</table>

or any other subject approved by the Head of Department.

114403 Met403 Metallurgy Project/Directed Reading 1 unit

**Prerequisites**
Nil

**Hours**
About 42 hours

**Examination**
By written report and seminar

**Content**
Topics to be arranged.

**Text**
Nil

114404 Met4 Metallurgy Seminar 1 unit

**Prerequisites**
Nil

**Hours**
About 42 hours
### 114411 Met411 Metallurgy Project/Computations 1 unit

**Prerequisites**  
Nil

**Hours**  
About 42 hours

**Examination**  
By written report and seminar

**Content**  
Topics to be arranged.

**Text**  
Nil

**References**  

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### 114401 Met401 Metallurgy Project 5 units

**Prerequisites**  
Nil

**Hours**  
Will fully occupy 1 term.

**Examination**  
By written report and seminar

**Content**  
Topic to be arranged.

**Text**  
Nil

**References**  

---

### 114421 Met421 Metallurgical Thermodynamics 1 unit

**Prerequisite**  
Met321

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
One 1½ hour paper

**Content**  

**Text**  
To be advised

**References**  

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### 114431 Met431 Heat Transfer 1 unit

**Prerequisite**  
Met331

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
One 1½ hour paper

**Content**  
Heat transfer modelling in casting and solidification, welding, pyrometallurgical reaction systems, heat treatment and fabrication systems.

**Text**  
To be advised

**Reference**  
To be advised

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### 114432 Met432 Fluid Mechanics 1 unit

**Prerequisite**  
Met332

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
One 1½ hour paper

**Content**  
The solidifying interface with various morphologies. The impinging jet geometry in gas-liquid metal contacting in pyrometallurgy. Melting packed beds.

**Text**  
To be advised

**References**  

---

### 114433 Met433 Metallurgical Rate Processes 1 unit

**Prerequisite**  
Met231

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
One 1½ hour paper

**References**  

---
Content

Text
References

114442 Met441 Applications of Fracture Mechanics 1 unit
Prerequisite
Met341

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content

Text
Knott, J. F. Fundamentals of Fracture Mechanics (Butterworths)

References
To be advised

114451 Met451 Electron Metallography 1 unit
Prerequisites
Met351, Met352, Met354

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
The interaction of electrons with crystalline materials and the development of image contrast. Characterization of structural defects.

Texts
To be advised

References
Hawkes, P. W. Electron optics and electron microscopy (Taylor & Francis)
Heidenreich, R. D. Fundamentals of transmission electron microscopy (Wiley)

114452 Met452 Physical Metallurgy 1 unit
Prerequisites
Met351, Met352, Met353

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Topics on the relation between mechanical properties and microstructure. Strengthening mechanisms. Internal friction in metals.

Text
To be advised

References
Cahn, R. W. Physical Metallurgy (Elsevier)
Kelly, A. Strong Solids (Oxford U.P.)
Kelly, A. & Nicholson, K. B. Strengthening Mechanisms in Crystals (Elsevier)

114453 Met453 Metallography 1 unit
Prerequisites
Met351, Met352, Met353

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Metallography of phase transformations in metals. Recrystallization, grain boundaries and interfaces.

Text
To be advised
References
Christian, J. W.
A.S.M.

The Theory of Phase Transformations in Metals and Alloys (Pergamon)
Phase Transformations (Manchester Conference "The Mechanism of Phase Transformations in Crystalline Solids")

114461 Met461 Extraction Metallurgy 1 unit
Prerequisites
Met361, Met362
Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination
One 1½ hour paper
Content
Study in depth of selected topics in the current technology of extraction metallurgy from the field of: hydrometallurgy, pyrometallurgy and electrometallurgy.
Text
To be advised
References

114462 Met462 Reactor Analysis 1 unit
Prerequisite
Met363
Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination
One 1½ hour paper
Content
Modelling and analysis of processes in extraction pyro-, hydro- and electro-metallurgy. Reactor kinetics of industrial reactors.
Text
To be advised
References

114471 Met471 Materials Selection 1 unit
Prerequisite
Met371
Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination
One 1½ hour paper
Content
An examination of the important features and properties of the less common and more technically sophisticated materials, their applications and limitations.
Texts
To be advised
References
A.S.M.
Metals Handbook Vol. 1, 8th edn

114472 Met472 Welding and Non-destructive Testing 1 unit
Prerequisite
Met374
Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination
One 1½ hour paper
Content
The course covers the important details of welding power supplies, advanced techniques and controls, Welding of special metals and alloys, Hard facing and metal cutting processes. Fundamental principles of modern non-destructive testing. Detailed examination of each process.
Text
To be advised
References
A.S.M.
Metals Handbook Vol. 6, 8th edn
Kennedy, G. A.
Welding Technology (Sams)

114481 Met481 Dislocation Theory 1 unit
Prerequisites
Met352, Met241
Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes
Examination
One 1½ hour paper
Content
Advanced topics on the structure, interactions and movement of dislocations. Applications to plastic deformation, fracture, transformations and strengthening.
Texts
To be advised
References
Friedel, J.
Nabarro, F. R. N.
Hirth, J. P. & Lothe, J.

Dislocations (Gautier-Villars)
Dislocations (Oxford U.P.)
Theory of dislocations (McGraw-Hill)

114482 Met482 Metal Physics
1 unit

Prerequisites
Met381, Met354

Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

Examination
One 1½ hour paper

Content
Topics will be chosen from a list including such items as: Neutron diffraction methods, diffraction theory, lattice vibrations, nuclear reactor materials, magnetic and electrical materials, superconductors, etc.

Text
To be advised

Reference
Kittel, C.
Introduction to Solid State Physics (Wiley)

INTERDEPARTMENTAL SUBJECTS

523202 GE350 Seminar

Prerequisites
Nil

Hours
42

Examination
Progressive assessment

Content
A series of seminars and discussions on topics chosen by students within a general theme which will vary from year to year. The purpose of the course is to explore some of the problems in modern society and the role technology plays in it. At the same time, students obtain some training in the skills of formal communication.

Texts
Nil

References
Nil

504101 GE471 Energy*

Prerequisites
Physics IA or IB, Maths IIB

Hours
3 hours per week

Examinations
Progressive assessment

Content

Texts
To be advised

504102 GE472 Energy**

Prerequisites
Physics IA or IB, Maths IIB

Hours
3 hours per week

Examinations
Progressive assessment

Content
Energy conversion technology:—
Conversion efficiencies and technical and economic constraints. Current technology—steam plants, combustion engines and turbines, nuclear reactors, hydro-electric plants etc. Possible future technology—solar power, m h d, fusion, fuel cells, the hydrogen economy, total energy etc. Energy management:—
Planning of systems, increase in efficiency of usage, choice of energy sources and energy conservation.

Texts
To be advised

*First half year
**Second half year

523203 GE501G Air Pollution Studies I

Hours
42
The approved subjects for the Diploma are arranged in three Groups and are listed in the schedule that follows. The Group I subjects are those required for a basic understanding of the principles of Industrial Engineering while the Groups II and III subjects permit a wider selection for those students already trained in the basic principles. The programme selected in every case is subject to the approval of the Faculty Board on the recommendation of the Head of the Department.

The general requirements concerning the conditions of award of the Diploma in Industrial Engineering are set out on the following pages.

**REQUIREMENTS FOR THE 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. In exceptional circumstances applications will be accepted after that date.

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

   (b) Under no circumstances will a subject qualify for the Diploma for more than ten years from the year in which it is passed.

6. An applicant for registration as a candidate for the Diploma may be granted standing on conditions to be determined by the Faculty Board.
7. The Faculty Board shall approve a programme of studies for each candidate. This programme may be varied only with the approval of the Dean.

8. 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.

9. To qualify for a Diploma a candidate shall, in not less than two years of part-time study, or in special cases approved by the Faculty Board, one year full-time study, complete satisfactorily a course of studies comprising twelve units composed as follows:
   Formal Course Work 10 units
   (a) Subjects to be selected from schedule of approved subjects in accordance with the requirements of subsections (b) and (c) of this Clause.
   ME684D Project 2 units
   12 units
   (b) The approved subjects have been arranged in three Groups. Group I contains subjects required for basic understanding of the principles of Industrial Engineering while Groups II and III contain a wider selection of subjects for those already trained in the subject areas of Group I. The selection of subjects shall normally be made from those in Group I of the Schedule, unless in order to satisfy the conditions of subsection (c) of this Clause or where a broader training is deemed to be desirable, the Faculty Board on the recommendation of the Head of Department, has prescribed a course of study including subjects from Groups II and III. In any event not more than three units may be selected from Group III.
   (c) Notwithstanding the requirements of parts (a) and (b) and except where standing is approved by the Board, no subject shall be included such that in the opinion of the Board, the subject concerned substantially overlaps in content that of a similar subject completed or work presented and for which credit has been given in the award of another degree or diploma.

10. All subjects listed in the Schedule may not necessarily be offered in any one year.

11. 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.

SCHEDULE OF SUBJECTS

<table>
<thead>
<tr>
<th>Group I</th>
<th>Units</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>ME381 Methods Engineering</td>
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<td>ME382 Production Engineering</td>
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<td>ME385 Accounting &amp; Financial Studies</td>
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<td>ME401 Systems Analysis</td>
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<td>ME481 Engineering Administration</td>
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<td>ME482 Engineering Economics</td>
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<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>ME582D Industrial Computations</td>
<td>1</td>
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<tr>
<td>ME681D Industrial Law</td>
<td>2</td>
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<td>Group II</td>
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<tr>
<td>ME402 Systems Planning, Organisation &amp; Control</td>
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<td>ME401</td>
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<td>ME404 Mathematical Programming</td>
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<td>ME407 Environmental Engineering</td>
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<tr>
<td>ME419 Design of Conveyors &amp; Materials Handling Equipment</td>
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<td>ME444 Properties of Materials</td>
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<tr>
<td>ME449 Reliability Analysis for Mechanical Systems</td>
<td>1</td>
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<tr>
<td>ME489 Operations Research—Applications in Industry</td>
<td>1</td>
<td>ME487, ME488</td>
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<tr>
<td>ME685D Industrial Process Control</td>
<td>1</td>
<td>ME401, or equivalent</td>
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<tr>
<td>ME686D Industrial Psychology</td>
<td>1</td>
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<tr>
<td>ME503G Design of Experiments for Engineering Research</td>
<td>2</td>
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<tr>
<td>ME505G Systems Analysis &amp; Design</td>
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<tr>
<td>ME507G Resources Planning &amp; Allocation</td>
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<tr>
<td>ME517G Materials Handling &amp; Transportation Systems</td>
<td>2</td>
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<tr>
<td>ME535G Vibration &amp; Noise Problems in Industry</td>
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<tr>
<td>ME583G Modelling of Management Problems</td>
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<tr>
<td>ME584G Simulation</td>
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</tbody>
</table>
Group III

Subjects approved by the Faculty Board for an individual course but not included in Group I or Group II.

The number of units to be assigned to these subjects will be determined by the Board.

1 Except where indicated the prerequisites will be those indicated in the Faculty of Engineering Handbook.

CONDITIONS FOR GRANTING OF STANDING

1. Standing in a subject in the Diploma in Industrial Engineering shall require the approval of the Faculty Board on the recommendation of the Dean of the Faculty of Engineering.

2. A candidate will not be eligible for standing in any subject for which credit has been given for the award of another degree or diploma except as otherwise provided for in succeeding clauses.

3. A candidate from the Master of Engineering Science course of the University of Newcastle who desires to transfer to the Diploma course in Industrial Engineering may be granted standing in those subjects of the Diploma deemed to be equivalent to any of the subjects already completed in the Master's programme.

4. 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 postgraduate course work degree or diploma subjects completed in such university or institution provided that the subjects are equivalent to any of those listed in Groups I and II of the Schedule.

5. Where a candidate has completed the first part-time year of the Diploma course he may be granted standing by the Faculty Board in respect of another subject subsequently passed at another university or approved tertiary institution under the following conditions:

   (a) the subject for which standing is granted shall have a reasonable correspondence with a subject of the Diploma in Industrial Engineering; and

   (b) standing shall not be granted in more than three subject units.

Diploma Subject Entries

540152 ME582D Industrial Computations

Prerequisites Nil

Hours 42

Examination Progressive assessment and examination

433240 ME681D Industrial Law

For subject entry see page 296.

540173 ME684D Project

Prerequisites Nil

Hours 84

Examination Progressive assessment

540174 ME685D Industrial Process Control

Prerequisites Nil

Hours To be advised

Examination To be advised

Content

Principles and techniques applicable to the analysis and design of control systems with particular application to industrial processes. Modelling of control systems. Time and frequency domain analysis of linear systems. Basic control actions. Detecting, measuring and correcting elements. Introduction to non-linear control. Introduction to system identification applied to industrial processes.

Texts Nil

References

Moroney, M. J.
Paradine, C. G. & Rivett, B.H.P.
Wadsworth, G. P. & Bryan, J. G.
Walpole, R. E.

Introductory Engineering Statistics (Wiley)

Facts from Figures (Pelican)

Statistical Methods for Technologists (English U.P.)

Probability and Random Variables (McGraw-Hill)

Introduction to Statistics (Macmillan)
The Doctor of Philosophy degree has the primary aim of producing a person 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.

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.

REQUIREMENTS FOR THE DEGREE OF MASTER OF ENGINEERING SCIENCE

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 the inclusion in the individual programme of advanced work from other faculties equivalent in total to not more than six units and senior undergraduate elective subjects offered within the Faculty of Engineering not exceeding two units provided that the total work allowed under this section shall not exceed six units.

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.

RECOMMENDED PROGRAMMES

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

<table>
<thead>
<tr>
<th>Department of Civil Engineering</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE515 Elastic Continua</td>
<td>1</td>
</tr>
<tr>
<td>CE516 Plastic Frame Design</td>
<td>1</td>
</tr>
<tr>
<td>CE517 Steel Beams, Columns &amp; Frames</td>
<td>1</td>
</tr>
<tr>
<td>CE555 Civil Engineering Systems II</td>
<td>1</td>
</tr>
<tr>
<td>CE617 Prestressed Concrete Design</td>
<td>2</td>
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<tr>
<td>CE626 Theoretical Aspects of Fracture Mechanics</td>
<td>1 or 2</td>
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<table>
<thead>
<tr>
<th>Department of Mechanical Engineering</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME503G Design of Experiments for Engineering Research</td>
<td>2</td>
</tr>
<tr>
<td>ME511G Experimental &amp; Theoretical Stress Analysis</td>
<td>2</td>
</tr>
<tr>
<td>ME515G Advanced Design Concepts in Mechanical Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ME517G Materials Handling &amp; Transportation Systems</td>
<td>2</td>
</tr>
<tr>
<td>ME535G Vibration &amp; Noise Problems in Industry</td>
<td>2</td>
</tr>
<tr>
<td>ME536G Advanced Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME546G Elasticity, Plasticity &amp; Applications</td>
<td>2</td>
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<tr>
<td>ME581G Mathematical Programming</td>
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<table>
<thead>
<tr>
<th>Department of Metallurgy</th>
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<tbody>
<tr>
<td>Met541 Fracture Mechanics</td>
<td>1</td>
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<tr>
<td>Met571 Materials Selection</td>
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B. Computer Science

<table>
<thead>
<tr>
<th>Department of Electrical Engineering</th>
<th>Units</th>
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<tbody>
<tr>
<td>EE516 Computer-Aided Analysis of Power Systems</td>
<td>1</td>
</tr>
<tr>
<td>EE549 Applied Information Theory</td>
<td>1</td>
</tr>
<tr>
<td>EE562 Advanced Topics in Switching Theory</td>
<td>1</td>
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<tr>
<td>EE563 Computer Operating Systems</td>
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<table>
<thead>
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<th>Department of Mechanical Engineering</th>
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<tbody>
<tr>
<td>EE564 Compilers, Assemblers &amp; Interpreters</td>
<td>1</td>
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<tr>
<td>EE565 Pattern Recognition</td>
<td>1</td>
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<tr>
<td>EE566 Automata &amp; Computing Machines</td>
<td>1</td>
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<tr>
<td>EE567 Computer Process Control</td>
<td>1</td>
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<tr>
<td>EE568 Advanced Computer Architecture</td>
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<tr>
<td>EE569 Formal Languages &amp; Automata</td>
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<table>
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<th>Department of Mathematics</th>
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<tr>
<td>Programming &amp; Algorithms</td>
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<tr>
<td>Data Structures &amp; Programming</td>
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<tr>
<td>Mathematics III, Topic Z</td>
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<table>
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<th>Department of Commerce</th>
<th>Units</th>
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<tr>
<td>Commercial Programming</td>
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C. Engineering Materials

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<tr>
<th>Department of Civil Engineering</th>
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<tbody>
<tr>
<td>CE526 Advanced Properties of Materials</td>
<td>1</td>
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<tr>
<td>CE527 Concrete Technology</td>
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<tr>
<td>CE528 Soil Mechanics</td>
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<tr>
<td>CE529 Foundation Engineering</td>
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<tr>
<td>CE574 Transportation Planning</td>
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<tr>
<td>CE674 Traffic Engineering</td>
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<table>
<thead>
<tr>
<th>Department of Mechanical Engineering</th>
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<tbody>
<tr>
<td>ME503G Design of Experiments for Engineering Research</td>
<td>2</td>
</tr>
<tr>
<td>ME511G Experimental &amp; Theoretical Stress Analysis</td>
<td>2</td>
</tr>
<tr>
<td>ME517G Materials Handling &amp; Transportation Systems</td>
<td>2</td>
</tr>
<tr>
<td>ME546G Elasticity, Plasticity &amp; Applications</td>
<td>2</td>
</tr>
<tr>
<td>ME581G Mathematical Programming</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Department of Metallurgy</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met541 Applications of Fracture Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>Met551 Electron Metallography</td>
<td>1</td>
</tr>
<tr>
<td>Met552 Physical Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met553 Metallography</td>
<td>1</td>
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<tr>
<td>Met571 Materials Selection</td>
<td>1</td>
</tr>
<tr>
<td>Met582 Metal Physics</td>
<td>1</td>
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</table>

Together with approved topics and subjects which may be
offered from the Faculty of Science.
D. Environmental Studies/Environmental Engineering  Units

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

Department of Civil Engineering
CE543 Water Quality Management 1
CE643 Water Pollution & Water Quality Management 1
CE644 Water & Wastewater Treatment 2
CE645J Microbiology of Water Resources 2
CE646 Public Health Science 1
CE647 Unit Operations in Public Health Engineering 1

Department of Mechanical Engineering
ME503G Design of Experiments for Engineering Research 2
ME505G Systems Analysis & Design 2
ME508G Air Pollution Studies II 1
ME535G Vibration & 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.

Interdepartmental Subjects
GE501G Air Pollution Studies I 1 or 2

E. Fluid Mechanics/Water Resources Engineering

Department of Civil Engineering
CE533 Theoretical Hydrodynamics 1
CE534 Open Channel Flow 1
CE535 River & Coastal Engineering I 1
CE543 Water Quality Management 1
CE634 Advanced Fluid Mechanics 1
CE635 River & Coastal Engineering II 1
CE636 Water Reticulation & Wastewater Collection 1
CE643 Water Pollution & Water Quality Management 1
CE644 Water & Wastewater Treatment 2
CE645J Microbiology of Water Resources 2
CE646 Public Health Science 1
CE647 Unit Operations in Public Health Engineering 1

F. Furnace Engineering

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 Communciation 1 or 2

Department of Electrical Engineering
EE542 Modern Control 1
EE546 Modern Control 1
EE641 Multivariable Control Systems 1
EE642 Stochastic Control 1

Department of Mechanical Engineering
ME503G Design of Experiments for Engineering Research 2
ME554 Fluid Mechanics 1
ME555 Advanced Turbo Machinery 2
ME581G Mathematical Programming 2

Department of Metallurgy
Met521 Metallurgical Thermodynamics 1
Met531 Heat Transfer 1
Met533 Metallurgical Rate Processes 1
Met571 Materials Selection 1

G. Operations Research/Management Science

Department of Chemical Engineering
ChE531 Process Optimization 2

Department of Civil Engineering
CE554 Civil Engineering Systems II 1
CE654 Construction Management 1

Department of Mechanical Engineering
ME502G Operations Research & Decision Theory 2
ME505G Systems Analysis & Design 2
ME581G Mathematical Programming 2
ME582G Probabilistic Models in Operations Research 2
ME583G Modelling of Management Problems 2
ME584G Simulation 1
ME685G Advanced Operations Research 1

Subjects offered by other Faculties

Department of Mathematics
Selected Topics in Mathematics IV.

Department of Commerce
Selected topics from 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE502</td>
<td>Reaction Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE513</td>
<td>Advanced Combustion</td>
<td>2</td>
</tr>
<tr>
<td>ChE514</td>
<td>Furnace Engineering</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE523</td>
<td>Particulate Separations</td>
<td>2</td>
</tr>
<tr>
<td>ChE531</td>
<td>Process Optimization</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE542</td>
<td>Comminution</td>
<td></td>
</tr>
<tr>
<td>ChE603</td>
<td>Advanced Problems in Mass Transfer &amp; Reaction Engineering</td>
<td>1 or 2</td>
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</table>

### Department of Chemical Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ME502G</td>
<td>Operations Research &amp; 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>ME546G</td>
<td>Elasticity, Plasticity &amp; Applications</td>
<td>2</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
<td>2</td>
</tr>
<tr>
<td>ME685G</td>
<td>Advanced Operations Research</td>
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</table>

### Department of Electrical Engineering

<table>
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<tbody>
<tr>
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<td>Modern Control</td>
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<tr>
<td>EE546</td>
<td>Modern Control</td>
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<tr>
<td>EE641</td>
<td>Multivariable Control Systems</td>
<td>1</td>
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<td>EE642</td>
<td>Stochastic Control</td>
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### Department of Mechanical Engineering

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ChE501</td>
<td>Chemical Process Principles for Effluent Control</td>
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<tr>
<td>ChE503</td>
<td>Computational Methods in Chemical Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE511</td>
<td>Advanced Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ChE512</td>
<td>Advanced Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ChE513</td>
<td>Advanced Combustion</td>
<td>2</td>
</tr>
<tr>
<td>ChE514</td>
<td>Furnace Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE515</td>
<td>Energy Management</td>
<td>2</td>
</tr>
<tr>
<td>ChE516</td>
<td>Reaction Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE521</td>
<td>Air Pollution Effluent Control****(P)</td>
<td>2</td>
</tr>
<tr>
<td>ChE522</td>
<td>Control of Industrial Liquid Effluents****(P)</td>
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### Tutorial Topics

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ChE523</td>
<td>Particulate Separations</td>
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<tr>
<td>ChE524</td>
<td>Comminution</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE611</td>
<td>Advanced Problems in Mass Transfer &amp; Reaction Engineering</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE612</td>
<td>Advanced Topics in Heat Transfer</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE621</td>
<td>Advanced Topics in Effluent Control</td>
<td>1 or 2</td>
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### Department of Mechanical Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ME404</td>
<td>Mathematical Programming</td>
<td>2</td>
</tr>
<tr>
<td>ME505G</td>
<td>Systems Analysis &amp; Design</td>
<td>2</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
<td>2</td>
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</table>

### Subjects offered by other Faculties

#### Department of Mathematics

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Stochastic Processes</td>
<td></td>
</tr>
<tr>
<td>Signal Detection</td>
<td></td>
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</table>

### 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.

### General Prerequisites

The general prerequisite for all subjects is graduate level in appropriate subjects. However, specific prerequisites are necessary for certain subjects and these are listed in the subject description where applicable.

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### DEPARTMENT OF CHEMICAL ENGINEERING

The following topics have been approved for inclusion in the M.Eng.Sc. course programmes. Those topics which will not be offered in 1977 are marked *1*. The other topics are offered subject to adequate enrolment. Units are equivalent to 42 hours contact time.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ChE501</td>
<td>Chemical Process Principles for Effluent Control*</td>
<td>1</td>
</tr>
<tr>
<td>ChE503</td>
<td>Computational Methods in Chemical Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE511</td>
<td>Advanced Heat Transfer</td>
<td>1</td>
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<tr>
<td>ChE512</td>
<td>Advanced Heat Transfer</td>
<td>1</td>
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<tr>
<td>ChE513</td>
<td>Advanced Combustion</td>
<td>2</td>
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<tr>
<td>ChE514</td>
<td>Furnace Engineering</td>
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<tr>
<td>ChE515</td>
<td>Energy Management</td>
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<tr>
<td>ChE516</td>
<td>Reaction Engineering</td>
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<tr>
<td>ChE521</td>
<td>Air Pollution Effluent Control****(P)</td>
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</tr>
<tr>
<td>ChE522</td>
<td>Control of Industrial Liquid Effluents****(P)</td>
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### Tutorial Topics

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<td>Particulate Separations</td>
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<td>ChE524</td>
<td>Comminution</td>
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<td>ChE621</td>
<td>Advanced Topics in Effluent Control</td>
<td>1 or 2</td>
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224 225
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

(P) Chemical Process Principles is recommended as a prerequisite to these courses for students who have not previously completed Chemical Engineering subjects.

SUBJECT ENTRIES

510128 ChE501 Chemical Process Principles for Effluent Control

Hours
Approx. 42 hours for course

Content
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.

Texts
Nil

References
Himmelblau, D. M. *Basic Principles and Calculations in Chemical Engineering* 2nd edn (Prentice-Hall 1967)
Levenspiel, O. *Chemical Reaction Engineering* 2nd edn (Wiley 1972)

510129 ChE503 Computational Methods in Chemical Engineering

Hours
Approx. 84 hours for course

Examination
To be advised

Content
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.

Texts
*Fortran IV Manual*

510117 ChE511 Advanced Heat Transfer
510118 ChE512 Advanced Heat Transfer

Hours
ChE512 — 42 hours ChE511 — 42 hours for course

Content
ChE511

ChE512
Studies in heat transfer in packed beds (e.g. blast furnaces, catalytic reactors) and in unsteady conditions.

Text
ChE511

510122 ChE513 Advanced Combustion

Hours
Approx. 84 hours for course

Content
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

References
510126 ChE514 Furnace Engineering

Prerequisites Advanced Heat Transfer desirable but not essential

Hours Approx. 84 hours for course

Content 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
- Thring, M. W. Science of Flames and Furnaces (Chapman & Hall 1962)
- Trinck, W. & MacWhinney Industrial Furnaces (Wiley)

510135 ChE515 Energy Management

Hours 3 hours per week

Content The cost-price structure of energy supply; factors influencing relative costs of coal-oil gas-electricity. Technical possibilities and limitations in change of fuel and energy sources for existing equipment. Primary fuel conversion; liquid fuels from coal and gas. Energy economy in process plant; the thermodynamics of heating and power generation. Methods of loss assessment and management of in plant energy use; loss control by furnace inculation, sensible heat recuperation and regeneration. Combustion control, Steam economy; the high cost of steam, the sensible use of latent heat; heat exchangers for low level heat recovery. Energy losses in mechanical and fluid-flow systems. Efficient and inefficient speed and flow control systems.

Combined power and process heat systems; the gas turbine in process plant; reversed cycles; the heat pump for distillation and other process systems. Energy storage, in hot water, as latent heat, in solid storage systems, as chemical energy in cells or in intermediate products.

The international resource situation. Energy resources for the future. (Nuclear, solar direct and vegetable growth, etc.)

Text
- Hottel, H. C. & Howard, J. B. New Energy Technology (M.I.T. 1971)

References To be advised

510125 ChE516 Reaction Engineering

Hours Approx. 84 hours for course

Content Kinetics of reactions involving mass transfer with chemical reaction and their application to the design of reactors for gas-solid catalytic reactions.

510123 ChE521 Air Pollution Effluent Control

Hours Approx. 84 hours for course

Content 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.

Text Strauss, W. or Dept of Health Education & Welfare
- Industrial Gas Cleaning (Pergamon 1967)

References Fuchs, N. Stern, A. C.
- Mechanics of Aerosols (Pergamon 1965)
- Air Pollution (Pergamon 1965)

510124 ChE522 Control of Industrial Liquid Effluents

Part I: The General Problem; chemical processes
Part II: Unit Operations

Hours Approx. 42 hours for course
Content
The general problem; statutory requirements; practice and fundamental principles. By-product recovery.
Background on liquid pollution overseas and in Australia. Effect of pollution on the ecosphere—basic principles of ecology, effects of liquid pollution, toxicity of certain materials. Water pollution legislation—overseas developments and research, Australian State requirements.
Sour water strippers—gas or steam stripping of sulphides, phenols.

Part II: Unit operations in Water and Wastewater Engineering

Content
Theory of treatment processes dealt with as various Unit Operations, together with practical aspects of overall treatment plants and costs of alternatives.

Topic outlines

Introduction to Biological Treatment Methods.
Design of Biological Treatment Systems for Activated Sludge, Trickling Filters, Lagoons, Stabilisation Ponds, to reduce BOD, COD. Design of Biological Treatment Systems for full nitrification/denitrification tertiary treatment. Physicochemical Methods for tertiary treatment including Ion exchange and Adsorption processes.

Texts
For Parts I & II

Reference
Nemerow, N. L. Liquid Waste of Industry (Addison-Wesley 1971)
References
Desai, C. S. & Abel, J. F.
Timoshenko, S. P. & Goodier, J. N.
Timoshenko, S. P. & Woinowsky-Krieger, S.

Introduction to the Finite Element Method
(Van Nostrand-Reinholt 1972)
Theory of Plates and Shells 2nd edn (McGraw-Hill 1965)

520116 CES16 Plastic Frame Design

Hours
1 lecture and 1 tutorial hour per week

Examination
One 2-hour paper

Content
Review of upper and lower bound theorems, beams, columns, connections, design of braced frames, column deflection curves, subassemblages, unbraced frames.

References
Lehigh University Plastic Design of Multi-Story Frames (1965)

520117 CES17 Steel Beams, Columns and Frames

Hours
1 lecture hour and 1 tutorial hour per week

Examination
One 3-hour paper

Content
Instability of beams, columns and frames, including analysis of thin-walled sections in torsion; box girder analysis.

References
Galambos, T. V. Structural Members and Frames (Prentice-Hall 1968)
Galambos, T. V. Combined Bending and Torsion Beams and Girders Pts 1 & 2 Publ. No. 31 (British Constructional Steelwork Ass.)

520118 CES19 Engineering Seismology

Hours
1½ hours per week

Examination
Progressive assessment

Content
Causes of earthquakes, the theory of plate tectonics, introduction to classical seismology; seismicity, source mechanisms, source parameters, simple source models; wave propagation, propagation of strong ground motion; effects of local geology and topography; design earthquake estimation; statistical characterization of high-frequency ground motion, introduction to random vibration theory; tectonics and seismicity of the South-West Pacific and resulting earthquake engineering problems.

Texts
To be advised

520131 CES26 Advanced Properties of Materials

Hours
1 lecture hour and 1 tutorial hour per week

Examination
One 3-hour paper

Content

Texts
To be advised

References

520130 CES27 Concrete Technology

Hours
1 lecture hour and 1 tutorial hour per week

Examination
One 2-hour paper

Content
Characteristics of special concretes. Use of high alumina, slag, fly ash and other special cements; gap-graded mixes; lightweight aggregate; fibre reinforcement; small scale concrete models.

Texts
To be advised

References

233
520121 CE528 Soil Mechanics

Hours 1 lecture hour and ¼ tutorial hour per week

Examination Progressive assessment

Content
More advanced work, including recent experimental and analytical advances in soil mechanics.

Texts Nil

Reference
Scott, R. F. Principles of Soil Mechanics (Addison-Wesley 1963)

520122 CE529 Foundation Engineering

Hours 1 lecture hour and ¼ tutorial hour per week

Examination Progressive assessment

Content
Course time will be divided between more advanced analytical and design methods, and exercises in practical soils engineering. Current soil mechanics projects in and about Newcastle will be followed and sites visited. Each student will undertake a small but complete foundation investigation including site investigation, laboratory testing, design recommendations and presentation of a brief written report.

Texts Nil

References To be advised

520123 CE533 Theoretical Hydrodynamics

Hours 1 lecture hour and ¼ tutorial hour per week

Examination One 3-hour paper

Content
Proof and applications of the Navier Stokes equations and the vorticity equation; irrotational flow and the use of complex variable methods to solve some of the basic engineering problems such as airfoil lift and percolation under dams.

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

520124 CE534 Open Channel Flow

Hours 1 lecture hour and ¼ tutorial hour per week

Examination One 3-hour paper

Content
Further methods of plotting longitudinal profiles, and solution of more difficult problems involving channel transitions and controls. Introduction to unsteady flow, the method of characteristics, and the principles of flood routing.

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

References As for CE 332

520125 CE535 River and Coastal Engineering I

Hours 1 lecture hour and ¼ tutorial hour per week

Examination One 3-hour paper

Content

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

References

Leliavsky, S. An Introduction to Fluvial Hydraulics (Dover 1966)

Leopold, L. B. et al. Fluvial Processes in Geomorphology (Freeman 1964)

Muir Wood, A. M. Coastal Hydraulics (Macmillan 1969)

Wiegel, R. L. Oceanographical Engineering (Prentice-Hall 1964)
520126 CE543 Water Quality Management

Hours 1 lecture hour and 1 tutorial hour per week

Examination One 3-hour paper

Content

Preliminary Reading
Imhoff, K. et al. Disposal of Sewage and other Waterborne Wastes 2nd edn (Butterworth 1971)

Text

Reference


520133 CE554 Civil Engineering Systems II

Hours 1 lecture hour and 1 tutorial hour per week

Examination One 3-hour paper

Content
Mathematical programming and optimisation techniques, applications to problems in structural design, engineering management, water resource systems and transportation.

References


520129 CE574 Transportation Planning

Hours 1 lecture hours per week

Examination One 2-hour paper

Content
Transportation in the national economy; sociological, environmental and economic requirements of transportation systems; demands for travel; land use/transport interaction. Transportation planning; data collection; trip generation; trip distribution; traffic assignment; modal split; economic evaluation. Recent innovations in transportation systems.

Text
Bruton, M. J. Introduction to Transportation Planning (Hutchinson 1970)

520600 CE617 Prestressed Concrete Design

Hours 2 lecture hours and 1 tutorial hour per week

Examination One 3-hour paper

Content

Text
SAA Prestressed Concrete Code AS1481-1974 (Standards Association of Australia)

References
Bennett, W. Structural Concrete Elements (Chapman-Hall)


Leonhardt, W. Prestressed Concrete Design and Construction (Wilhelm)

520611 CE626 Theoretical Aspects of Fracture Mechanics

Hours 2 lecture hours and 1 tutorial hour per week

Examination One 3-hour paper

Contents

References

- Muskhelishvili, N. I. *Some Basic Problems in the Mathematical Theory of Elasticity* (Noordoff 1956)
- Sneddon, I. N. & Lowengrub, M. *Crack Problems in the Classical Theory of Elasticity* (Wiley 1969)

520601 CE634 Advanced Fluid Mechanics

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

One 3-hour paper

**Content**

Treatment at an advanced level of selected topics that are relevant to civil engineering problems, for example in pipe systems and the design and performance of hydraulic structures.

References

To be advised

520602 CE635 River and Coastal Engineering II

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

Progressive assessment

**Content**


References

- Wiegel, R. L. *Oceanographical Engineering* (Prentice-Hall 1964)

520603 CE636 Water Reticulation and Wastewater Collection

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

Progressive assessment

**Content**

Design and analysis of water collection, transmission and distribution systems. Design and analysis of wastewater collection systems.

References

To be advised

520604 CE643 Water Pollution and Water Quality Management

**Hours**

1 lecture hour and ½ tutorial hour per week

**Examination**

One 3-hour paper

**Content**


References

- Imhoff, K. et al. *Disposal of Sewage and other Waterborne Wastes* 2nd edn (Butterworths 1971)
- Klein, L. *River Pollution Vol. 2 Causes and Effects* (Butterworths 1962)
- Klein, L. *River Pollution Vol. 3 Control* (Butterworths 1966)

520605 CE644 Water and Wastewater Treatment

**Hours**

2 lecture hours and ½ tutorial hour per week

**Examination**

One 3-hour paper

**Content**


References

- Water Treatment Plant Design (Amer. Water Works Assn 1969)
- Metcalf & Eddy Wastewater Engineering (McGraw-Hill 1972)

520606 CE645J Microbiology of Water Resources

Hours 2 lecture hours and 1 tutorial hour per week
Examination Progressive assessment and final examination

Content

Texts To be advised

520607 CE646 Public Health Science

Hours 1 lecture hour and ½ tutorial hour per week
Examination Progressive assessment and final examination

Content

Texts To be advised

520608 CE647 Unit Operations in Public Health Engineering

Hours 1 lecture hour and ½ tutorial hour per week
Examination Progressive assessment and final examination

Content
Theory of treatment processes used in municipal water and wastewater treatment works.

Texts To be advised

520609 CE654 Construction Management

Hours 1½ lecture hours per week
Examination Progressive assessment

Content
The civil engineering construction industry in perspective. Functions of construction management, project evaluation, planning, cost estimating, bidding, construction supervision. Day-labour versus contract organisations. Work study in construction. Labour relations.

Texts To be advised

520610 CE674 Traffic Engineering

Hours 1½ lecture hours per week
Examination One 2-hour paper

Content
The relationship between speed, flow and density of a highway traffic stream. Intersection design with and without signal control. Economic analysis for highways.

Winfrey, R. Economic Analysis for Highways (Intext 1969)

DEPARTMENT OF ELECTRICAL ENGINEERING

The following subjects have been approved for inclusion in the M.Eng.Sc. course programme. Those subjects which will not be offered in 1977 are marked †. The other subjects will be offered subject to adequate enrolment.

All subjects are 1 unit (42 hours) unless otherwise noted.

†EE516 Computer-Aided Analysis of Power Systems
EE541 Sample Data Control Systems *
†EE542 Modern Control **
EE543 Optimization Techniques **
†EE545 Communication Systems *
†EE546 Modern Control
EE547 Digital Communications **
†EE552 Advanced Topic in Communication Systems **
EE62 Advanced Switching Theory and Logic Design
EE63 Computer Operating Systems
EE64 Compilers, Assemblers & Interpreters
EE65 Pattern Recognition
EE66 Automata & Computing Machines
EE67 Computer Process Control
EE68 Advanced Computer Architecture
EE69 Formal Languages & Automata
EE80 Thesis/Project (by arrangement)
EE90 Seminar
EE41 Multivariable Control Systems
EE42 Stochastic Control

* First half year
** Second half year
*** Full year

SUBJECT ENTRIES

530100 EE516 Computer-Aided Analysis of Power Systems (not offered in 1977)

530127 EE541 Sample Data Control Systems (Digital Signal Processing)

Prerequisites Consent of instructor
Hours 3 hours of lectures, tutorial and laboratory work per week
Examination Progressive assessment and final examination
Content Digital filtering and digital control systems, z-transforms, state-variable techniques, sampling and reconstruction, fast fourier transforms.
Text Nil
Kuo, B. C. Discrete-Data Control Systems (Prentice-Hall 1970)

530120 EE543 Optimization Techniques

Prerequisites Maths II Topics C, D, E.
Content Mathematical background to optimization. Comparison of optimization methods; engineering applications — such as to problems of identification, control, pattern recognition and resource allocation.
Texts
Aoki, M. Introduction to Optimization Techniques (Macmillan)
Luenberger, D. G. Introduction to Linear and Non-Linear Programming (Addison-Wesley 1973)
Reference
Luenberger, D. G. Optimization via Vector Space Methods (Wiley 1969)

530123 EE545 Communication Systems (not offered in 1977)

530128 EE546 Modern Control (Linear Optimal Control Theory) (not offered in 1977)

530129 EE547 Digital Communication

Prerequisites Consent of instructor
Hours 3 hours of lectures and tutorials per week
Examination Progressive assessment, a term paper and a final examination
Content As for EE447
Text Nil
References

530130 EE552 Advanced Topics in Communications Systems (not offered in 1977)
530117 EE563 Computer Operating Systems*

Prerequisite
EE361

Hours
3 hours per week

Examination
Progressive assessment and final examination

Content
Views of an operating system. Multiprogramming, interacting concurrent processes, process control primitives. Processor management, memory management, name management. Protection.

Text
Shaw, A. C. The Logical Design of Operating Systems (Prentice-Hall)

References
Coffman, E. G. & Denning, P. J. Operating Systems Theory (Prentice-Hall)
Hansen, P. B. Operating Systems Principle (Prentice-Hall)

530132 EE562 Advanced Switching Theory and Logic Design *
(Not offered in 1977)

530118 EE564 Compilers, Assemblers and Interpreters **

Prerequisite
EE361

Hours
3 hours per week

Examination
Progressive assessment and final examination

Content

Text
Gries, D. Compiler Construction for Digital Computers (Wiley)

References
Donovan, J. J. Systems Programming (McGraw-Hill)

530108 EE565 Pattern Recognition**
530119 EE566 Automata and Computing Machines
530125 EE567 Computer Process Control
530121 EE568 Advanced Computer Architecture**
530122 EE569 Formal Languages and Automata*

530110 EE580 Thesis/Project

Content
Multiples of 1 unit. Topics to be arranged

530111 EE590 Seminar ***

Content
A series of seminars for full-time postgraduate students who each will prepare approximately one seminar per semester on a technical or theoretical subject. Each student will also attend EE491 seminars.

530133 EE641 Multivariable Control Systems
530134 EE642 Stochastic Control

* (not offered in 1977)

DEPARTMENT OF MECHANICAL ENGINEERING

The following subjects have been approved for inclusion in M.Eng.Sc. programmes. The offering of any subject is dependent on adequate enrolments in that subject. Subjects marked † are unlikely to be offered in 1977.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME404</td>
<td>Mathematical Programming</td>
</tr>
<tr>
<td>ME502G</td>
<td>Operations Research &amp; Decision Theory</td>
</tr>
</tbody>
</table>
† ME503G | Design of Experiments for Engineering Research | 2 |
| ME505G | Systems Analysis & Design                        | 2 |
| ME508G | Air Pollution Studies II                         | 1 |
| ME511G | Experimental & Theoretical Stress Analysis       | 2 |
| ME515G | Advanced Design Concepts in Mechanical Engineering | 2 |
| ME517G | Materials Handling & Transportation Systems      | 2 |
| ME535G | Vibration & Noise Problems in Industry           | 2 |
† ME536G | Advanced Dynamics of Machines                    | 1 |
| ME546G | Elasticity, Plasticity & Applications            | 2 |
† ME554G | Fluid Mechanics                                  | 1 |
† ME555G | Advanced Turbomachinery                          | 2 |
| ME575G | Heat Transfer                                    | 1 |
| ME581G | Mathematical Programming                         | 2 |
† ME582G | Probabilistic Models in Operations Research      | 2 |
<table>
<thead>
<tr>
<th><strong>Unit</strong></th>
<th><strong>Text</strong></th>
<th><strong>References</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nil</td>
<td>Introduction to Scientific Research (McGraw-Hill)</td>
</tr>
<tr>
<td>1</td>
<td>Nil</td>
<td>Physical Measurements and Analysis (Addison-Wesley)</td>
</tr>
<tr>
<td>2</td>
<td>Nil</td>
<td>Methods of Correlation Analysis and Regression Analysis (Wiley)</td>
</tr>
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<td></td>
<td>Mathematics Handbook for Scientists and Engineers (McGraw-Hill)</td>
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<td>Experimental Statistics Handbook 91 (U.S. National Bureau of Standards)</td>
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</table>

### Subject Entries

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
<th>Examination</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>540115</td>
<td>ME502G Operations Research and Decision Theory (Refer also ME487/488)</td>
<td>3 hours of lectures, seminars and tutorials per week</td>
<td>Progressive assessment and examination</td>
<td>Development of models as an aid in decision making. Mathematical concepts of statistics in problem solving. Mathematical programming. Inventory control theory. Queueing theory and applications. Texts As for ME487 and ME488</td>
</tr>
</tbody>
</table>

### Prerequisites

**540101 ME503G Design of Experiments for Engineering Research**

- **Prerequisites**: Nil
- **Hours**: 3 hours of lectures, seminars and tutorials per week
- **Examination**: Progressive assessment
- **Content**: 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.
540124 ME508G Air Pollution Studies II

Prerequisite
GE501G

Hours
42

Content
Atmospheric diffusion models and physico-chemical interactions on the local and global scale. Ambient measurement and control of exhausts from motor vehicles.

Text

References
Deminger, A. *Models for Environmental Pollution Control* (Ann Arbor Science Publishers 1973)
Stern, A. C. *Air Pollution 3 Vols* (Academic 1968)

540106 ME511G Experimental and Theoretical Stress Analysis

Hours
3 hours of lectures and tutorials per week

Examination
Progressive assessment

Content
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.

Texts
Nil

References
Southwell, R. V. *An Introduction to the Theory of Elasticity* (Dover 1969)

540107 ME515G Advanced Design Concepts in Mechanical Engineering

Hours
3 hours per week

Examination
Progressive assessment

Content
The application of system 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.

Texts
Nil

References
Furman, T. T. *The Use of Computers in Engineering Design* (English U.P.)
Haviland, R. P. *Engineering Reliability and Long Life Design* (Van Nostrand 1964)
Johnson, R. C. *Optimum Design of Mechanical Elements* (Wiley)
Matouseki, R. *Engineering Design* (Blackie)
Morrison, D. *Engineering Design* (McGraw-Hill)
Polovko, R. M. *Fundamentals for Reliability Theory* (Academic 1968)

540113 ME517G Materials Handling and Transportation Systems

Hours
3 hours per week

Examination
Progressive assessment

Content
Principles of granular mechanics and flow patterns and properties. Measurement of strength and flow properties in relation to hopper design. Stress analysis of bulk solids. Design of hoppers, feeding and handling equipment. Analysis and optimization of materials handling and transportation systems. Examination of the technical characteristics and unit cost data for various types of transport systems. Examples considered will be selected from various types of conveyor systems, pipeline systems (pneumatic and hydraulic) road and rail systems and sea transport systems such as Lash, Splash, Ro Ro, Container etc. Other studies may include stockpiling, packaging and cargo systems.
540102 ME535G Vibration and Noise Problems in Industry

Hours
3 hours of lectures, tutorials and laboratory per week

Examination
Progressive assessment

Content
A systematic study of both noise and vibration problems which are of common occurrence in industrial plants and structures. It is divided into:

Texts
Anderson, R. A.
Beranek

References
Hall, A. S.
Hill, R.
Wang
Zienkiewicz & Holister

Text
Fundamentals of Vibrations (Macmillan)
Noise Reduction (McGraw-Hill)

References
Matrix Methods in Elastomechanics (McGraw-Hill)

540108 ME536G Advanced Dynamics of Machines

Hours
One and a half hours per week

Examination
Progressive assessment

Content
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, Bobilliers construction, Hartmann's construction. Introduction to synthesis; graphical methods, analytical methods.

Text
Hirschhorn, J.

References
Hall, A. S.
Holowenko, A. R.

540109 ME546G Elasticity, Plasticity and Applications

Hours
3 hours of lectures and tutorials per week

Examination
Progressive assessment

Content
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.

Texts
Nil

References
Ford
Hill, R.
Wang
Zienkiewicz & Holister

Text
Advanced Mechanics of Materials (Longmans)
The Mathematical Theory of Plasticity (Oxford U.P.)
Applied Elasticity (McGraw-Hill)
Stress Analysis (Wiley)

540114 ME554G Fluid Mechanics

Hours
1½ lecture hours per week

Examination
To be advised
Content
A selection of the following topics.
Two phase flow particularly related to transport of solids in pipelines;
Fractional analysis and its application; Pump and compressor design;
Application of hydrodynamics; Computer applications in fluid
mechanics.

Texts
Kovats, A. Centrifugal and Axial Flow Pumps and Compressors (Pergamon)
Streeter, V. L. and Vallentine, H. R. Handbook of Fluid Dynamics (McGraw-Hill)
Applied Hydrodynamics (Butterworths)

540103 ME555G Advanced Turbomachinery

Hours 3 hours of lectures and tutorials per week
Examination Progressive assessment

Content
More advanced study of the fluid mechanics and thermodynamics of
flow in cascades and three-dimensional guiding surfaces, leading to the
design of a selected turbomachine.

Texts Nil

References
Csanady, G. T. Theory of Turbomachines (McGraw-Hill 1964)

540118 ME575G Heat Transfer

Hours 1½ hours of lectures and laboratory per week
Examination Progressive assessment

Content
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 To be advised

540119 ME581G Mathematical Programming

Hours 3 hours of lectures and tutorials per week
Examination To be advised

Content
A survey of methods for the solution of statics, 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.

Texts
Geoffrion, A. M. (ed.) Perspectives on Optimisation (Addison-Wesley 1972)
Nemhauser, G. L. Introduction to Dynamic Programming (Wiley 1966)

References
Hadley, G. Linear Programming World Student Series Addison-Wesley 1969)
Künzi, H. P. et al. Nonlinear Programming (Blaisdell 1966)
Luenberger, D. G. Introduction to Linear and Nonlinear Programming (Addison-Wesley 1973)
Taha, H. A. Operations Research (Macmillan 1971)

540120 ME582G Probabilistic Models in Operations Research

Hours 3 hours of lectures, tutorials and seminars per week
Examination Progressive assessment
Content
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.

Texts
Nil

References
Taha, H. A.  
Operations Research (Macmillan)
Wagner, H. M.  
Principles of Operations Research (Prentice-Hall)

540121 ME583G Modelling of Management Problems

Hours  
1½ lecture hours per week

Examination  
Progressive assessment

Content
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
Rivett, B. H. P.  
Principles of Model Building (Wiley)

540122 ME584G Simulation

Hours  
1½ lecture hours per week

Examination  
Progressive assessment

Content
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.

Texts
Nil

References
Naylor, T. H.  
Computer Simulation Experiments with Models of Economics Systems (J. Wiley 1971)
Naylor, T. H. et al.  
Computer Simulation Techniques (J. Wiley 1966)
Tocher, K. D.  
The Art of Simulation (English U.P. 1963)

433260 ME681G Industrial Law
For subject description see page 296.

540123 ME685G Advanced Operations Research

Prerequisite
ME502G or ME487/488

Hours  
3 hours of lectures, tutorials and seminars per week

Examination  
Progressive assessment

Content
The application of the Operational Research Method 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
Wagner, H. M.  
Principles of Operations Research (Prentice-Hall)

DEPARTMENT OF METALLURGY

The following subjects have been approved for inclusion in M.Eng.Sc. programmes. The offering of any subject is dependent on adequate enrolments in that subject.

<table>
<thead>
<tr>
<th>Units</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>1</td>
<td>Met 521  Metallurgical Thermodynamics</td>
</tr>
<tr>
<td>1</td>
<td>Met 531  Heat Transfer</td>
</tr>
<tr>
<td>1</td>
<td>Met 532  Fluid Mechanics</td>
</tr>
<tr>
<td>1</td>
<td>Met 533  Metallurgical Rate Processes</td>
</tr>
</tbody>
</table>
### Subject Entries

#### 115521 Met521 Metallurgical Thermodynamics

**Prerequisite** Met321

**Hours** About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination** To be advised

**Content**

**Texts** To be advised

**References**
Richardson, F. D. *The Physical Chemistry of Melts in Metallurgy* Vols I-II (Academic Press)

Wagner, C. *Thermodynamics of Alloys* (Addison-Wesley)

#### 115531 Met531 Heat Transfer

**Prerequisite** Met331

**Hours** About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination** To be advised

**Content**
Heat transfer modelling in casting and solidification, welding, pyrometallurgical reaction systems, heat treatment and fabrication systems.

**Texts** To be advised

**References**
To be advised

#### 115541 Met541 Fracture Mechanics

**Prerequisite** Met341

**Hours** About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Content**
The teeming system geometry for continuous or batch ingot production. The solidifying interface with various morphologies. The impinging jet geometry in gas-liquid metal contacting in pyrometallurgy. Melting packed beds.

**Texts** To be advised

**References**
To be advised

#### 115532 Met532 Fluid Mechanics

**Prerequisite** Met332

**Hours** About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination** To be advised

**Content**

**Texts** To be advised

**References**
To be advised

#### 115541 Met541 Fracture Mechanics

**Prerequisite** Met341

**Hours** About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Content**
The teeming system geometry for continuous or batch ingot production. The solidifying interface with various morphologies. The impinging jet geometry in gas-liquid metal contacting in pyrometallurgy. Melting packed beds.

**Texts** To be advised

**References**
To be advised
## Examination
To be advised

## Content

### Text
Knott, J. F.  
*Fundamentals of Fracture Mechanics*  
(Butterworths)

### References
To be advised

### 115551 Met551 Electron Metallography

#### Prerequisites
Met351, Met352, Met354

#### Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

#### Examination
To be advised

### Content
The interaction of electrons with crystalline materials and the development of image contrast. Characterization of structural defects.

### Texts
To be advised

#### References
Hawkes, P. W.  
*Electron Optics and Electron Microscopy*  
(Taylor & Francis)

Heidenreich, R. D.  
*Fundamentals of Transmission Electron Microscopy*  
(Wiley)

### 115552 Met552 Physical Metallurgy

#### Prerequisites
Met351, Met352, Met353

#### Hours
About 21 lecture hours and 21 hours of tutorials, demonstrations and practical classes

#### Examination
To be advised

### Content
Topics on the relation between mechanical properties and microstructure. Strengthening mechanisms. Internal friction in metals.

### Texts
To be advised

### References
Cahn, R. W.  
*Physical Metallurgy* (Elsevier)

Kelly, A. & Nicholson, K. B.  
*Strengthening Mechanisms in Crystals*  
(Elsevier)

Kelly, A.  
*Strong Solids* (Oxford U.P.)

Nowich, A. S. & Berry, B. S.  
*Anelastic Relaxation in Crystalline Solids*  
(Academic Press)

### 115553 Met553 Metallography

#### Prerequisites
Met351, Met352, Met353

#### Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

#### Examination
To be advised

### Content
Metallography of phase transformations in metals. Recrystallization, grain boundaries and interfaces.

### Texts
To be advised

#### References
A.S.M.  
*Phase Transformations* (Manchester Conference "The Mechanism of Phase Transformation in Crystalline Solids")

Christian, J. W.  
*The Theory of Phase Transformations in Metals and Alloys* (Pergamon)

### 115561 Met561 Extraction Metallurgy

#### Prerequisites
Met361, Met362

#### Hours
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

#### Examination
To be advised

### Content
Study in depth of selected topics in the current technology of extraction metallurgy from the field of: hydrometallurgy, pyrometallurgy and electrometallurgy.

### Texts
To be advised
115562 Met562 Reactor Analysis

**Prerequisite**  
Met363

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
To be advised

**Content**  
Modelling and analysis of processes in extraction pyro- hydro- and electro-metallurgy. Reactor kinetics of industrial reactors.

**Texts**  
To be advised

115571 Met571 Materials Selection

**Prerequisite**  
Met371

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
To be advised

**Content**  
An examination of the important features and properties of the less common and more technically sophisticated materials, their application and limitations.

**Texts**  
To be advised

**References**  
A.S.M.  
*Metals Handbook* Vol. 8th edn

115572 Met572 Welding and Non-destructive Testing

**Prerequisite**  
Met374

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
To be advised

**Content**  
The course covers the important details of welding power supplies, advanced techniques and controls. Welding of special metals and alloys. Hard facing and metal cutting processes. Fundamental principles of modern non-destructive testing. Detailed examination of each process.

**Texts**  
To be advised

**Reference**  
A.S.M.  
*Metals Handbook* Vol. 6, 8th edn

115581 Met581 Dislocation Theory

**Prerequisites**  
Met352, Met241

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
To be advised

**Content**  
Advanced topics on the structure, interactions and movement of dislocations. Applications to plastic deformation, fracture, transformations and strengthening.

**Texts**  
To be advised

**References**  
Friedel, J.  
Dislocations (Gautier-Villan)  
Dislocations (Oxford U.P.)

115582 Met582 Metal Physics

**Prerequisites**  
Met381, Met354

**Hours**  
About 21 lecture hours and 21 hours of tutorial, demonstration and practical classes

**Examination**  
To be advised

**Content**  
Topics will be chosen from a list including such items as: neutron diffraction methods, diffraction theory, lattice vibrations, nuclear reactor materials, magnetic and electrical materials, superconductors, etc.

**Texts**  
To be advised

**Reference**  
Kittel, C.  
*Introduction to Solid State Physics* (Wiley)
Approved Diploma Subjects Offered
By Other Faculties

(a) Faculty of Economics and Commerce
   ME385D  1. Accounting & Financial Studies  1
   ME681D  1. Industrial Law  1
   2. Commercial Programming

(b) Faculty of Mathematics
   CS 3. Programming & Algorithms  1
   CS 3. Data Structures & Programming  1

1. Refer to Diploma in Industrial Engineering
2. Refer to Diploma in Business Studies
3. Refer to Diploma in Computer Science

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 com-
mencement 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 pass 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 can-
didate, the Faculty Board shall be satisfied that adequate super-
vision 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.

(iii) A part-time candidate shall, except in special circumstances—
i. conduct the major proportion of the research or design
work in the University; and
ii. take part in research seminars within the department in
which he is working.

(iv) Every candidate shall submit annually a report on his work
to his supervisor for transmission to the Higher Degree
Committee.

(v) Every candidate shall submit three copies of the thesis as pro-
vided under paragraph 6 (i). All copies of the thesis shall be
double-spaced typescript, shall include a summary of approx-
imately 200 words, and a certificate signed by the candidate
to the effect that the work is his own and has not been sub-
mitted for a higher degree to any other university or institu-
tion. The ORIGINAL copy of the thesis for deposit in the
Library shall be prepared and bound in a form approved by
the University. The other two copies of the thesis shall be
bound in such manner as allows their transmission to the
examiners without possibility of their disarrangement.

(vi) It shall be understood that the University retains the three
copies of the thesis and is free to allow the thesis to be con-
sulted or borrowed. Subject to the provisions of the Copy-
right Act (1968) the University may issue the thesis in whole
or in part in photostat or microfilm or other copying medium.

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 can-
didate 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.
4. In every case, before permitting an applicant to register as a candidate for the degree, 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.

(iii) A part-time candidate shall, except in special circumstances—
   (a) conduct the major proportion of the research or design work in the University; and
   (b) take part in research seminars within the Department in which he is working.

(iv) Every candidate shall submit annually a report on his work to his supervisor for transmission to the Higher Degree Committee.

(v) Every candidate shall submit three copies of the thesis as provided under paragraph 6 (i). All copies of the thesis shall be double-spaced typescript, shall include a summary of approximately 200 words, and a certificate signed by the candidate to the effect that the work has not been submitted for a higher degree to any other university or institution. The ORIGINAL copy of the thesis for deposit in the Library shall be prepared and bound in a form approved by the University. The other two copies of the thesis shall be bound in such a manner as allows their transmission to the examiners without possibility of their disarrangement.

(vi) It shall be understood that the University retains the three 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.

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 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.

1 Separate sheet on the preparation and binding of higher degree theses is available on application.
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

1. The degree of Doctor of Philosophy may be awarded by 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;
   (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. (a) The course shall be carried out in a Department of the University.

   (b) Notwithstanding the provisions of subsection (a) of this clause, 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.

   (c) The course shall be carried out under the direction of a supervisor or supervisors appointed 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.

24. In exceptional circumstances the Senate may relax any of these Requirements.

**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. Any 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 of criticism by relevant experts, and examiners are given discretion to disregard any work he has published, whether or not it bears on the subject of the thesis.

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

1 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 work underlying the work submitted if, in their opinion, the work has not been so available for criticism.

**REQUIREMENTS FOR THE DEGREE OF DOCTOR OF SCIENCE**

1. The degree of Doctor of Science may be awarded by the Council on the recommendation of the Senate, for an original contribution or contributions of distinguished merit adding to the knowledge or understanding of any branch of learning with which the Faculty is concerned.

2. An applicant for registration for the degree of Doctor of Science 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 although additional unpublished work may also be considered.

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. An applicant for registration for the degree shall submit in writing to the Secretary a statement of his academic qualifications together with:
   (a) four copies of the work, published or unpublished, which he desires to submit; and
   (b) a Statutory Declaration indicating those sections of the work, if any, which have been previously submitted for a degree or diploma in any other 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 examiners may require the candidate to answer, *viva voce* or in writing, any questions concerning his work.

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

1 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 examiners are given discretion to disregard any of the work submitted if, in their opinion, the work has not been so available for criticism.

**C. SUBJECTS OFFERED BY NON-ENGINEERING DEPARTMENTS**

The subjects included in this section are those offered by Departments in other Faculties which are compulsory subjects in one or more Engineering courses. A few subjects which are popular as Electives are also included. For details of other subjects, it will be necessary to refer to the appropriate Faculty Handbook.

The subjects names are arranged in alphabetical order.

**416108 ME385 Accounting and Financial Studies**

*Note* Enrolment in this subject is restricted to students who have not previously passed any accounting examinations at tertiary level.

**Prerequisites** Nil

**Hours** 2 lecture hours per week

**Examination** An examination each half-year

**Content**
The use of accounting information for business decisions. Analysis of balance sheets. Income appropriation and flow of funds statements; basic accounting procedures; the concept of cost; types and uses of internal accounting systems; cost allocation; the concept of income; inventory valuation; measurement and accounting; accounting for inflation; preparation of financial statements; analysis and interpretation of financial statements.

Basic cost accounting; management control processes; budget as a planning device; budget as a control device; budgeting and employee behaviour; responsibility accounting; performance evaluation; cost analysis for management decisions including capital acquisitions and optimal investment behaviour; transfer pricing; capacity utilisation and control; statistical techniques for operational cost control.

**Text**

**References**
To be advised

**411100 Accounting I**

**Prerequisites** Nil

**Hours** 2 lecture hours and 2 tutorial hours per week

**Examination** Two 3-hour papers

**Content**
An analysis of the accounting function in the social structure; the historical cost model of income measurement and asset valuation; Alternative systems of accounting measurement — current purchasing power, current value. Various types of entities: partnerships, companies, manufacturing and non-trading concerns. An introduction to basic techniques of management accounting including allocation of overheads, product costing and budgeting. Analysis and interpretation of financial statements; funds statements and an introduction to business finance. A brief survey of external influences on accounting.

**Texts**
Burns, T. J. & Hendrickson, H. S. *The Accounting Sampler* 2nd edn (McGraw-Hill)
Colditz, B. T. & Gibbins, R. W. *Australian Accounting: The Basis for Business Decisions* 2nd edn (McGraw-Hill)
Accountancy Exercises (University of Newcastle)
References
Barton, A. D.

Buckley, J. W. & Lightner, K. M.

Carey, J. L.

Chambers, R. J.

Colditz, B. T. & Gibbins, R. W.

The Anatomy of Accounting (Queensland U.P.)

Accounting: An Information Systems Approach (Dickenson)

The Rise of the Accounting Profession Vols I & II (A.I.C.P.A.)

Accounting and Action (Law Book Co.)

Study Guide to Australian Accounting (McGraw-Hill)

72100 Chemistry I

Prerequisites
Nil

Hours
About 3 lecture hours and 3 hours of tutorial and laboratory classes per week

Examination
Three 3-hour papers, one in mid-year

Content
Inorganic Chemistry (30 lectures)
The periodic properties of the elements and their compounds; chemistry of selected elements from some Groups of the Periodic Table.

Organic Chemistry (30 lectures)

Physical Chemistry (30 lectures)
The mole concept; atomic and molecular structure; binding and energy; chemical equilibria and energetics; chemical kinetics.

Texts
Aylward, G. H. & Findlay, T. J. V.

Benfey, O. T.

Hart, H. & Scheutz, R. D.
a,b Pimental, G. C. & Spratley, R. D.

Texts
Aylward, G. H. & Findlay, T. J. V.

The Names and Structures of Organic Compounds (Wiley 1966)

Organic Chemistry 4th edn (Houghton Mifflin 1973)

Understanding Chemistry (Holden-Day 1971)


a Several other texts provide suitable alternative approaches, one widely used is:

Brescia, F. et al.

b Students with deficient background knowledge are advised to consolidate basic understanding through study of books such as:


Or


721900 Chemistry I

(for Civil, Electrical and Mechanical Engineering Students)

Prerequisites
Nil

Hours
About 2 lecture hours and 1 hour of tutorials, computational classes and student participation per week

Examination
Three 1-hour papers at end of each term or one 3-hour paper in November

Content
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 backdrop of water usage, treatment and beneficication; electrochemistry in relation to corrosion and related phenomena; structural chemistry of engineering materials; organic chemistry with special reference to petrochemistry, polymers, fuels and lubricants.

Texts
Aylward, G. H. & Findlay, T. J. V.

Pimental, G. C. & Spratley, R. D.

Steedman, W. et al.

S.I. Chemical Data (Wiley 1970)

Understanding Chemistry (Holden-Day 1971)

Chemistry for the Applied Sciences (Pergamon 1970)

72220 Chemistry IIA

Prerequisite
Chemistry I

Preparatory Subjects
Mathematics I & either Physics IA or IB

Hours
About 3 lecture hours and 6 hours of tutorial and laboratory classes per week

Examination
These examinations are optional in the sense that a student may satisfy the examiners:
Either by achieving an overall satisfactory performance in the two progressive examinations (Paper 1 & 2).

Or by achieving an overall satisfactory performance in the two final papers scheduled for the November examination (Papers 3 & 4).

Students who attempt both sets of examinations will be credited with the higher of the two results.

All papers are of 3-hours duration.

The average laboratory mark counts 20% towards the final grading.

**Texts**

- Geissman, T. A.
  - *Principles of Organic Chemistry* 3rd edn (Freeman 1968)

- Pickering, W. F.
  - *Modern Analytic Chemistry* (Dekker 1971)

- Shoemaker, D. P. & Garland, C. W.

- Shriner, R. L. et al.

- Wentworth, W. E. & Ladner, S. J.
  - *Fundamentals of Physical Chemistry* (Wadsworth 1972)

- Pecskok, R. L. & Shields, L. D.

- Barrett, J.

Students intending to proceed to Chemistry IIIA are advised to purchase a copy of:


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**Economics I**

**Prerequisites** Nil

**Hours** 3 lecture hours and 1 tutorial hour per week

**Examination** One 3-hour paper plus progressive assessment

Introduces the basic economic problem (the problem of scarcity) and reviews the relevance of the main areas of economic study to this problem. Theories and aspects of such topics as employment, economic allocation, the distribution of income, and growth and development are broadly reviewed in the beginning to provide a background for later studies. While elementary macroeconomic concepts and theories are introduced at various points in this course, the course principally concentrates on microeconomics but in a way which integrates it with other areas of economics.

Following the introductory review, the course concentrates on the theory of individual and market demand. There is also some discussion of macroeconomic concepts of demand. Concepts of supply and of market equilibrium are introduced, and the macroeconomic Keynesian analog to Marshallian market equilibrium is discussed. After an analysis of the production, the course examines various types of market competition and their economic implications. Perfect competition, monopoly, oligopoly and other types of imperfect competition are considered. Attention is paid to the results of both theoretical and empirical studies. A section then follows analysing the pricing and employment of productive services and some macroeconomic extensions of distribution theory are considered. A concluding section of the course deals with various aspects of economic welfare.

Throughout the course special attention will be given to the institutional context in which economic decisions are made.

**Background Reading**

- Heyne, P. *The Economic Way of Thinking* (Science Research Associates)
- Lipsey, R. *Positive Economics* 2nd edn (Weidenfeld)

**Texts**

  - *Workbook to Accompany the Economics of Markets* (Wiley 1975)


Notes will be distributed on topics not covered by the above texts.

**References** To be advised
422203 Economics II

**Prerequisites**
Economics I

**Hours**
3 lecture hours and 1 tutorial hour per week

**Examination**
One 3-hour paper

**Content**
The elementary macroeconomic concepts introduced in Economics I are developed into a comprehensive examination of the determinants of aggregate economic activity. The microeconomic foundation of macroeconomic analysis is examined and the concept of general equilibrium is introduced. Conventional static models of economic activity, including both product and monetary markets, are examined from Keynesian and Monetarist points of view. Dynamic implications are introduced and extended into a preliminary discussion of the nature and causes of economic fluctuations and growth. Emphasis is given to the welfare implications of macroeconomic analysis, particularly in relation to policy goals associated with levels of employment, price stability and economic growth. Reference is made to externalities associated with macroeconomic policy measures, particularly as they effect the non-economic welfare of society. Special attention is given to the institutional context in which macroeconomic decisions are made and the role of the government and international sectors.

**Texts**
Wonnacott, P. *Macroeconomics* (Irwin 1974)

**References**
Keynes, J. M. *General Theory of Employment, Interest and Money* (Macmillan)
Trevithick, J. A. & Mulvey, C. *The Economics of Inflation* (Martin Robinson 1975)

742101 PH221 Electromagnetics and Quantum Mechanics—see Physics II

352200 Geography IIB

**Prerequisite**
Geography I

**Hours**
4 lecture hours, 2 hours of practical/tutorial work per week and 8 days field work

**Examination**
To be advised

**Content**
(i) A study of processes and patterns in man's physical environment. The behaviour of the atmosphere, including its interaction with the earth's surface, over wide ranges of scale in space and time.
(ii) Geomorphic processes and problems of historical geomorphology. The subject is a prerequisite for the Fluvial Geomorphology and Advanced Geomorphology electives in Geography III.

**Texts**
Barry, R. G. & Chorley, K. J. *Atmosphere, weather and climate* (Methuen Paperback 3rd edn 1968)
Strahler, A. N. *Physical geography* 4th edn (Wiley 1975)

**References**
To be advised

**Topic (b) 353110 Advanced Geomorphology**

**Prerequisites**
Geography IIB

**Hours**
2 hours per week and related tutorials and fieldwork

**Examination**
To be advised

**Content**
(i) Alluvial processes within the drainage basin system.
(ii) The historical-geomorphological interpretation of selected landscapes with some regard to the significance of the physical features for human occupation.

**Texts**
Gregory & Walling *Drainage basin form and process. A geomorphological approach* (Arnold 1973)
Lambert, A. M. *The making of the Dutch landscape* (Seminar 1971)

**References**
To be advised
Topic (c) 353111 Advanced Urban Geography

Prerequisites  Nil
Hours  2 hours per week and related tutorial and fieldwork
Examination  To be advised

Content
The study of human behaviour in urban systems, with an emphasis on temporal characteristics.

References  To be advised

Topic (d) 353103 Biogeography

Prerequisites  Nil
Hours  2 hours per week and related tutorial and fieldwork
Examination  To be advised

Content
(i) Some basic concepts in biogeography;
(ii) An introduction to ecology, with emphasis on man as an inseparable part of nature;

421107 Introductory Quantitative Methods (Replaces Economic Statistics I)
Not available to students who passed Economics IA prior to 1977.

Prerequisites  Nil
Hours  3 hours of lectures and tutorials per week in small groups
Examination  One final 3-hour paper and progressive assessment

Content
This course is an introductory course aimed at giving students an understanding of basic quantitative methods used in economics and business. The course covers three broad areas: elementary statistics, mathematical techniques in economics and elementary statistics, mathematical techniques in economics and elementary computing.

Elementary Statistics: Topics covered include probability, measures of central tendency and dispersion, introductory sampling and sampling distributions, hypothesis testing, linear regression and correlation analysis, time series analysis and index numbers.

Mathematical Techniques: Topics covered include the use of functions in economics, elementary calculus and matrices in economics and Mathematics of Finance.

Elementary Computing: Students will be taught BASIC programming and how to use the Faculty's computing facilities.

Preliminary Reading
Moroney, H. J.
Yeomans, K. A.

Texts
James, D. E. & Throsby, C. D.
Newton, B. L.

References
Kazmier, L. G.
Noter, J. et al.
Pollard, A. H.
Shao, S. P.
Whitmore, G. A. et al.
Yamane, T.

Mathematics

Preliminary Notes
The Department offers and examines subjects. Each subject is composed of topics, each topic consisting of about 27 lectures and 13 tutorials throughout the year. Each of the Part I, Part II, and Part III subjects consist of four topics. For Mathematics I, there is no choice of topics; for Mathematics IIA, IIB, IIC there is some choice available to students; for Mathematics IIA and IIB there is a wider choice. No topic may be counted twice in making up distinct subjects. (Students who passed some mathematics subjects before this arrangement of subjects was introduced should consult the "transition arrangements" set out on p.155 of the 1970 Faculty of Arts handbook, and p.76 of the 1973 Faculty of Mathematics handbook. Note that the "code letters" for the topics may vary slightly from year to year.)

661100 Mathematics I

Part I Subject

Prerequisites  Nil
Hours

4 lecture hours and 2 tutorial hours per week for three terms

Examination

Two papers of three hours duration

Content

Topics AN — Real Analysis
AL — Algebra
CA — Calculus
NM — Numerical Mathematics

PART I TOPICS

Topic AN — Real Analysis — M. J. Hayes

Prerequisites
Nil

Hours
1 lecture hour per week and 1 tutorial hour per fortnight

Content

Text
Nil

References
Apostol, T. Calculus Vol. 1 2nd edn (Blaisdell 1967)
Spivak, M. Calculus (Benjamin 1967)

Topic AL — Algebra — R. B. Eggleton

Prerequisites
Nil

Hours
One lecture hour per week and one tutorial hour per fortnight

Content
Introduction to basic algebraic objects and ideas. Matrices, permutations, complex numbers. Linear Algebra: vectorspaces, homomorphisms, matrices, determinants; algorithms for solution of equations; rank, nullity; eigenvectors and eigenvalues; applications various.

Text
Brisley, W. A Basis for Linear Algebra (Wiley 1973)

References
Lipschutz, S. Linear Algebra (Schaum 1968)
McCoy, N. Introduction to Modern Algebra (Allyn & Bacon 1968)
Tropper, Mary A. Linear Algebra (Nelson 1973)

Topic CA — Calculus — R. F. Berghout

Prerequisites
Nil

Hours
One lecture hour per week and one tutorial hour per fortnight

Content

Text
Nil

References
Apostol, T. Calculus Vol. 1 2nd edn (Blaisdell 1967)
Ayres, F. Calculus (Schaum Outline Series, McGraw-Hill)
Hille, E. & Salas, S. First Year Calculus Internat. Textbook Series (Blaisdell 1968)

Topic NM — Numerical Mathematics — R. J. Vaughan

Prerequisites
Nil

Hours
One lecture hour per week and one tutorial hour per fortnight

Content
Introduction to computers, flowcharts and Fortran coding. Elementary data analysis: calculations of sample moments of discrete distributions and programming of these operations. Introduction to statistical
analysis and numerical analysis with computer illustrations. The writing of successful computer programs is a required part of this topic.

Texts
Blatt, J. M.
or
Bellamy, C. J. & Whitehouse, L. G. and
Hoel, P. G.

References
Greenspan, H. D. & Benney, D. J.
Ralston, A.
Wilkes, M. V.

Basic Fortran IV Programming Version
MIDITRAN (Computer Systems of Australia Pty Ltd 1969)

or

An Introduction to Computer Programming in Fortran (monecs Fortran) (Monash Univ. Computer Centre 1976)

Introduction to Mathematical Statistics 4th edn (Wiley 1971)

Calculus—an Introduction to Applied Mathematics (McGraw-Hill 1973)

A First Course in Numerical Analysis (McGraw-Hill 1965)

A Short Introduction to Numerical Analysis (Cambridge U.P. 1971)

Part II Subjects

The Department offers three Part II subjects. Students whose course restricts them to one such subject must study Mathematics IIA or Mathematics IIB. The subject Mathematics IIA is a pre- or corequisite for Mathematics IIC, and IIA and IIC together a prerequisite for any Part III subject, so students wishing to take two Part II subjects would normally choose Mathematics IIA and IIC. Students taking all three of the Part II subjects would study all twelve of the topics listed below. Summaries and extended booklists for these topics will appear in the handbook of the Faculty of Mathematics and will also be available from the Department.

LIST OF TOPICS FOR PART II MATHEMATICS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Corequisite or Prerequisite Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mathematical Models</td>
</tr>
<tr>
<td>B</td>
<td>Complex Analysis</td>
</tr>
<tr>
<td>C</td>
<td>Calculus and Vector Calculus</td>
</tr>
<tr>
<td>D</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>E</td>
<td>Differential Equations and Integral Transforms</td>
</tr>
</tbody>
</table>

F    Numerical Analysis and Computing
G    Fourier series, Partial Differential Equations and Special Functions
H    Probability and Statistics
I    Topic in Statistics
J    e.g. Applications of Statistics
K    Topic in Applied Mathematics
L    e.g. Mechanics
M    Topic in Pure Mathematics
e.g. Group Theory
N    Analysis of Metric Spaces

The selection rules and definitions of the Part II subjects follow.

662100 Mathematics IIA

Prerequisite Mathematics I

Hours 4 lecture-hours and 2 tutorial-hours per week for three terms

Examination Each topic is examined separately

Content Topics B, C, D, and E. In exceptional circumstances and with the consent of the Head of Department, one topic from A, F, G, or H may be substituted for B. Additional substitutions may be allowed in the case of candidates who have passed the subject Mathematics IIB.

662200 Mathematics IIB

Prerequisite Mathematics I

Hours 4 lecture-hours and 2 tutorial-hours per week for three terms

Examination Each topic is examined separately

Content Four topics chosen from A to H and approved by the Head of Department. In exceptional circumstances, and with the consent of the Head of Department one or more of the topics I, J, K or L may be included.

Content For students in the Department of Chemical Engineering, Topics C, D, E, F
Civil Engineering, Topics C, D, E, H
Electrical Engineering, Mechanical Engineering, Surveying, 
For students taking a combined BSc/BE course: 

Any four of the eight topics A-H from the Part II list on page 282 and approved by the Head of Department

<table>
<thead>
<tr>
<th>662300 Mathematics IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
</tr>
<tr>
<td><strong>Corequisite</strong></td>
</tr>
<tr>
<td><strong>Hours</strong></td>
</tr>
<tr>
<td><strong>Examination</strong></td>
</tr>
<tr>
<td><strong>Content</strong></td>
</tr>
</tbody>
</table>

**Notes**

1. Students may, with the consent of the Head of Department, take Mathematics IIB in two parts each of two lectures per week for three terms.
2. In order to pass both Mathematics IIA and Mathematics IIB a student must study all the topics A to H above and offer them for examination.
3. Mathematics IIA is a corequisite for Mathematics IIC.
4. In order to pass in all three Part II subjects a student must study all twelve topics and offer them for examination.
5. Students who passed a Part II Mathematics subject prior to 1974 and who wish to take further Part II Mathematics subjects should note that the topic coded “L” since 1974 corresponds to the topic coded “A” in previous years. Such students may require special permission for their selection of Part II topics, and should consult with the Head of Department.

**Texts for Part II Topics**

<table>
<thead>
<tr>
<th>Topic A</th>
<th>Nil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic B</td>
<td>Theory and Problems of Complex Variables (McGraw-Hill 1964)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic C</th>
<th>Greenspan, H. D. &amp; Benney, D. J.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marder, L.</td>
</tr>
<tr>
<td></td>
<td>Marder, L.</td>
</tr>
<tr>
<td></td>
<td>Spiegel, M. R.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic D</th>
<th>Lipschutz, S.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Topic E</th>
<th>Boyce, W. E. &amp; DiPrima, R. C.</th>
</tr>
</thead>
</table>

| Topic F | Nil |

<table>
<thead>
<tr>
<th>Topic G</th>
<th>Boyce, W. E. &amp; DiPrima, R. C. and Sneddon, I. N.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Topic H</th>
<th>Freund, J. E. or Hoel, P. G.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Topic I</th>
<th>Nil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic J</td>
<td>Nil</td>
</tr>
<tr>
<td>Topic K</td>
<td>Nil</td>
</tr>
<tr>
<td>Topic L</td>
<td>Nil</td>
</tr>
</tbody>
</table>

**Part III Subjects**

The Mathematics Department offers two Part III subjects, each comprising four topics chosen from the list below. Students wishing to proceed to Honours in Mathematics are required to take both these subjects. They will also be required to study additional topics as prescribed by the Heads of Departments concerned.
Passes in both Mathematics IIA and IIC are prerequisite for entry to
Mathematics IIIA, and Mathematics IIIA is prerequisite or corequisite for
Mathematics IIIB. It will be assumed that students taking a third-year
subject in 1977 have already studied topics C, D, E, K and L in their
Part II subjects.
Summaries of the Part III topics together with extended booklists will
appear in the handbook of the Faculty of Mathematics and will also be
available from the Department.

LIST OF TOPICS FOR PART III MATHEMATICS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>General Tensors</td>
</tr>
<tr>
<td>N</td>
<td>Variational Methods</td>
</tr>
<tr>
<td>O</td>
<td>Mathematical Logic</td>
</tr>
<tr>
<td>P</td>
<td>Differential and Integral Equations</td>
</tr>
<tr>
<td>PD</td>
<td>Applications of Partial Differential Equations</td>
</tr>
<tr>
<td>Q</td>
<td>Fluid Dynamics</td>
</tr>
<tr>
<td>R</td>
<td>Probability and Statistics</td>
</tr>
<tr>
<td>S</td>
<td>Geometry</td>
</tr>
<tr>
<td>T</td>
<td>Group Theory</td>
</tr>
<tr>
<td>TC</td>
<td>Theory of Computing</td>
</tr>
<tr>
<td>U</td>
<td>Operations Research</td>
</tr>
<tr>
<td>V</td>
<td>Measure Theory and Integration</td>
</tr>
<tr>
<td>W</td>
<td>Analysis of Normed Linear Spaces</td>
</tr>
<tr>
<td>X</td>
<td>Rings and Fields</td>
</tr>
<tr>
<td>Y</td>
<td>Topic in Applied Probability</td>
</tr>
<tr>
<td>Z</td>
<td>Mathematical Principles of Numerical Analysis</td>
</tr>
</tbody>
</table>

The selection rules and definitions of the Part III subjects follow.

663100 Mathematics IIIA

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Hours</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIA &amp; IIC</td>
<td>4 lecture hours and 2 tutorial hours per week for three terms</td>
<td>Each topic is examined separately</td>
</tr>
</tbody>
</table>

663200 Mathematics IIIB

<table>
<thead>
<tr>
<th>Prerequisite or Corequisite</th>
<th>Hours</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIIA</td>
<td>4 lecture hours and 2 tutorial hours per week for three terms</td>
<td>Each topic is examined separately</td>
</tr>
</tbody>
</table>

Content
A subject comprising four topics, which must include one of P, PD, Q, R, U, or Y. In addition, students taking this subject will be required to complete an essay on a topic chosen from the history or philosophy of Mathematics.

NOTES
1. In order to take both Mathematics IIA and Mathematics IIIB, a student must study eight topics from M to Z above with the restriction that Topic O, and at least one of P, PD, Q, R, U or Y must be included in these eight topics.
2. Students aiming to take Mathematics IV may be required to undertake study of more topics than the eight comprising the two part III subjects.
3. Further details are available in the Mathematics Faculty handbook.

Texts for Part III Topics
Topic M | Nil

Elsgolc, L. E. | Calculus of Variations (Pergamon 1963)

Enderton, H. B. | A Mathematical Introduction to Logic (Academic 1972)

Sanchez, D. A. | Ordinary Differential Equations and Stability Theory: an Introduction (Freeman 1968)

ELECTIVE MATHEMATICS

Subject to meeting any pre- or corequisite requirements, students may take additional Part II and III 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:

<table>
<thead>
<tr>
<th>Number</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>662105</td>
<td>EM2A Mathematical Models</td>
</tr>
<tr>
<td>662106</td>
<td>EM2B Complex Analysis</td>
</tr>
<tr>
<td>662107</td>
<td>EM2C Calculus &amp; Vector Calculus</td>
</tr>
<tr>
<td>662108</td>
<td>EM2D Linear Algebra</td>
</tr>
<tr>
<td>662205</td>
<td>EM2E Differential Equations &amp; Integral Transforms</td>
</tr>
<tr>
<td>662206</td>
<td>EM2F Numerical Analysis &amp; Computing</td>
</tr>
<tr>
<td>662207</td>
<td>EM2G Fourier Series, Partial Differential Equations &amp; Special Functions</td>
</tr>
<tr>
<td>662208</td>
<td>EM2H Probability &amp; Statistics</td>
</tr>
<tr>
<td>662305</td>
<td>EM2I Topic in Statistics, e.g. Applications of Statistics</td>
</tr>
<tr>
<td>662306</td>
<td>EM2J Topic in Applied Mathematics, e.g. Mechanics</td>
</tr>
<tr>
<td>662307</td>
<td>EM2K Topic in Pure Mathematics, e.g. Group Theory</td>
</tr>
<tr>
<td>662308</td>
<td>EM2L Analysis of Metric Spaces</td>
</tr>
</tbody>
</table>

Recommended electives for students in the different Departments are as follows:

- Chemical Engineering: EM2B, EM2G
- Civil Engineering: EM2B, EM2G
- Electrical Engineering: EM2B, EM2F

Students may not take as an elective unit any topic which is included in Mathematics IIB for the Department in which they are enrolled.

Topics in Mathematics III subjects are also available as electives for Engineering students, and have been allocated EM3 numbers. Details are available as required.

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.

Note: The prerequisite for individual topics may not involve more than Mathematics IIB.

412600 Organisational Behaviour

Prerequisites Nil

Hours 2 lecture hours per week

Examination Two 2-hour papers (Terms 1 and 2)
               One 3-hour paper (Final)

Content Theories and research results relevant to problems of administration from the behavioural sciences viewpoint. Topics include behavioural models, values and attitudes, learning, perception, motivation, creativity, problem-solving, communications, group dynamics and leadership. These are treated in relation to the classical managerial functions, and the management of specialised functional areas, such as personnel, marketing, production and finance.

Texts

Leavitt, H. J. & Pondy, L. R.
Luthans, F.

References

Leavitt, H. J.
Miner, J. B.
Pugh, D. S.
Schein, E. H.
Sutermeister, R.
Tannenbaum, A. S.

Readings in Managerial Psychology 2nd edn
(Chicago U.P.)

Organisational Behavior (McGraw-Hill)

The Management of Human Relations
(Holt, Rinehart & Winston)

Managerial Psychology (Chicago U.P.)

Management Theory (Macmillan)

Writers on Organisations (Penguin)

Organisational Psychology (Prentice-Hall)

People and Productivity (McGraw-Hill)

Social Psychology of the Work Organisation
(Wadsworth)
Philosophy

General Note
One subject only is offered in First Year and Fourth Year, but two
subjects are offered in Second Year and Third Year, of which
students may take one or both. For each subject there will be two
examination papers.
To enrol in Fourth (Honours) Year, students should have completed
at least four Philosophy subjects and obtained at least Credit grad­
ing. In addition to course work, Fourth Year students will write a
thesis. In other years, essays and exercises will be part of the year's
work.

381100 Philosophy I

Prerequisites Nil

Hours 3-4 hours per week

Examination See below

Content
Section 1: Introduction to Philosophy
Section 2: Logic and Options
Section 3: Seminars

Section 1: 381101 Introduction to Philosophy (Dr Dockrill)

Hours 1 hour per week

Examination One 3-hour paper

Content
(i) Plato’s theory of political activity, morality, the nature of the
soul and its immortality, and universals.
(ii) Descartes’ quest for infallible knowledge, his theory of innate
ideas, and his attempt to prove the existence of God and the
immaterial character of the soul. This section will continue
throughout the year.

Texts
Descartes Philosophical Writings (Anscombe & Geach
(ed.s.) (Nelson)
Plato The Last Days of Socrates (Penquin)

References
Burnet, J. Greek Philosophy (Macmillan)
Guthrie, W. K. C. The Greek Philosophers (Methuen)
Socrates (Cambridge U.P.)

Kenny, A. Descartes (Random House)
Taylor, A. E. Plato: the Man and his Work (Methuen)

Section 2: 381103 Logic and Options

Hours 2 hours per week

Content
First half-year, Introduction to Logic (Dr Robinson)
Assumes no prior acquaintance with logic and introduces students to
a formal study of validity of arguments as encountered in philosophy
and elsewhere. Topics include truth and implication, the structure of
propositions and arguments, class and logical relations.

Texts Nil. Lecture notes with further references will
be issued.

Examination An examination in Term II: For those dis­
satisfied with their result, a further examina­
tion in November.

Second and Third Terms: two of a series of options.

Content
(a) Basic Symbolic Logic
(b) Scientific Method
(c) Introduction to Ethics
(d) Introduction to Political Philosophy
Details of options will be provided during the first half-year, and
choice should be discussed with members of the Department.

Examination One 3-hour paper for the 2 options

Section 3: 381104 Seminars (Mr Sparkes)

Hours Seminars are held approx. fortnightly in Term
I & II.

Content
Seminars are conducted in small groups, and the programme is
related to the material of Section 1. Members of groups are expected
to prepare papers, and to develop acquaintance with problems and
ways of discussing them.
As with essays, marks awarded for papers will be included in the
mark for the year’s work. Credit is also given for performance as
a group member.
**741200 Physics IA**

**Prerequisite**  
Physics (2 unit course), grade 1, 2 or 3 or Multistrand (4 unit) Science, grade 1, 2 or 3 (advisory)

**Hours**  
3 lecture hours and 3 hours of laboratory and tutorial work per week

**Examination**  
One 2-hour paper after the end of each term and an hour's written examination on the year's practical work.

**Content**  
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). A rigorous, mathematically based discipline with emphasis on the unifying principles which link together different areas of the subject. 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.

**Texts**  

**741300 Physics IB**

**Prerequisite**  
Physics (2 unit course), grade 1, 2 or 3 or Multistrand (4 unit) Science, grade 1, 2 or 3 (advisory)

**Hours**  
3 lecture hours and 3 hours of laboratory or demonstrations and practice period per week

**Examination**  
One 2-hour paper after the end of each term.

**Content**  
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). 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.

**Texts**  
Refer to Physics Department notice board.

**742100 Physics II**

**Prerequisites**  
Mathematics I, Physics IA or normally a credit pass or better in Physics IB.

**Hours**  
3 lecture hours and 6 laboratory hours per week.

**Examination**  
Equivalent of 6 hours total examination.

**Content**

Mechanics  
Thermal Physics  
Quantum Physics  
Electromagnetics  
Physical Optics

Physics II students should include at least one Group II Mathematics subject, incorporating for preference Topics C, E, G and H in their course. (It is possible to achieve this combination with either Mathematics IIB alone, or Mathematics IIA and IIC).

**Texts**  
Baird, D. C.  
Hayt, W. H.  
Smith, F. G. & Thompson, J. H.  
Young, H. D.

*Experimentation* (Prentice-Hall 1962)  
*Optics* (Wiley 1971)  

Any further texts will be listed on the Physics Department notice board.

**743100 Physics IIIA**

**Prerequisites**  
Physics II, Mathematics IIA or IIB or IIC with Topics C, E, G and H or B or D recommended.

**Hours**  
4 lecture hours and 8 laboratory hours per week

**Examination**  
Assessment to the equivalent of three 3-hour papers.

**Content**  
The areas of classical and quantum physics essential to the understanding of both advanced pure physics and also the many applications of physics. Some electronics is also included.

**Texts**

Refer to Physics Department notice board.
742101 PH221 Electromagnetics and Quantum Mechanics

Prerequisites
Mathematics I, Physics IA, or normally a credit pass in IB

Hours
45 lecture hours and 45 laboratory hours

Examination
One 2-hour paper and one 1-hour paper

Content
For students in Electrical Engineering and covers Electromagnetics and Quantum Physics.
Students who may later wish to continue Physics in the Science Faculty are advised that Science Faculty regulations require that Physics II be completed in a single year.

Texts
Young, H. D. *Fundamentals of Optics and Modern Physics* (McGraw-Hill)

Further texts will be advised.

660101 Programming and Algorithms — A. J. Guttmann

Assumed Standard of Mathematics I

Attainment

Hours
2 lecture hours and 1 tutorial hour per week for 1st half year

Examination
One 3-hour paper and a possible paper on programming techniques

Content
Structured Programming, Program design, Flow charts, Decision Tables, Natural Language formulation of algorithms. Introduction to FORTRAN, ALGOL and the conversational language BASIC. Use of higher level languages to solve problems of a non-numerical nature. Programming techniques, efficient programming, evaluation of expressions, sources of error. Programme development, diagnostics, testing, etc. Nature of algorithms and heuristics. Analysis of algorithms. Programme structure, procedures, subroutines, scope of variables. Recursion. Simulation, Random number generators.

Text
Guttmann, A. J. *Programming and Algorithms* (Heinemann 1976)

References

International Computers Ltd

Day, A. C. *Introduction to Fortran IV Programming* (Goodyear 1967)


660112 CS—Data Structures and Programming — J. A. Campbell

Assumed Standard of Programming & Algorithms

Attainment

Hours
2 lecture hours and 1 tutorial hour per week for the 2nd half year

Examination
One 2-hour paper

Content
Introduction to data structures: lists, strings, arrays, trees, graphs, searching and sorting; list processing. Higher level programming languages: Syntax and semantics. Backus normal form, Polish notation. Declarations, storage allocation, subroutines and linkage. Compilation, interpretation and translation. Study and comparison of data structures in several languages, e.g. ALGOL 60, ALGOL 68, COBOL, FORTRAN, LISP, etc.

Text
Nil

References

Day, A. C. *Fortran Techniques: with Special Reference to Non-numerical Applications* (Cambridge U.P. 1972)
433200  Industrial Law

Prerequisites
Although Legal Studies I is not a mandatory prerequisite for Industrial Law, it is desirable that students taking the subject should have completed such a “legal system” course. Students who have not studied Legal Studies I before or some similar course giving an introduction to the Australian Legal System are strongly advised to take the introductory course offered by the Department of Legal Studies in the week prior to the commencement of the academic year (see “Introduction to the Australian Legal System”).

Duration
One full academic year

Hours
2 lecture hours and 1 tutorial hour per week

Assessment
Students will be advised at the beginning of the course of the methods of assessment to be used. Part of the assessment will consist in the regular presentation of written answers to tutorial problems.

Content
Industrial law is divided into five parts:

(1) Relationship of Employer and Employee
This covers the principles involved in identifying and defining the relationship of employer and employee.

(2) Contract of Employment
This examines the formation, termination and terms of the contract of employment; in particular it looks at the terms relating to the duration of the contract and the duties of the employer and the employee.

(3) Statutes Regulating Employment
This examines some of the important statutes regulating the employment relationship, e.g. Annual Holidays Act 1944, Long Service Leave Act 1955.

(4) Collective Aspects of Industrial Law
As a background to this topic the division of power to regulate industrial matters between the Commonwealth and States is examined. Then the course looks at the status of trade unions, strikes and lockouts, award making and wage fixing and the legal framework of the Commonwealth and State systems of conciliation and arbitration.

(5) Compensation for Injuries
This examines the two methods of compensation presently used, the common law action for negligence and the Workers’ Compensation Scheme and then looks at the proposed reforms in the National Compensation Scheme.

Introduction to the Australian Legal System
To cater for students who have not studied law before an introductory course will be offered in the week before term commences. Classes will be held from Monday to Friday commencing at 5.30 p.m. and finishing at 7.30 p.m. Further information can be obtained from the Secretary, Department of Legal Studies after February 1, 1977.

Texts
Derham, D. P. et al. An Introduction to Law (Law Book Co.)
Enright, C. S. Constitutional Law of Australia (Law Book Co.) Chapters 1 & 2 should be read before the first class.
Vermeesch, R. B. & Lindgren, K. E. Business Law of Australia (Butterworths)
The above three books will be on closed reserve in the University Library.

Suggested Preliminary Reading
Cullen, C. L. & Sykes, E. I. An Outline of Industrial Law (Law Book Co.)
Macken, J. J. The Employer, the Employee and the Law 3rd edn (Law Book Co.)

Texts
Sykes, E. I. & Glasbeek, H. J. Labour Law in Australia (Butterworths)

Statutes
—Annual Holidays Act, 1944 (N.S.W. Govt Printer)
—Conciliation and Arbitration Act, 1905 (Australian Govt Printer)
431100 Legal Studies I

Prerequisites
Nil

Duration
One full academic year

Hours
2 lecture hours and 1 tutorial hour per week

Examination
Progressive assessment during the year, with an end of year examination. At the commencement of the course students will be informed of the number, status for assessment, and periods for submission of written assignments.

Content
The course is designed to enable students of a number of disciplines within the University to:

- examine some basic legal concepts and the divisions of law and the institutions of the Australian legal system
- acquire special skills for the examination of legal materials, such as an ability to analyse statements contained in judgments, and to interpret provisions of an Act of Parliament.
- explore the foundation of the processes of law-making through judicial decisions, and primary and delegated legislation.

This course also introduces the student to some theories as to the nature and function of law in society.

Suggested Preliminary Reading

Derham, D. P. et al. An Introduction to Law (Law Book Co.)
Sawer, G. The Australian and the Law (Pelican)
Shtein, B. J. L. & Lindgren, K. E. Introduction to Business Law (Law Book Co.)
Williams, G. L. Learning the Law (Stevens)

Prescribed Reading

Vermeesch, R. B. & Lindgren, K. E. Business Law of Australia (Butterworths)


Printed materials will be issued to students at the commencement of the course.

Other References

Netheim, G. & Chisolm, R. Understanding Law (Butterworths)
Sawer, G. Australian Government Today (Melbourne U.P.)
Sawer, G. The Australian Constitution (Aust. Govt Publishing Service)