The information in this Handbook is correct as at 1st October, 1978.

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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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A Message from the Dean

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.

Having chosen to study in one of the fields of Engineering, in Surveying or Metallurgy, we believe you are embarking on a professional career which is both challenging and stimulating. It is clear we are living in a technological age—an age which has seen a tremendous burst of scientific and technological development and which has had a marked effect on the modes and characteristics of our society. It is also clear that the future of our society is very much dependent on the solution of a number of very complex technological problems, notably those associated with the alternative forms of energy and with food production. Graduates in the various professions of Engineering, Surveying and Metallurgy will, in their own way, be required to contribute to the solution of these problems.

With these objectives in mind, the Faculty of Engineering has continued to up-date course material to meet the current and future standards of the professions and the needs of society. To ensure that this is done effectively, it is essential to maintain a stimulating learning environment, teaching and assessment methods. While the various courses provide the essential depth of study in the principal technical fields, we believe it to be of major importance that students gain some breadth in their educational experience. For this reason each degree programme contains a component of supporting studies in which students are encouraged to take subjects in other faculties. The rationale for this is obvious. While the role of the professional Engineer, Surveyor or Metallurgist may be seen as providing technical solutions to technical problems, he or she must also be acutely aware of the social implications of the decisions being made. The interrelation of the professions and society is one of growing importance.

The opportunity to obtain a well-rounded tertiary educational experience is embodied in the very concept of the University system. 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 in any way 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, Surveying or Metallurgy degree requires a great deal of dedication and perseverance, but the task is certainly a rewarding one.

A. W. Roberts,
Dean, Faculty of Engineering.

INTRODUCTION

In this Handbook we have attempted to provide most of the information you will need regarding both undergraduate and postgraduate courses offered in the Faculty of Engineering. This Handbook will help you to know who the people in your Faculty are, the requirements for degrees offered in the Faculty and the ways that these can be satisfied, what subjects are offered, and the books required for these subjects; and where to turn for more information, advice and help.

Section I sets out the staff of the Faculty of Engineering. Section 2 deals with the Departments of the Faculty and courses for which each Department is responsible. Degree requirements for both undergraduate and postgraduate courses are set out in Section 3 and descriptions of subjects are listed in Section 4. Approved programmes for combined degree courses are set out in Section 5 and subject computer numbers for use with Enrolment Forms and Variation of Programme Forms are listed in Section 6.

ADVICE AND INFORMATION

Advice and information on matters concerning the Faculty of Engineering can be obtained from a number of people. For general enquiries about University regulations, Faculty rules and policies, studies within the Faculty and so on, you should see:

The Faculty Secretary — Mr. B. J. Kelleher
The Faculty Administrative Assistant — Ms. L. R. Brown
The Sub-Dean of the Faculty — Mr. G. D. Butler
or The Dean of the Faculty — Professor A. W. Roberts.

For enquiries regarding studies in particular Departments within the Faculty you should arrange to see the following staff in the particular Department concerned:

Chemical Engineering — Dr. W. G. Kirchner
or Professor G. J. Jameson
Civil Engineering — Dr. W. G. Field
or Professor F. M. Henderson
Electrical Engineering — Dr. K. K. Saluja
or Associate Professor G. C. Goodwin
Mechanical and Industrial Engineering — Mr. G. D. Butler
or Professor A. W. Roberts
Metallurgy — Mr. J. E. McLennan
or Professor E. O. Hall
Surveying — Dr. J. G. Fryer
Section 1

STAFF OF THE
FACULTY OF ENGINEERING

FACULTY OF ENGINEERING

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Sub-Dean
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Faculty Secretary
B. J. Kelleher, BE, BCom

Professor of Engineering
D. W. George, BSc, BE, PhD(Sydney), FTS, FIEE, FIMechE, FIEAust, FAIP (Vice-CHANCELLOR AND PRINCIPAL)

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Section 2

THE FACULTY OF ENGINEERING AND THE DEGREES OFFERED

1. THE FACULTY OF ENGINEERING
The Faculty of Engineering is constituted by the Council of the University under By-law 2.4.1 and comprises the Departments of Chemical Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering and Metallurgy.

The Faculty Board, Faculty of Engineering is charged with conducting the affairs of the Faculty under By-law 2.4.2. The Faculty Board consists of:

(i) the members of the full-time academic staff of the Departments composing the Faculty;
(ii) a member from the Department of Chemistry;
(iii) a member from the Department of Geology;
(iv) a member from the Department of Physics;
(v) a member from the Department of Architecture;
(vi) a member from the Department of Psychology;
(vii) Two members from the Department of Mathematics;
(viii) a member from the Faculty of Arts;
(ix) a member from the Faculty of Economics and Commerce;
(x) a member from the Department of Education;
(xi) four student members.

The responsibilities of the Faculty Board are set out in By-law 2.4.4 which states:

"Subject to the authority of the Council and the Senate and to any resolution thereof, a Faculty Board shall:

(a) encourage and supervise the teaching and research activities of the Faculty;
(b) determine the nature and extent of examining in the subjects in the courses of study for the degrees and diplomas in the Faculty;
(c) determine the grades of pass to be awarded and the conditions for granting deferred or special examinations in respect of the subjects in the courses of study for the degrees and diplomas in the Faculty;
(d) determine matters concerning admissions, enrolment and progression in the courses of study for the degrees and diplomas in the Faculty and make recommendations on such of those matters as require consideration by the Admissions Committee;
(e) consider the examination results recommended in respect of each of the candidates for the degrees and diplomas in the Faculty and take action in accordance with the Examination Regulations made by the Council under By-law 5.9.1;
(f) deal with any matter referred to it by the Senate;
(g) make recommendations to the Senate on any matter affecting the Faculty;"
The degrees offered by the Faculty of Engineering are:

(i) Undergraduate—
- Bachelor of Engineering (B.E.)
- Bachelor of Metallurgy (B.Met.)
- Bachelor of Surveying (B.Surv.)
- Bachelor of Science (Engineering) (B.Sc.(Eng.))
- Bachelor of Science (Metallurgy) (B.Sc.(Met.))

(ii) Postgraduate—
- Master of Engineering (M.E.)
- Master of Science (M.Sc.)
- Master of Engineering Science (M.Eng.Sc.)

In addition to the above degrees the Faculty of Engineering also offers the postgraduate Diploma in Industrial Engineering (Dip.Ind.Eng.)

Departments within the Faculty are also equipped to supervise research leading to the award of the degree of Doctor of Philosophy (Ph.D.)

2. UNDERGRADUATE COURSES OFFERED

Each Department within the Faculty of Engineering is responsible for the offering of courses leading to degrees in particular specialities as well as the offering of service subjects for courses leading to degrees in other specialities.

(i) DEPARTMENT OF CHEMICAL ENGINEERING

The Department of Chemical Engineering is responsible for teaching courses in the speciality 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 bio-chemical and bio-medical engineering apply chemical engineering principles to bacterial processes and to research into the functions of and artificial substitution for such systems as kidneys and other organs.

Two degree courses are offered in the Department of Chemical Engineering.

(a) BACHELOR OF ENGINEERING in the speciality of Chemical Engineering. This 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).

(b) BACHELOR OF SCIENCE (ENGINEERING) in the speciality of Chemical Engineering. This 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 (Great Britain) recognises it as exempting from two of their examinations.

Degree Requirements and course programmes for the above degrees are set out in Section 3 of this Handbook.

In addition to these degree courses, combined courses leading to the degree B.E. in the Chemical Engineering speciality and the degree of B.A., B.Com., B.Ec., B.Math. or B.Sc. have been approved. The approved combined course programmes are set out in Section 5 of this Handbook.

(ii) DEPARTMENT OF CIVIL ENGINEERING

The Department of Civil Engineering is responsible for teaching courses in the specialities of Civil Engineering and Surveying.

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 and 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.

Surveying entails the measurement of lengths, angles and heights on the earth’s surface and thus a land surveyor is an expert in such measurements. The land surveyor’s claim to professional status, however, lies in his ability to use and interpret the results of his, or others’, measurements of categories, such as Cadastral Surveying,
Engineering Surveying, Topographical Surveying, Geodetic Surveying, and Hydrographic Surveying. There is also a current trend which may lead to the surveyor coming to be regarded as an expert in all aspects of land use and management. Modern technology plays a large part in the life of the twentieth century surveyor. He may be required to use very sophisticated electronic equipment for precise distance measurement, programmable electronic desk computers or precision plotting machines interfaced with electronic computers. As well as being trained to handle such equipment, and the conventional surveying instruments such as theodolites, levels, tapes, etc., he must be educated in such a way as to ensure that he is not left behind in the inevitable advance of surveying technology during his working lifetime.

This implies that his education should include a good grounding in mathematics and physics, the sciences which form the basis of technology. However, his education must be far broader than this, as he must be able to apply existing and new techniques to the various fields of surveying which were mentioned earlier. This requires an understanding of the requirements of each of these fields, and a study of a number of special disciplines which are involved in supplying these requirements e.g. study of land law, town planning, land use, economics etc. is essential to the correct development of land for society’s needs; while the study of specialised branches of mathematics may be needed for an understanding of geodetic surveying and mapping.

In order to work in a full professional capacity in the field of Cadastral or Property Surveying, it is necessary to become a Registered Surveyor under the Surveyors Act, 1929, as amended. Before applying for registration a surveyor is required to graduate from a University, Institute of Technology or a College of Advanced Education in Surveying. In New South Wales only two such courses are available. These are offered by the University of New South Wales and this University. A surveying graduate is required to serve two years under articles to a Registered Surveyor engaged primarily on land boundary surveys. An exemption of up to six months may be granted in respect of non-continuous training and experience gained during vacation periods, provided it is gained under a Registered Surveyor engaged in land boundary definition during that period. The surveyor must provide a certificate satisfactory to the Board of Surveyors of New South Wales. A further non-continuous period of up to six months may be served under articles during vacations, i.e. the student must become articled to each surveyor for whom he works, and the articles must be registered with the Board. The Board of Surveyors administers the Surveyors Act of 1929. Its executive officer is known as the Registrar, and enquiries regarding any aspect of registration should be directed to him. The remaining period of articles, being not less than one year, is taken after completion of the degree by full-time students. After completing the necessary period under articles candidates for registration are required to complete the Board’s examination.

Two degree courses are offered in the Department of Civil Engineering.

(a) BACHELOR OF ENGINEERING in the speciality of Civil Engineering. This may be read as a four year full-time course or a seven year part-time course or any combination of full-time and part-time attendance. The degree is recognised for the full academic requirements of corporate membership of the Institution of Engineers, Australia. The first two years of this course are 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.

(b) BACHELOR OF SURVEYING. This may be read as a four year full-time course or a seven year part-time course or any combination of full-time and part-time attendance.

Degree Requirements and course programmes for the above degrees are set out in Section 3 of this Handbook.

In addition to the above degree courses, combined courses leading to the degree of B.E. in the Civil Engineering speciality and the degree of B.A., B.Com., B.Ec., B.Math. or B.Sc. have been approved. The approved combined course programmes are set out in Section 5 of this Handbook.

(iii) DEPARTMENT OF ELECTRICAL ENGINEERING

The Department of Electrical Engineering is responsible for teaching courses in the specialities of Computer Engineering and 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.

Two degree courses are offered in the Department of Electrical Engineering.

(a) BACHELOR OF ENGINEERING in the speciality of Electrical Engineering. This may be read as a four year full-time course or a seven year part-time course or any combination of full-time and part-time attendance. This course may also be taken under a sandwich pattern.
(b) BACHELOR OF ENGINEERING in the speciality of Computer Engineering. This may be read as a four year full-time or a seven year part-time course or any combination of full-time or part-time attendance. This course may also be taken under a sandwich pattern.

Degree Requirements and course programmes for the above degrees are set out in Section 3 of this Handbook.

These degree courses are recognised for the full academic requirements of corporate membership of the Institution of Engineers, Australia. In addition to the above degree courses, combined courses leading to the degree of B.E. in either the Mechanical or Industrial Engineering speciality and the degree of B.A., B.Com., B.Ec., B.Math. or B.Sc. have been approved. The approved combined course programmes are set out in Section 5 of this Handbook.

(v) DEPARTMENT OF METALLURGY

The Department of Metallurgy is responsible for teaching courses in the speciality of Metallurgy.

The field of knowledge, experience and practice covered by the term Metallurgy is one that has expanded and developed greatly in the past and is still doing so today. Briefly metallurgy is concerned with the extraction of metals from their ores, their properties, fabrication and fundamental structure. Embracing such a wide field the subject gives scope for many types of interest and allows the inter-action of many disciplines.

Two degree courses are offered in the Department of Metallurgy.

(a) BACHELOR OF METALLURGY. This may be studied as a full-time or part-time degree and may be taken out after the successful completion of the equivalent of four years full-time study and the fulfillment of the requirements of industrial experience. Candidates achieving a high over-all standard may be awarded the degree with Honours. The standard required is calculated on a grade point average system. Various combinations of full and part-time study are available for both these degree courses.

(b) BACHELOR OF SCIENCE (METALLURGY). This is a part-time degree and may be taken out after the successful completion of the equivalent of three years full-time study and fulfillment of the requirements of industrial experience.

Degree Requirements and course programmes for the above degrees are set out in Section 3 of this Handbook.

In addition to the above degree courses, the combined course leading to the degrees of B.Met. and B.Math. has been approved. The combined course programme is set out in Section 5 of this Handbook.

3. POSTGRADUATE DEGREES OFFERED

(i) Diploma in Industrial Engineering

The Department of Mechanical Engineering is responsible for the teaching of subjects which may be taken in the Diploma of Industrial Engineering.

The Diploma in Industrial Engineering is a postgraduate course directed especially towards those concerned with the planning, supervision and administration of industrial undertakings. The course
has a twofold objective. Primarily it has been designed as a bridging course for those graduates with limited or no formal training in the various basic disciplines of industrial engineering. In this respect the programme of study will be selected so as to complement the person's particular technological knowledge with instruction in the industrial field so that he can better perform the functions of industrial management, planning and control. For those who already have had in their undergraduate programme, a comprehensive training in the basic disciplines of industrial engineering, the course has a secondary objective. In this case the aim is to broaden the person's basic training with the offer of study in a wider range of disciplines which have an important application in the industrial engineering field.

The Diploma programme consists of ten units of formal course work plus two units of project work. Normally this programme shall be completed in not less than two years of part-time study, although in special cases approved by the Faculty Board, the programme may be completed in one year on a full-time study basis.

The Requirements for the Diploma in Industrial Engineering and the Schedule of Subjects available is set out in Section 3 of this Handbook.

(ii) Master of Engineering Science

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

The Departments of the Faculty of Engineering offer 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 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.

The Requirements for the Master of Engineering Science degree and the subjects offered are set out in Section 3 of this Handbook.

(iii) Master of Engineering

The Master of Engineering degree has the primary aim of introducing the student to research, and bringing him to the point where he will be able to conduct research effectively under direction. Course work will normally be included in the programme with a normal minimum amount of three postgraduate “units,” but the quality and standard of work required in the thesis will be at a higher level than that expected of an Honours Bachelor of Engineering graduate.

The Requirements for the Master of Engineering degree are set out in Section 3 of this Handbook.

(iv) Master of Science

This degree is similar to the Master of Engineering degree but is usually taken by students with a non-engineering background or students who are carrying out research in areas related to engineering.

The Requirements for the Master of Science degree are set out in Section 3 of this Handbook.
I—DEGREE REQUIREMENTS FOR UNDERGRADUATE COURSES

Contents:
1 — General
2 — Bachelor of Engineering
3 — Bachelor of Metallurgy
4 — Bachelor of Surveying
5 — Bachelor of Science (Engineering)
6 — Bachelor of Science (Metallurgy)
7 — Combined Courses
8 — Elective Requirements
9 — Relaxing Clause
Appendix A — Elective Requirements
Appendix B — Transition Arrangements

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) (i) 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.
(ii) There shall be two classes of Honours, namely Class I and Class II. Class II shall have two divisions, namely Division I and Division II.
(iii) In each degree course, the most distinguished of the candidates being awarded First Class Honours may be awarded a University Medal.

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

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

8 The Faculty Board has adopted a method for determining the grade of honours to be awarded. This is shown on page 68 of this Handbook.
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 the Examination Regulations.

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) The Faculty Board on the recommendation of the Head of a Department of the Faculty may prescribe prerequisites and/or corequisites for any subject offered by that Department.

(b) Except with the permission of the Dean acting on the recommendation of the Head of the Department offering the subject, no candidate may enrol in any subject unless he has passed the subjects prescribed as its prerequisites and has already passed or concurrently enrols in or is already enrolled in the subjects prescribed as its corequisites.

(c) A candidate shall be deemed for the purposes of subsection (b) of this section to have passed subjects in which he has been granted standing pursuant to section 12.

12. **Standing**

The Faculty Board may grant to a candidate, on such conditions as it may determine:

(a) standing in subjects prescribed for the course in which he is enrolled in recognition of work completed in this University or another institution;

(b) 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.

1 For list of subjects deemed to be mutually exclusive see page 72 of this Handbook.

2 For list of subjects deemed to be acceptable alternatives see page 73 of this Handbook.

3 For industrial experience requirements as prescribed by the Faculty Board see page 74 of this Handbook.

9 For Faculty Board's interpretation of the Academic Progress By-laws see page 71 of this Handbook.

11 For standing granted to holders of Technical College Certificate see page 73 of this Handbook.
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 3.1
Bachelor of Engineering in Civil Engineering — Schedule 3.2
Bachelor of Engineering in Electrical Engineering — Schedule 3.3
Bachelor of Engineering in Industrial Engineering — Schedule 3.4
Bachelor of Engineering in Mechanical Engineering — Schedule 3.5
Bachelor of Engineering in Naval Architecture — Schedule 3.6

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 as 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 these Requirements or
   (b) continue in the course to enable him to complete all requirements for admission to the degree before the end of the 1979 academic year.

4 Schedule 1.6 has been deleted from this Handbook as the Bachelor of Engineering course shown in Naval Architecture is being phased out.
5 For industrial experience requirements as prescribed by the Faculty Board see page 74 of this Handbook.
6 Schedules 3.2-3.6 have been deleted from this Handbook as the Bachelor of Science (Engineering) courses in Civil, Electrical, Industrial and Mechanical Engineering, and Naval Architecture are being phased out.

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 Economics, or Bachelor of Mathematics or Bachelor of Science by completing a combined degree course approved by the appropriate Faculty Boards.
(v) Bachelor of Metallurgy?
A candidate may satisfy the requirements for admission to the degree of Bachelor of Metallurgy together with the requirements for admission to the degree of Bachelor of Mathematics by completing a combined course approved by the Faculty Board, Faculty of Engineering and the Faculty Board, Faculty of Mathematics.

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.

5 For industrial experience requirements as prescribed by the Faculty Board see page 74 of this Handbook.
7 For approved combined degree programmes see Section 5 of this Handbook.
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 7 ½ hours/week) taken from other departments in the University. Normally students will include EE131 Circuit Fundamentals—EE211 Energy Conversion and materials science and structural mechanics. 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

(a) Bachelor of Engineering in Electrical or Computer Engineering

Nine units of electives shall be chosen in accordance with the following rules:

(1) Eight units shall be selected from subjects offered outside the Faculty of Engineering.
(2) At least four units of the eight units in Rule (1) above shall comprise a first-year Arts subject or the equivalent in a non-technical area.
(3) One unit shall be selected from subjects offered within the Faculty of Engineering but not offered by the Department of Electrical Engineering.
(4) Students may count up to five units from the Department of Electrical Engineering's List of Industrial Experience Subjects as elective units provided that no such subjects are counted as first-year Arts subjects under Rule (2) above.

(b) List of Industrial Experience Subjects

The subjects comprising the Department of Electrical Engineering's List of Industrial Experience Subjects shall be determined by the Faculty Board on the recommendation of the Head of Department of Electrical Engineering.

The following subjects have been approved for this purpose:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE092 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>EE093 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>EE094 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>EE095 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>EE096 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>EE097 Industrial Experience</td>
<td>2</td>
</tr>
</tbody>
</table>

The subject EE097 may be taken only by students enrolled under the sandwich pattern.

4. DEPARTMENT OF MECHANICAL ENGINEERING

(a) Bachelor of Engineering in Mechanical Engineering

Ten units of electives shall be chosen in accordance with the following rules:

(1) At least two units but not more than six units shall be taken outside the Faculty of Engineering.
(2) At least four units shall be selected from the Department of Mechanical Engineering's List of Technical Electives.
(3) Students may count up to four units from the Department of Mechanical Engineering's List of Industrial Experience Subjects as elective units taken outside the Faculty of Engineering under Rule (1) above.

(b) Bachelor of Engineering in Industrial Engineering

Eleven units of electives shall be chosen in accordance with the following rules:
(1) At least four units shall be selected from the List of Industrial Engineering Electives.
(2) No more than seven units (including the four units under Rule (1) above) may be counted from subjects taken outside the Faculty.
(3) At least four units shall be selected from the Department of Mechanical Engineering's List of Technical Electives.
(4) Students may count up to three units from the Department of Mechanical Engineering's List of Industrial Experience Subjects as elective units taken outside the Faculty of Engineering under Rule (2) above.

(c) List of Technical Electives

The subjects comprising the Department of Mechanical Engineering's List of Technical Electives shall be determined by the Faculty Board on the recommendation of the Head of the Department of Mechanical Engineering.

The following subjects have been approved for this purpose. Not all of these subjects need be offered in any one year.

Subject | Units
--- | ---
ME401 Systems Analysis | 1
ME404 Mathematical Programming | 1
ME405 Advanced Engineering Computations | 1
ME407 Environmental Engineering | 1
ME409 Introduction to Noise Pollution Control | 1
ME410 Advanced Design Concepts I | 1
ME419 Bulk Materials Handling Systems Analysis and Design | 1
ME434 Advanced Kinematics and Dynamics of Machines | 1
ME444 Properties of Materials | 1
ME445 Mechanics of Solids | 1
ME448 An Introduction to Photomechanics | 1
ME449 Reliability Analysis for Mechanical Systems | 1
ME453 Fluid Mechanics | 1
ME473 Thermodynamics | 1
ME474 Heat Transfer | 1
ME476 Developments in the Use of Solar Energy | 1
ME483 Production Engineering | 1
ME484 Engineering Economics II | 1
ME487 Operations Research—Deterministic Models | 1
ME488 Operations Research—Probabilistic Models | 1
ME505 Systems Planning, Organisation and Control | 1
GE471 Energy | 1
GE472 Energy | 1

Students are encouraged to choose technical electives related to their ability, area of interest and in particular, their final year project. Thus students are advised to choose technical electives from one of the following strands only.

(d) List of Industrial Engineering Electives

The subjects comprising the Department of Mechanical Engineering's List of Industrial Engineering Electives shall be determined by the Faculty Board on the recommendation of the Head of the Department of Mechanical Engineering.

The following subjects have been approved for this purpose. Students wishing to take subjects marked * should make sure that they have met the necessary prerequisite conditions prior to enrolling in them.

Subject | Units
--- | ---
Psychology I | 4
Sociology I | 4
Economics I | 4
Legal Studies I | 4
Organisational Behaviour | 4
Industrial Law | 4
Industrial Relations II | 4
*Theories of Organisation | 4
*Labour Economics | 4

(e) List of Industrial Experience Subjects

The subjects comprising the Department of Mechanical Engineering's List of Industrial Experience Subjects shall be determined by the Faculty Board on the recommendation of the Head of the Department of Mechanical Engineering.

The following subjects have been approved for this purpose:

ME092 Industrial Experience 1 unit
ME093 Industrial Experience 1 unit
ME094 Industrial Experience 1 unit
ME095 Industrial Experience 1 unit
ME096 Industrial Experience 2 units
ME097 Industrial Experience 2 units
ME098 Industrial Experience 2 units

The subjects ME097 and ME098 may be taken only by students enrolled under the sandwich pattern.

5. DEPARTMENT OF METALLURGY

Elective I

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

- Physics II (4) (6 contact hrs/wk.)
- Maths II Topics (1 each)
- Electronics & Instrumentation (4)
- EE131 Circuit Fundamentals (1)
- ME251 Fluid Mechanics (1) or
- CE231 Fluid Mechanics (1) or
- ChE211 Fluid Statics & Dynamics (1)
- ME372 Heat Transfer (1) or
- ChE212 Heat Transfer (1)
- ME223 Engineering Technology (1)
- ME131 Dynamics (1)
- ME111 Graphics and Engineering Drawing (1)
- GE112 Introduction to Engineering Design (1)
- CE111 Statics (1)
- CE221 Properties of Materials (1) or
- ME241 Properties of Materials I (1) or
- 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 the 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.

APPENDIX B

TRANSITION ARRANGEMENTS 1979

(a) DEPARTMENT OF CIVIL ENGINEERING

Bachelor of Engineering & Bachelor of Science (Engineering)
See Transition Arrangements in the 1977 Faculty Handbook (pp. 23-24).

Bachelor of Surveying

Any candidate currently enrolled for the degree of Bachelor of Surveying who has not completed the requirements for admission to that degree by the end of 1977, shall be deemed to be enrolled thereafter for the new degree course with credit for the number of units passed in the old degree course. A candidate who fails one or more subjects in the old course in 1977 will receive credit for all units passed in the old course but may be required to complete a degree course programme as approved by Faculty Board. As a guide, any candidate who has passed or has been granted standing in a subject or part subject shown below, shall be given standing as shown:

Subject already passed or credited  Standing to be granted

<table>
<thead>
<tr>
<th>Engineering I and CE201 Engineering for Surveyors</th>
<th>CE201 Civil Engineering IIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE350 Seminar</td>
<td>CE360 Civil Engineering IIS</td>
</tr>
<tr>
<td>Town Planning A (prior to 1977)</td>
<td>CE372 Transportation Engineering and 1 unit of elective</td>
</tr>
<tr>
<td></td>
<td>SV473 Town Planning</td>
</tr>
</tbody>
</table>

(b) DEPARTMENT OF ELECTRICAL ENGINEERING

All students currently enrolled in the Bachelor of Engineering in Computer Engineering, Bachelor of Engineering in Electrical Engineering, or the combined degree programmes who have not completed the requirements for the award of the degree by the end of 1978 shall be deemed to be enrolled thereafter for the new degree courses to be introduced in 1979 with credit for all subjects passed in the old courses, subject to the transition conditions given hereunder.

1. Year by Year Progression

(A) BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING (Full-time)

<table>
<thead>
<tr>
<th>Year completed in 1978</th>
<th>Required to complete in subsequent years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td>Years II, III and IV less Met162</td>
</tr>
<tr>
<td>Year II</td>
<td>Years III and IV plus EE264 less 1 unit of elective taken from the Faculty of Engineering</td>
</tr>
<tr>
<td>Year III</td>
<td>Year IV less 1 unit from EE300, 400, 500</td>
</tr>
</tbody>
</table>
(B) BACHELOR OF ENGINEERING IN COMPUTER ENGINEERING (Full-time)

**Year completed in 1978**

- **Year I**
- **Year II**
- **Year III**

2. Individual Subjects

Students out of phase with year by year progression will be granted standing in all units passed in 1978 and previous years. The following additional information may be used to determine standing.

Subject already passed or credited

<table>
<thead>
<tr>
<th>Subject already passed or credited</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME111 Graphics</td>
</tr>
<tr>
<td>ME112 Engineering Drawing and Elementary Design</td>
</tr>
<tr>
<td>EE261 Information Structures and Programming</td>
</tr>
<tr>
<td>EE361 Introduction to Logic and Assembly Languages</td>
</tr>
<tr>
<td>ME301 Engineering Construction</td>
</tr>
</tbody>
</table>

3. Exceptional Circumstances

In order to provide for exceptional circumstances arising in particular transition cases the Dean may determine the transition programme to be followed.

(c) DEPARTMENT OF MECHANICAL ENGINEERING

All students currently enrolled in the Bachelor of Engineering in Mechanical Engineering, Bachelor of Engineering in Industrial Engineering, or the combined degree programmes who have not completed the requirements for the award of the degree by the end of 1978 shall be deemed to be enrolled thereafter for the new degree courses to be introduced in 1979 with credit for all subjects passed in the old courses, subject to the transition conditions given hereunder.

1. Year by Year Progression

(A) BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING (Full-time)

**Year completed in 1978**

- **Year I**
- **Year II**
- **Year III**

2. Individual Subjects

Students out of phase with year by year progression will be granted standing in all units passed in 1978 and previous years. The following additional information may be used to determine standing.

Subject already passed or credited

<table>
<thead>
<tr>
<th>Subject already passed or credited</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME111 Graphics</td>
</tr>
<tr>
<td>ME112 Engineering Drawing and Elementary Design</td>
</tr>
<tr>
<td>EE261 Information Structures and Programming</td>
</tr>
<tr>
<td>EE262 Systematic Programming</td>
</tr>
<tr>
<td>EE264 Introduction to Logic and Assembly Language</td>
</tr>
<tr>
<td>1 unit of Elective taken in Faculty of Engineering</td>
</tr>
</tbody>
</table>

3. Exceptional Circumstances

In order to provide for exceptional circumstances arising in particular transition cases the Dean may determine the transition programme to be followed.

(d) DEPARTMENT OF METALLURGY

Any candidate currently enrolled for the degree of Bachelor of Metallurgy or Bachelor of Science (Metallurgy) who has not completed the requirements for admission to that degree by the end of 1977, shall be deemed to be enrolled thereafter for the new degree course with credit for the number of units passed in the old degree course. A candidate who fails one or more subjects in the old course in 1977 will receive credit for all units passed in the old course but may be required to complete a degree course programme as approved by Faculty Board.
**SCHEDULES**

(a) DEPARTMENT OF CHEMICAL ENGINEERING

**SCHEDULE 1.1**

**DEPARTMENT OF CHEMICAL ENGINEERING**

**BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td></td>
</tr>
<tr>
<td>ChE101</td>
<td>4</td>
</tr>
<tr>
<td>CE111</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td>GE112</td>
<td>1</td>
</tr>
<tr>
<td>ME111</td>
<td>1</td>
</tr>
<tr>
<td>ME121</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Year II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
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<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Year III</td>
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</tr>
<tr>
<td></td>
<td>7</td>
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<tr>
<td></td>
<td>3</td>
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<tr>
<td></td>
<td>5</td>
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<tr>
<td></td>
<td>15</td>
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<tr>
<td>Year IV</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Year VI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
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<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

1. Students may offer study in ME121 workshop practice until Year II.
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.
4. See Note on Field Excursions—Page 80 of this Handbook.

**Recommended Programme**

**Part-time Study for Bachelor of Engineering in Chemical Engineering**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ChE101</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE111</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>GE112</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME111</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ME121</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Elective-Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</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. Students may, if they wish, defer study in ME121 workshop practice until Year II.
3. See Note on Field Excursions—Page 80 of this Handbook.

**SCHEDULE 3.1**

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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ChE101</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE111</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>GE112</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME111</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ME121</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Chemistry I</td>
<td>4</td>
</tr>
<tr>
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<td>Mathematics I</td>
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Stale

5

StaKe 6

Chemical Engineering IIA Part 2
Chemical Engineering IIB
Elective IA

Stage 6

Process Engineering
Design Project
Elective IA

Industrial Experience Units

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 Students may, if they wish, defer study in ME121 workshop practice until Year II.
3 See Elective Requirements—Appendix A.
4 See Note on Field Excursions—Page 80 of this Handbook.

(b) DEPARTMENT OF CIVIL ENGINEERING

SCHEDULE 1.2

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING

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<tr>
<td>ME111</td>
<td>Graphics and Engineering Drawing</td>
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<td>ME131</td>
<td>Dynamics</td>
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Year II

Mathematics IIB | 4 |
CE212 | Mechanics of Solids | 1 |
CE221 | Properties of Materials | 1 |
CE222 | Materials Technology | 2 |
CE231 | Fluid Mechanics I | 1 |
CE241 | Water Resources Engineering | 2 |
CE223J | Engineering Geology | 1 |
EE131 | Circuit Fundamentals | 1 |
EE211 | Energy Conversion | 1 |
ME121 | Workshop Practice | 1 |
ME271 | Thermodynamics I | 1 |
|         | **Total**                       | **16** |

Year III

CE313 | Structural Analysis & Design I | 4 |
CE324 | Soil Mechanics | 2 |
CE332 | Fluid Mechanics II | 2 |
GE350 | Seminar | 1 |
CE351 | Civil Engineering Systems I | 1 |
CE372 | Transportation Engineering | 1 |
ME301 | Engineering Computations | 1 |
| Electives(s) | 1 | 4 |
|         | **Total**                       | **16** |

Year IV

CE414 | Structural Analysis & Design II | 4 |
CE425 | Earth & Rock Engineering | 1 |
CE452 | Engineering Construction | 2 |
CE453 | Project | 2 |
ME482 | Engineering Economics I | 1 |
| Electives(s) | 1 | 4 |
|         | **Total**                       | **14** |

1 Mathematics IIB may be taken in two parts each of three terms duration.
2 See Elective Requirements—Appendix A.
During the course each full-time student should complete periods of industrial training acceptable to the Faculty Board totalling 20 weeks before 31st January in the year in which the degree is to be awarded.
### SCHEDULE 4.1

#### BACHELOR OF SURVEYING

**Full-time Course**

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| **Part-Time Study in Civil Engineering & Surveying**

#### Recommended Programmes

**Stage I**

**Civil Engineering**

- Engineering I: 8 units
- Mathematics I: SVIII, SV121: 8 units
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1. Suggested Non Faculty electives are: 2 units of Physics to replace PH221 by Physics II, plus 2 further units from Mathematics II Topics.
2. EE480 and EE481 will normally refer to a single project.
3. Part-time students may substitute Mathematics IIB (Topics B, CO, D) for Mathematics IIA (B, CO, D) and may take this in two parts.
4. Students may, if they wish, defer study in ME121 workshop practice until Year II.
5. See Elective Requirements—Appendix A.

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<td><strong>Year II</strong></td>
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1. Suggested Non Faculty electives are: 2 units of Physics to replace PH221 by Physics II, plus 2 further units from Mathematics II Topics.
2. EE480 and EE491 will normally refer to a single project.
3. Part-time students may substitute Mathematics IIB (Topics B, CO, D) for Mathematics IIA (B, CO, D) and may take this in two parts.
4. Students may, if they wish, defer study in ME121 workshop practice until Year II.
5. See Elective Requirements—Appendix A.
LIST 1: Fourth Year Subjects for Computer Engineering

a) Any EE300, 400 or 500 subject.

b) Any ME400, 500 level subject with approval of Head of Department of Electrical Engineering.

c) Commerce—Commercial Programming (2 units).

Systems Analysis and Design (2 units).

d) Year III and IV topics offered by Mathematics Department with the approval of the Head of Department of Electrical Engineering.

PART-TIME AND SANDWICH COURSES IN ELECTRICAL & COMPUTER ENGINEERING

Recommended Programmes

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<th>Computer Engineering by Sandwich Pattern</th>
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| Stage 2                                  | Stage 2                                  | Stage 2                                  |
| Physics IA                               | Physics IA                               | Physics IA                               |
| ME131                                    | ME131                                    | ME131                                    |
| ME121                                    | ME121                                    | ME121                                    |
| Chem1S                                   | Chem1S                                   | Chem1S                                   |
| EE092                                    | EE092                                    | EE092                                    |
| 9 units                                  | 10 units                                 | 10 units                                 |
|                                    | 1st Semester only—Full-time              | 1st Semester only—Full-time              |
|                                    | Full-year—Part time                      | Full-year—Part time                      |
|                                    | As for EE part-time                      | As for EE part-time                      |

| Stage 3                                  | Stage 3                                  | Stage 3                                  |
| EE093                                    | EE093                                    | EE093                                    |
| EE211                                    | EE211                                    | EE211                                    |
| EE221                                    | EE221                                    | EE221                                    |
| EE232                                    | EE232                                    | EE232                                    |
| Ph221                                    | Ph221                                    | Ph221                                    |
| Maths II A                               | Maths II A                               | Maths II A                               |
| 10 units                                 | 9 units                                  | 10 units                                 |
|                                    | 1st Semester only—Full-time              | 1st Semester only—Full-time              |
|                                    | Full-year—Part time                      | Full-year—Part time                      |
|                                    | As for EE part-time                      | As for EE part-time                      |

| Stage 4                                  | Stage 4                                  | Stage 4                                  |
| EE262                                    | EE262                                    | EE262                                    |
| EE264                                    | EE264                                    | EE264                                    |
| EE313                                    | EE313                                    | EE313                                    |
| EE314                                    | EE314                                    | EE314                                    |
| Met182                                   | Met182                                   | Met182                                   |
| EE094                                    | EE094                                    | EE094                                    |
| 4 units Elective (Arts)                  | 4 units Arts                             | 4 units Arts                             |
|                                    | Elective                                 | Elective                                 |
|                                    | ME121                                    | ME121                                    |
|                                    | Full-time                                | Full-time                                |
|                                    | 10 units                                 | 10 units                                 |

| Stage 5                                  | Stage 5                                  | Stage 5                                  |
| 1 from EE300, 400                        | 1 from EE300, 400                        | 1 from EE300, 400                        |
| EE313                                    | EE313                                    | EE313                                    |
| EE324L                                   | EE324L                                   | EE324L                                   |
| EE344                                    | EE344                                    | EE344                                    |
| Met182                                   | Met182                                   | Met182                                   |
| 5 from EE300, 400                        | 5 from EE300, 400                        | 5 from EE300, 400                        |
| EE362                                    | EE362                                    | EE362                                    |
| 2 units Elective                         | 2 units Elective                         | 2 units Elective                         |
|                                    | Full-time                                | Full-time                                |
|                                    | 9 units                                  | 9 units                                  |
### SCHEDULE 1.5

#### BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

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1. With approval of the Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and 1 unit of elective.
2. Mathematics IIB may be taken in two parts each of three terms duration.
3. With the approval of the 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.
5. Students may, if they wish, defer study in ME121 workshop practice until Year II.

### SCHEDULE 1.4

#### BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

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1. With approval of the Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and 1 unit of elective.
2. Mathematics IIB may be taken in two parts each of three terms duration.
3. See Elective Requirements—Appendix A.
4. Students may, if they wish, defer study in ME121 workshop practice until Year II.
### Recommended Programmes

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*To qualify for admission to the Bachelor of 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.*
II—REQUIREMENTS FOR POSTGRADUATE DIPLOMAS AND DEGREES

(a) 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 prerequisites 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.

After discussion with the Head of Department, certain of these subjects may be offered at a higher level and at an increased unit value.

Only a student transferring from the degree of B.Sc.(Met.) to B.Met. may claim his industrial experience as appropriate Met092-096 Industrial Experience units.
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.

(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**

(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

(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.

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**SCHEDULE OF SUBJECTS**

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<td>ME681D Industrial Law</td>
<td>2</td>
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<tr>
<td><strong>Group II</strong></td>
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<tr>
<td>ME404 Mathematical Programming</td>
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<td>ME407 Environmental Engineering</td>
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<tr>
<td>ME419 Bulk Materials Handling Systems Analysis and Design</td>
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<tr>
<td>ME444 Properties of Materials</td>
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<tr>
<td>ME449 Reliability Analysis for Mechanical Systems</td>
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<td>ME503G Design of Experiments for Engineering Research</td>
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<tr>
<td>ME505 Systems Planning, Organisation and Control</td>
<td>1</td>
</tr>
<tr>
<td>ME517G Materials Handling and Transportation Systems</td>
<td>2</td>
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<tr>
<td>ME535G Vibration and Noise Problems in Industry</td>
<td>2</td>
</tr>
<tr>
<td>ME584G Simulation</td>
<td>1</td>
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<tr>
<td><strong>Group III</strong></td>
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</tr>
</tbody>
</table>
| 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 Faculty Board.

1. Prerequisites for the above subjects will be those indicated in the Faculty of Engineering Handbook.

2. Accounting and Financial Studies may be taken as a 2 unit subject in lieu of both ME482 Engineering Economics I and ME484 Engineering Economics II.

**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.

(b) 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 from a four year full-time or equivalent part-time Bachelor's degree in Engineering or Metallurgy from the University of Newcastle or other approved university; or

   (b) he is a graduate or graduand from a three year-full or equivalent part-time Bachelor's degree from the University of Newcastle or other approved university and has had a minimum of two years' professional experience; or

   (c) 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.

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**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. The subjects listed will be offered subject to adequate enrolment and availability of staff.

A. **Applied Mechanics/Structures**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CE515</td>
<td>Elastic Continua</td>
<td>1</td>
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<tr>
<td>CE516</td>
<td>Plastic Frame Design</td>
<td>1</td>
</tr>
<tr>
<td>CE517</td>
<td>Steel Beams, Columns &amp; Frames</td>
<td>1</td>
</tr>
<tr>
<td>CE555</td>
<td>Civil Engineering Systems II</td>
<td>1</td>
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<tr>
<td>CE517</td>
<td>Prestressed Concrete Design</td>
<td>2</td>
</tr>
<tr>
<td>CE626</td>
<td>Theoretical Aspects of Fracture Mechanics</td>
<td>1 or 2</td>
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</table>

B. **Computer Science**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>EE516</td>
<td>Computer-Aided Analysis of Power Systems</td>
<td>1</td>
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<tr>
<td>EE549</td>
<td>Applied Information Theory</td>
<td>1</td>
</tr>
<tr>
<td>EE562</td>
<td>Advanced Topics in Switching Theory</td>
<td>1</td>
</tr>
<tr>
<td>EE553</td>
<td>Computer Operating Systems</td>
<td>1</td>
</tr>
<tr>
<td>EE564</td>
<td>Compilers, Assemblers &amp; Interpreters</td>
<td>1</td>
</tr>
<tr>
<td>EE565</td>
<td>Pattern Recognition</td>
<td>1</td>
</tr>
<tr>
<td>EE566</td>
<td>Automata &amp; Computing Machines</td>
<td>1</td>
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<tr>
<td>EE567</td>
<td>Computer Process Control</td>
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<tr>
<td>EE568</td>
<td>Advanced Computer Architecture</td>
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<tr>
<td>EE569</td>
<td>Formal Languages &amp; Automata</td>
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C. **Mathematics**

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<tr>
<td>CS</td>
<td>Data Structures &amp; Programming</td>
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<tr>
<td>Mathematics III, Topic Z</td>
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</tr>
</tbody>
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Subject offered by other faculties:

- **Department of Electrical Engineering**
- **Department of Mechanical Engineering**
- **Department of Computer Science**
- **Department of Mathematics**
- **Department of Commerce**
C. Engineering Materials

<table>
<thead>
<tr>
<th>Department of Civil Engineering</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE526 Advanced Properties of Materials</td>
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<tr>
<td>CE527 Concrete Technology</td>
<td>1</td>
</tr>
<tr>
<td>CE528 Soil Mechanics</td>
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</tr>
<tr>
<td>CE529 Foundation Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE574 Transportation Planning</td>
<td>1</td>
</tr>
<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>ME404 Mathematical Programming I</td>
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<tr>
<td>ME419 Bulk Materials Handling Systems Analysis and Design</td>
<td>1</td>
</tr>
<tr>
<td>ME503 Design of Experiments for Engineering Research</td>
<td>1</td>
</tr>
<tr>
<td>ME511 Experimental and Theoretical Stress Analysis</td>
<td>2</td>
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<tr>
<td>ME517 Materials Handling and Transportation Systems</td>
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<tr>
<td>ME581 Mathematical Programming II</td>
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<thead>
<tr>
<th>Department of Metallurgy</th>
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<tbody>
<tr>
<td>Met541 Applications of Fracture Mechanics</td>
<td>1</td>
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<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>
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<tr>
<td>Met582 Metal Physics</td>
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Together with approved topics and subjects which may be offered from the Faculty of Science.

D. Environmental Studies/Environmental Engineering

<table>
<thead>
<tr>
<th>Department of Chemical Engineering</th>
<th>Units</th>
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<tbody>
<tr>
<td>ChE501 Chemical Process Principles for Effluent Control</td>
<td>1</td>
</tr>
<tr>
<td>ChE513 Advanced Combustion</td>
<td>2</td>
</tr>
<tr>
<td>ChE521 Air Pollution Effluent Control</td>
<td>2</td>
</tr>
<tr>
<td>ChE522 Control of Industrial Liquid Effluents</td>
<td>2</td>
</tr>
<tr>
<td>ChE623 Advanced Topics in Effluent Control</td>
<td>1 or 2</td>
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<thead>
<tr>
<th>Department of Civil Engineering</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE543 Water Quality Management</td>
<td>1</td>
</tr>
<tr>
<td>CE643 Water Pollution &amp; Water Quality Management</td>
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<tr>
<td>CE644 Water &amp; Wastewater Treatment</td>
<td>2</td>
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<tr>
<td>CE645 Microbiology of Water Resources</td>
<td>2</td>
</tr>
<tr>
<td>CE646 Public Health Science</td>
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</tr>
<tr>
<td>CE647 Unit Operations in Public Health Engineering</td>
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<table>
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<th>Units</th>
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<tr>
<td>ME401 Systems Analysis</td>
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<tr>
<td>ME404 Mathematical Programming I</td>
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<tr>
<td>ME407 Environmental Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME409 Introduction to Noise Pollution Control</td>
<td>1</td>
</tr>
<tr>
<td>ME503 Design of Experiments for Engineering Research</td>
<td>1</td>
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<tr>
<td>ME505 Systems Analysis, Organisation and Control</td>
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<tr>
<td>ME508 Air Pollution Studies II</td>
<td>1</td>
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<tr>
<td>ME535 Vibration and Noise Problems in Industry</td>
<td>1</td>
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<tr>
<td>ME554 Computation of Fluid Flows and Heat Transfer</td>
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<td>ME581 Mathematical Programming II</td>
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<thead>
<tr>
<th>Interdepartmental Subjects</th>
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<tr>
<td>GE501G Air Pollution Studies I</td>
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</table>

Together with approved topics or subjects which may be offered by other Faculties.

E. Fluid Mechanics/Water Resources Engineering

<table>
<thead>
<tr>
<th>Department of Civil Engineering</th>
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<tbody>
<tr>
<td>CE633 Theoretical Hydrodynamics</td>
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<tr>
<td>CE634 Open Channel Flow</td>
<td>1</td>
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<tr>
<td>CE635 River &amp; Coastal Engineering I</td>
<td>1</td>
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<tr>
<td>CE643 Water Quality Management</td>
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<tr>
<td>CE634 Advanced Fluid Mechanics</td>
<td>1</td>
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<tr>
<td>CE635 River &amp; Coastal Engineering II</td>
<td>1</td>
</tr>
<tr>
<td>CE646 Water Reticulation &amp; Wastewater Collection</td>
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<tr>
<td>CE643 Water Pollution &amp; Water Quality Management</td>
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<tr>
<td>CE644 Water &amp; Wastewater Treatment</td>
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<td>CE645 Microbiology of Water Resources</td>
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<tr>
<td>CE646 Public Health Science</td>
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<td>CE647 Unit Operations in Public Health Engineering</td>
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F. Furnace Engineering

<table>
<thead>
<tr>
<th>Department of Chemical Engineering</th>
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<tbody>
<tr>
<td>Che502 Reaction Engineering</td>
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<tr>
<td>Che511/512 Advanced Heat Transfer</td>
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<tr>
<td>Che513 Advanced Combustion</td>
<td>2</td>
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<tr>
<td>Che514 Furnace Engineering</td>
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<tr>
<td>Che521 Air Pollution Effluent Control</td>
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</tr>
<tr>
<td>Che542 Combustion</td>
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<tr>
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<td>EE546 Modern Control</td>
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<tr>
<td>EE544 Multivariable Control Systems</td>
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<tr>
<td>EE542 Stochastic Control</td>
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<tr>
<td>ME404 Mathematical Programming I</td>
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<tr>
<td>ME503 Design of Experiments for Engineering Research</td>
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<tr>
<td>ME554 Computation of Fluid Flows and Heat Transfer</td>
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<tr>
<td>ME581 Mathematical Programming II</td>
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<tr>
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<td>Met531 Heat Transfer</td>
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<tr>
<td>Met533 Metallurgical Rate Processes</td>
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<td>Met571 Materials Selection</td>
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G. Operations Research/Management Science

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<thead>
<tr>
<th>Department of Chemical Engineering</th>
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<tbody>
<tr>
<td>ChE531 Process Optimization</td>
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<tr>
<td>CE554 Civil Engineering Systems II</td>
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<td>CE654 Construction Management</td>
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<th>Department of Mechanical Engineering</th>
<th>Units</th>
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<tr>
<td>ME401 Systems Analysis</td>
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<td>ME404 Mathematical Programming I</td>
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<tr>
<td>ME407 Environmental Engineering</td>
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</tr>
<tr>
<td>ME409 Introduction to Noise Pollution Control</td>
<td>1</td>
</tr>
<tr>
<td>ME503 Design of Experiments for Engineering Research</td>
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<tr>
<td>ME505 Systems Analysis, Organisation and Control</td>
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<td>ME508 Air Pollution Studies II</td>
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<tr>
<td>ME535 Vibration and Noise Problems in Industry</td>
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<tr>
<td>ME554 Computation of Fluid Flows and Heat Transfer</td>
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<td>ME581 Mathematical Programming II</td>
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<table>
<thead>
<tr>
<th>Interdepartmental Subjects</th>
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<tbody>
<tr>
<td>GE501G Air Pollution Studies I</td>
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</tbody>
</table>

Together with approved topics or subjects which may be offered by other Faculties.
Subjects offered by other Faculties

Department of Mathematics
Selected Topics in Mathematics IV.

Department of Commerce
Selected topics from Diploma in Business Studies.

H. Mineral Process Engineering

Department of Chemical Engineering
ChE502 Reaction Engineering 2
ChE513 Advanced Combustion 2
ChE514 Furnace Engineering 2
ChE523 Particulate Separations 1 or 2
ChE531 Process Optimization 2
ChE542 Communion 1 or 2
ChE603 Advanced Problems in Mass Transfer & Reaction Engineering 1 or 2

Department of Electrical Engineering
EE442 Modern Control 1
EE446 Modern Control 1
EE441 Multivariable Control Systems 1
EE442 Stochastic Control 1

Department of Mechanical Engineering
ME404 Mathematical Programming I 1
ME407 Operations Research - Deterministic Models 1
ME408 Operations Research - Probabilistic Models 1
ME503 Design of Experiments for Engineering Research 1
ME581 Mathematical Programming II 1
ME685 Advanced Operations Research 1

Department of Metallurgy
Met521 Metallurgical Thermodynamics 1
Met531 Heat Transfer 1
Met533 Metallurgical Rate Processes 1
Met541 Fracture Mechanics 1
Met561 Extraction Metallurgy 1
Met562 Reactor Analysis 1

1. Systems

Department of Civil Engineering
CE555 Civil Engineering Systems II 1

Department of Electrical Engineering
EE541 Sample Data Control Systems 1
EE542 Modern Control 1
EE543 Optimization Techniques 1
EE545 Communication Systems 1
EE546 Modern Control 1
EE547 Digital Communications 1
EE552 Advanced Topics in Communication Systems 1
EE562 Advanced Switching & Logic Design 1
EE567 Computer Process Control 1
EE641 Multivariable Control Systems 1
EE642 Stochastic Control 1

Department of Mechanical Engineering
ME401 Systems Analysis 1
ME404 Mathematical Programming I 1
ME505 Systems Analysis, Organisation and Control 1
ME591 Mathematical Programming II 1

Units

Subjects offered by other Faculties

Department of Mathematics
Stochastic Processes
Signal Detection

General Statement
Before preparing their course for any year students should check in the Departmental lists which subjects are to be offered in that year. Approval for any course chosen from the subjects 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.

Approved M.Eng.Sci. Subjects

The following subjects have been approved for inclusion in the M.Eng.Sci. course programme. Not all subjects will be offered in any one year. For details of which subjects will be offered in 1979 consult the Department concerned.

Department of Chemical Engineering
ChE501 Chemical Process Principles for Effluent Control* 1
ChE503 Computational Methods in Chemical Engineering 2
ChE511 Advanced Heat Transfer 1
ChE512 Advanced Heat Transfer 1
ChE513 Advanced Combustion*** 2
ChE514 Furnace Engineering*** 2
ChE515 Energy Management 2
ChE516 Reaction Engineering 2
ChE521 Air Pollution Effluent Control*** (P) 2
ChE522 Control of Industrial Liquid Effluents*** (P) 2

Transfer Topics
ChE523 Particulate Separations 1 or 2
ChE524 Communion 1 or 2
ChE611 Advanced Problems in Mass Transfer & Reaction Engineering 1 or 2
ChE612 Advanced Problems in Effluent Control 1 or 2

Department of Civil Engineering
CE515 Elastic Continua 1
CE516 Plastic Frame Design 1
CE517 Steel Beams, Columns and Frames 1
CE519 Engineering Seismology 1
CE526 Advanced Properties of Materials 1
CE527 Concrete Technology 1
CE528 Soil Mechanics 1
CE529 Foundation Engineering 1
CE533 Theoretical Hydrodynamics 1
CE534 Open Channel Flow 1
CE535 River and Coastal Engineering I 1
CE538 Water Quality Management 1
CE544 Civil Engineering Systems II 1
CE574 Transportation Planning 1
CE575 Highway Engineering 1
CE617 Prestressed Concrete Design 2
CE626 Theoretical Aspects of Fracture Mechanics 2
CE634 Advanced Fluid Mechanics 1
CE635 River and Coastal Engineering II 1
CE636 Water Retirculation and Wastewater Collection 1
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<th>Course Title</th>
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<td>Public Health Science</td>
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<td>CE647</td>
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<td>Sample Data Control Systems*</td>
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<tr>
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<td>Modern Control**</td>
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<tr>
<td>EE543</td>
<td>Optimization Techniques*</td>
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<td>Communication Systems*</td>
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<td>Mathematical Programming I</td>
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<td>Advanced Design Concepts I</td>
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<td>Bulk Materials Handling Systems Analysis and Design</td>
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<td>Operations Research — Deterministic Models</td>
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<td>ME488</td>
<td>Operations Research — Probabilistic Models</td>
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<td>ME511</td>
<td>Experimental and Theoretical Stress and Analysis</td>
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<td>ME515</td>
<td>Advanced Design Concepts II</td>
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<td>ME555</td>
<td>Vibration and Noise Problems in Industry</td>
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<td>Computation of Fluid Flows and Heat Transfer</td>
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<td>ME582</td>
<td>Probabilistic Models in Operations Research</td>
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<td>Modelling of Management Problems</td>
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<td>ME584</td>
<td>Simulation</td>
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<td>ME597</td>
<td>Project/Seminar</td>
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(c) REQUIREMENTS FOR THE DEGREE OF
MASTER OF ENGINEERING

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

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

3. In the case of applicants desiring to register under provision 2(b), and (c), the Faculty Board may require the applicants to carry out such work and 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 candidate, the Faculty Board shall be satisfied that adequate supervision and facilities are available.

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

6. (i) Every candidate for the degree shall be required to submit a thesis embodying the results of an investigation or design, to take such examinations and to perform such other work as may be prescribed by the Faculty Board. The candidate may submit also for examination any work he has published, whether or not such work is related to the thesis.
   (ii) The investigation or design and other work as provided in paragraph 6 (i) shall be conducted under the direction of a supervisor appointed by the Faculty Board or under such conditions as the Faculty Board may determine.
   (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 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 is his own and 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 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 that in the case of a candidate who has obtained the degree of Bachelor with Honours or a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, this period may, with the approval of the Faculty Board, be reduced by up to three terms.

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

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

1. An application to register as a candidate for the degree of Master of Science shall be made on the prescribed form which shall be lodged with the 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 of Science 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. Before registration as a candidate for the degree is confirmed, an applicant desiring to register under Clause 2 (b) or 2 (c) above, shall be required to carry out such work and to sit for such examinations as the Faculty Board may determine and to achieve a standard at least equivalent to that required for the award of a bachelor's degree with second class honours in an appropriate subject.

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

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

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

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

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

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

1 Separate sheet on the preparation and binding of higher degree theses is available on application.
III—POLICIES DETERMINED BY FACULTY BOARD UNDER DEGREE REQUIREMENTS

The following policies have been determined by Faculty Board under the provisions of the Degree Requirements.

(a) Award of Merit and Honours

The following policy on the grading of degrees was determined under Section 2 of Part I of the Requirements.

The Award of Merit and Honours in the Degrees of Bachelor of Engineering, Bachelor of Science (Engineering), Bachelor of Metallurgy, Bachelor of Science (Metallurgy) and Bachelor of Surveying is based on the complete record of the candidates over the entire course.

Faculty Board awards Honours and Merit gradings to students who have met the requirements for their respective degrees on the recommendation of the appropriate Head of Department. The following has been approved by Faculty Board as a guide to the method to be followed in the award of Honours and Merit gradings.

Honours Gradings in Bachelor of Engineering, Bachelor of Metallurgy and Bachelor of Surveying Degrees

1. The subjects taken in the degree are divided into four groups based on the years in which they would normally have been taken according to the full-time programmes as set out in the degree schedules.

2. Grade points are assigned to subjects on the basis of the grades obtained in that subject, as follows:

   HD = 4
   D  = 3
   C  = 2
   P and P* = 1
   FF, WF, AF and EF = 0

3. The product of the grade points assigned to a subject and the unit value of that subject yields the unit grade point product of each subject. That is

   \[ W_n = \text{Unit grade point product for subject } i \]

   \[ W_i = \text{Grade points assigned to subject } i \]

   \[ n_i = \text{Unit value for subject } i \]

4. The grade point average is calculated for each group of subjects as follows:

   \[ \text{GPA}(t) = \frac{\left( \sum W_n \right)_t}{\left( \sum n_i \right)_t} \]

   Where GPA(t) = Grade point average of subjects grouped in year \( t \)
   \( \left( \sum W_n \right)_t = \text{Sum of unit grade point products for subjects grouped in year } t \)
   \( \left( \sum n_i \right)_t = \text{Sum of unit values for subjects grouped in year } t \)

5. The unweighted overall grade point average (GPA) is calculated thus

   \[ \text{GPA} = \frac{\sum \text{GPA}(t)}{4} \]

6. The weighted overall grade point average (WGPA) is calculated thus

   \[ \text{WGPA} = \frac{1}{7} \left( \text{GPA}(1) + \text{GPA}(2) + 2\text{GPA}(3) + 3\text{GPA}(4) \right) \]

7. The weighted overall grade point average calculated above is used as a guide for the recommendation of honours gradings on the basis of

   - WGPA ≥ 2.5 Honours Class I
   - 2.0 ≤ WGPA < 2.5 Honours Class II (Division I)
   - 1.5 ≤ WGPA < 2.0 Honours Class II (Division II).

8. In making their recommendation Heads of Departments should present to the Faculty Board the complete record of each candidate being recommended for an honours grading, together with the grade point average for each yearly grouping of subjects as well as both the weighted and unweighted overall grade point averages.

9. Note (i) The following are excluded from the above calculation:
   (a) Subjects for which a full range of grades are not awarded;
   (b) Subjects in which a student has been granted standing;
   (c) Subjects from which a student has withdrawn without penalty.
   (ii) Repeats in a subject after a grade of FF, WF, AF or EF has been awarded are treated as an extra subject taken in the year in which the previously failed subject is normally taken.

Merit Gradings in Bachelor of Science (Engineering) and Bachelor of Science (Metallurgy) Degrees

The procedure to be followed for the calculation of grade point averages for the recommendation of merit grades is similar to that for the recommendation of honours grades except that:

1. The subjects taken in the degree are divided into groups based on a three year full-time programme.

2. The weighted overall grade point average is calculated thus

   \[ \text{WGPA} = \frac{1}{4} \left( \text{GPA}(1) + \text{GPA}(2) + 2\text{GPA}(3) \right) \]

3. The unweighted overall grade point average is calculated thus

   \[ \text{GPA} = \frac{1}{3} \sum \text{GPA}(t) \]

4. The weighted overall grade point average to be used as a guide for the recommendation of a merit grade is WGPA ≥ 2.
Example

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<tr>
<th>Subject</th>
<th>Grade</th>
<th>( W_i )</th>
<th>( n_i )</th>
<th>( W_i n_i )</th>
<th>GPA(t)</th>
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<td></td>
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</table>

\[
\text{GPA} = \frac{1.70 + 1.50 + 1.59 + 1.67}{4} = 1.61
\]

\[
\text{WGPA} = \frac{1.70 + 1.50 + 2 \times 1.59 + 3 \times 1.67}{7} = 1.62
\]

Based on WGPA = 1.62 recommend award of Honours Class II Division 2.

(b) Interpretation of the Academic Progress By-Laws

The following policy on academic progress was determined under Section 10 of Part I of the Requirements.

By-Law 5.4.1 (2) leaves it open to each particular faculty to decide what constitutes unsatisfactory progress calling for action under subheadings (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 pro-
gress, 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 77.

(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 enrol-
ment. 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.).

(c) Mutually Exclusive Subjects
(See Section 14 of the Requirements)
The Faculty Board has deemed the following subjects or part subjects
to be mutually exclusive under Section 14 of Part I of the Require-
ments.
Methods.
(2) Mathematics II Topic F, EM2F Numerical Analysis & Computing, ME301 Engineer-
ing Computations.
(3) ME482 Engineering Economics I, Accounting & Financial Studies.
(4) Accounting & Financial Studies & Accounting I.

(d) Years/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 ac-
cordance with the following table:

<table>
<thead>
<tr>
<th>B.E. Full-time &amp; B.Surv.</th>
<th>B.E. Part-time</th>
<th>B.Sc.(Eng.) &amp; B.Sc.(Met.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units Year</td>
<td>Units Stage</td>
<td>Units Stage</td>
</tr>
<tr>
<td>0-15 — I</td>
<td>0-7 — I</td>
<td>0-7 — I</td>
</tr>
<tr>
<td>15-31 — II</td>
<td>8-16 — 2</td>
<td>8-15 — 2</td>
</tr>
<tr>
<td>32-47 — III</td>
<td>17-25 — 3</td>
<td>16-23 — 3</td>
</tr>
<tr>
<td>48+ — IV</td>
<td>26-34 — 4</td>
<td>24-31 — 4</td>
</tr>
<tr>
<td></td>
<td>35-43 — 5</td>
<td>32-39 — 5</td>
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<tr>
<td></td>
<td>44-52 — 6</td>
<td>40+ — 6</td>
</tr>
<tr>
<td></td>
<td>53+ — 7</td>
<td></td>
</tr>
</tbody>
</table>

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

(e) Alternative Subjects
The Faculty Board has deemed the following groups of subjects to be
acceptable alternatives under Section 15 of Part I of the Requirements.
(1) CE212 Mechanics of Solids & ME214 Mechanics of Solids I.
(2) CE221 Properties of Materials I & ME241 Properties of Materials I.
(3) ChE211 Fluid Statics & Dynamics, CE231 Fluid Mechanics & ME251 Fluid
Mechanics I.
(4) ChE212 Heat & ME372 Heat Transfer.
(5) Met213 Applied Statistics & ME522D Industrial Computations,
(6) ME222 Process Technology & ME271 Fabrication Metallurgy.
(7) Met312 Modelling & Control of Metallurgical Processes, & ChE314 Process
Control.
(8) Met341 Fracture & Failure Analysis & ME342 Properties of Materials II.

(f) Standing and Exemption Examinations for
      Holders of Technical College Certificates
Faculty Board has agreed on the following with respect to the granting
of standing to holders of Technical College Certificates under the
provisions Section 12 of Part I of the Requirements.
A student may apply for standing in any subject. The Head of the
appropriate Department will decide whether standing shall be recom-
manded immediately 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 be granted standing in the sub-
jects or subject units as follows:

SUBJECT OR SUBJECT UNITS

Mechanical Engineering Certificate
B.E. Full-time & B.Surv.
B.E. Part-time
B.Sc.(Eng.) & B.Sc.(Met.)

Land & Engineering Survey & Drafting Certificate
Surveying I
Surveying II
Survey Camp I
Survey Camp II
Town Planning A
Town Planning B

Survey Certificate
Survey I
Survey II
Survey Camp I
Survey Camp II
Town Planning A
Town Planning B

Engineering Survey Certificate
Survey I
Survey II
Survey Camp I
Survey Camp II

Examination exemptions may be granted in the following subjects:
CE111 Statics
ME131 Dynamics
ME212 Engineering Design I
(g) Industrial Training

Faculty Board has agreed on the following as its policy with respect to industrial training under Parts 2, 3, 4, 5 and 6 of the Requirements.

1. General

For the degrees of Bachelor of Engineering and Bachelor of Metallurgy, students will normally be required to complete a total of at least 20 weeks of practical work of a nature acceptable to the Faculty Board. This practical experience may be either gained during long vacations or as part of an Industrial Experience elective.

2. Full-time Students

Full-time students will normally gain their practical experience during vacation employment. Students are required to write a report outlining the experience gained during each period of practical work. This report must be submitted to the appropriate Department by the 31st March following the period of employment.

Students experiencing difficulty in obtaining suitable employment during long vacations may be able to obtain assistance in finding such employment by contacting the University's Careers and Student Employment Office.

3. Part-time and Sandwich Pattern Students

3(i) Industrial Experience Units

(i) Students enrolled in the degree of Bachelor of Engineering on a part-time basis may choose to take Industrial Experience units as part of their elective programmes. 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. This approved employment must continue for one calendar year, that is, until the 31st October of the year in which the unit is to be counted. Students enrolled in Industrial Experience units must attend such lectures, seminars etc. and submit such reports as the relevant Head of Department may require. Normally no Industrial Experience unit will be allowed in the first year of enrolment.

The following is a list of the maximum number of Industrial Experience units that may be counted towards the degree in the various courses offered.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

Students following the sandwich patterns offered by the Departments of Electrical and Mechanical Engineering should consult with the Heads of those Departments before enrolling in Industrial Experience units.

NOTE—The University can accept no responsibility for finding suitable employment for students wishing to enrol for Industrial Experience units.

The successful completion of one Industrial Experience unit satisfies the requirement that students complete 20 weeks practical experience.

3(ii) Part-time Students Who Do Not Enrol in Industrial Experience Electives

A student who has been attending on a part-time basis and who during this attendance has been employed in work of a suitable nature but who has not completed an Industrial Experience unit may satisfy the Industrial Training requirement by submitting a report on the experience gained during this period of part-time attendance.

4 B.Sc(Eng) and B.Sc(Met) Students

4(i) For the degrees of Bachelor of Science (Engineering) and Bachelor of Science (Metallurgy) students must complete at least three years of practical experience before the 31st January in the year in which the student is to be admitted to the Degree. If this requirement is not met admission to the degree may be deferred.

4(ii) Students transferring from the degree of Bachelor of Science (Metallurgy) to the degree of Bachelor of Metallurgy may claim up to five Industrial Experience units at Met. 400 subjects.
Guide to Subject Entries

1. 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 per year (1.5 hours per week for the whole year, or 3 hours per week for half a year) 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.

2. Nomenclature
The six digit number which precedes the name is the Computer Code Number for the subject.

3. Subject Number
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
- SV — Surveying

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 in each Department are shown in the table below.

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
<th>Indicating Numerals</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering</td>
<td></td>
<td>Civil Engineering</td>
<td></td>
</tr>
<tr>
<td>ChE-0- General</td>
<td></td>
<td>CE-0- Service Courses</td>
<td></td>
</tr>
<tr>
<td>ChE-1- Chemical Engineering Science</td>
<td></td>
<td>CE-1- Structures</td>
<td></td>
</tr>
<tr>
<td>ChE-2- Unit Operations</td>
<td></td>
<td>CE-2- Materials</td>
<td></td>
</tr>
<tr>
<td>ChE-3- Engineering Practice</td>
<td></td>
<td>CE-3- Fluid Mechanics</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>CE-4- Water Resources</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>CE-5- Civil Engineering Practice</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CE-6- Surveying—Specialist Courses</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>CE-7- Surveying and Transportation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CE-9- Special Topics</td>
<td></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td>Mechanical Engineering</td>
<td></td>
</tr>
<tr>
<td>EE-0- General Electrical Engineering</td>
<td></td>
<td>ME-0- General courses</td>
<td></td>
</tr>
<tr>
<td>EE-1- Electrical Machines or Power Systems</td>
<td></td>
<td>ME-1- Analysis and Design</td>
<td></td>
</tr>
<tr>
<td>EE-2- Electronics</td>
<td></td>
<td>ME-2- Mechanical Engineering Practice</td>
<td></td>
</tr>
<tr>
<td>EE-3- Electrical Circuit Theory or Measurements</td>
<td></td>
<td>ME-3- Machens</td>
<td></td>
</tr>
<tr>
<td>EE-4- Control or Communication Systems</td>
<td></td>
<td>ME-4- Materials</td>
<td></td>
</tr>
<tr>
<td>EE-5- Field Theory</td>
<td></td>
<td>ME-5- Fluid Mechanics</td>
<td></td>
</tr>
<tr>
<td>EE-6- Computer Science or Automata Theory</td>
<td></td>
<td>ME-6- Automatic Control</td>
<td></td>
</tr>
<tr>
<td>EE-8- Project/Directed Reading</td>
<td></td>
<td>ME-7- Thermodynamics</td>
<td></td>
</tr>
<tr>
<td>EE-9- Seminar</td>
<td></td>
<td>ME-8- Industrial Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ME-9- Project and Seminar</td>
<td></td>
</tr>
<tr>
<td>Metallurgy</td>
<td></td>
<td>Surveying</td>
<td></td>
</tr>
<tr>
<td>Met-0- General</td>
<td></td>
<td>SV-0- Servicing Course</td>
<td></td>
</tr>
<tr>
<td>Met-1- Computations</td>
<td></td>
<td>SV-1- General Surveying</td>
<td></td>
</tr>
<tr>
<td>Met-2- Physical Chemistry</td>
<td></td>
<td>SV-2- Survey Camps</td>
<td></td>
</tr>
<tr>
<td>Met-3- Transport</td>
<td></td>
<td>SV-3- Survey Computations</td>
<td></td>
</tr>
<tr>
<td>Met-4- Mechanical</td>
<td></td>
<td>SV-4- Astronomy</td>
<td></td>
</tr>
<tr>
<td>Met-5- Physical Metallurgy and Metallography</td>
<td></td>
<td>SV-5- Geodesy</td>
<td></td>
</tr>
<tr>
<td>Met-6- Extraction</td>
<td></td>
<td>SV-6- Photogrammetry</td>
<td></td>
</tr>
<tr>
<td>Met-7- Fabrication and Materials</td>
<td></td>
<td>SV-7- Land Studies</td>
<td></td>
</tr>
<tr>
<td>Met-8- Structure and Metal Physics</td>
<td></td>
<td>SV-8- Project and Seminars</td>
<td></td>
</tr>
<tr>
<td>Met-9- Laboratory</td>
<td></td>
<td>SV-9- Special Courses</td>
<td></td>
</tr>
</tbody>
</table>

**Subject Name**

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

**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.

**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.
I SUBJECTS OFFERED BY DEPARTMENTS COMPRISING THE FACULTY OF ENGINEERING

Chemical Engineering

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

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. These principles will be illustrated from such processes as water treatment, metallurgical ore smelting and steel production, cement manufacture, combustion of coal and oil, production of tonnage oxygen, ammonia and acids.

Text
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 1
Prerequisites Maths I & Physics IA or IB
Hours 9 hours per week

Examination Two 3-hour final papers & term tests.

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

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

Part I
(i) 512201 ChE201 Fuels & 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) 512202 ChE202 Industrial Chemical Processes & 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
Shreve & Brink Chemical Process Industries 4th edn (McGraw-Hill)

Reference
Kütt, Y. A. Riegels Handbook of Industrial Chemistry 7th edn (Van Nostrand 1973)
Part II

(iii) 512203 ChE203 Laboratory

Hours 84 hours

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.

Text

Reference

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

Hours Approx 42 hours for each course

Examination One 3-hour paper in November & term tests

(iv) 512204 ChE211 Fluid Statics & 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
Kay, J. M. & Nedderman, R. Introduction to Fluid Mechanics & Heat Transfer (Cambridge)

Reference

(v) 512205 ChE212 Heat

Content
Conduction of heat; Fourier's equation, steady state unidirectional and uniform radial flow, surface transfer coefficients, extended surfaces.

Heat exchangers, mean convection coefficients. Convection transfer, dimensionless numbers and their significance; natural convection. Relationships between mass, momentum and heat transfer. Condensation film theory; effect of surfaces, of non-condensible gases; boiling nucleate and film; condensers and evaporators. 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) 512206 ChE221 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

(vii) 512207 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 Ptl 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

(iii) ChE311 Thermodynamics

(iv) ChE312 Reaction Engineering

Part II

(ii) ChE302 Unit Operations Laboratory

(v) ChE313 Transport Principles

(vi) ChE321 Continuous Contacting Processes

(vii) ChE322 Particulate Systems

(i) 513101 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.

Text


References

Kemeny, J. C. & Kurtz, T. E. Basic Programming 2nd edn (Wiley 1971)

513102 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.

Text

Crow et al. Statistics Manual (Dover 1972)

513103 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.

Reference


513104 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) 513105 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) 513106 ChE321 Continuous Contacting Processes

**Hours**
Approx. 42 hours

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

**Text**

**Reference**

(vii) 513107 ChE322 Particulate Systems

**Hours**
Approx. 42 hours

**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**
McCabe, H. L. & Smith, S. C. *Unit Operations of Chemical Engineering* 3rd edn (McGraw-Hill)

**References**
Foust et al. *Unit Operations* 2nd edn (Wiley)

513200 Chemical Engineering II B

**Prerequisites**
Chemical Engineering I

**Pre- or Corequisite**
Chemical Engineering IIA

**Hours**
4½ hours per week

**Examination**
One 3-hour paper & one 8-hour paper

(i) 513222 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.

**Text**

(ii) 513221 ChE331 Process Economics

**Hours**
Approx. 21 hours
Examination

To be advised

Content

2. Cost estimation procedures — cost indices — six tenths rule and economy of scale.
3. Economic production charts (break even analysis)
   Capacity factors, incremental costs.
4. Depreciation — Purpose of depreciation studies in process costs — types and requirements of depreciation methods — taxation allowances in process plant and equipment — economic life.
5. Project profitability — Concept of equivalence and discounted cash flows — methods for measuring project profitability including rate of return, payout time, interest rate of return (DCF) net present value, annual cost and capitalised cost — continuous discounting.
6. Economic balances — General considerations for economic balance — brief introduction to optimisation — Economic balances applied to selected operations, i.e. mass transfer, cyclic operation, yield and recovery operation.
7. Feasibility studies — selected examples.

Text

Jelen, F. C.  
Cost and Optimization Engineering  
(McGraw-Hill 1970)

Reference

Thuesen, et al.  
Engineering Economy (McGraw-Hill)

(iii) 513223 ChE332 Equipment Design

Hours

Approx. 42 hours

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  
Engineering Drawing Practice ASCZ1 Pt I 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

513224 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)

513225 ChE342 Furnace Heat Transfer — 1 unit

Prerequisites

1st courses in heat transfer & 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.
Trinka, W. & McWhinney

Radiative Transfer (McGraw-Hill 1967)
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 & 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 I or 2 topics)
ChE412 Radiant Heat Transfer (or ChE342 Furnace Heat Transfer — 2 topics)
ChE413 Selected topics in Heat & Mass Transfer
ChE414 Advanced Reaction Engineering
ChE415 Advanced Transport Theory
ChE416 Advanced Process Control
ChE421 Multicomponent Separations
ChE422 Particle Mechanics
ChE432 Environmental Control
ChE433 Process Evaluation & Optimization
ChE403 Advanced Computations

Texts
As for Level 3 subjects except ChE432
Eckenfelder, W. W.

Industrial Water Pollution Control (McGraw-Hill 1966)

References
To be advised

514111 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.

514112 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.

514200 Projects II (comprising ChE401/434)

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>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE131 Circuit Fundamentals</td>
<td>1</td>
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<tr>
<td>EE211 Energy Conversion</td>
<td>1</td>
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<tr>
<td>ChE341 Fuel Technology I</td>
<td>1</td>
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<tr>
<td>ChE342 Furnace Heat Transfer</td>
<td>1</td>
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<tr>
<td>GE471 Energy</td>
<td>1</td>
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<tr>
<td>Chemistry Advanced Topics (from IIB, IIIA, IIIB, to not more than 3 units)</td>
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<tr>
<td>GE350 Seminar</td>
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<td>GE472 Energy may be available for students who have completed GE471 Energy or GE 472 Energy.</td>
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<tr>
<td>Energy I or II may not be credited at more than 1 unit (2 topics) as a 4th Year Advanced Topic</td>
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<tr>
<td>Mathematics Advanced Topics (to not more than 3 units)</td>
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<tr>
<td>Metallurgy Advanced Topics (to not more than 3 units)</td>
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<tr>
<td>ME361 Automatic Control</td>
<td>1</td>
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<tr>
<td>ME401 Systems Analysis</td>
<td>1</td>
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<tr>
<td>ME505 Systems Planning, Organisation &amp; Control</td>
<td>1</td>
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<tr>
<td>ME481 Engineering Administration</td>
<td>1</td>
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<tr>
<td>ME482 Engineering Economics I</td>
<td>1</td>
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<tr>
<td>ME487 Operations Research—Deterministic Models</td>
<td>1</td>
</tr>
<tr>
<td>ME488 Operations Research—Probabilistic Models</td>
<td>1</td>
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<tr>
<td>Other preferred 1 or 2 unit courses in Arts or Economics Faculties should be discussed with Head of Department of Chemical Engineering. Up to 4 units of Industrial Experience may be credited to Elective II.</td>
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</tbody>
</table>

509200 Elective II

Content

Elective II is normally a full 1st year level subject or equivalent material taken in breadth and depth. A broad non-professional subject in Languages or Social Science is recommended. Alternatives to this unit may be made up of 4 units as approved by the Head of the Department of Chemical Engineering.

Note:
Not all units for either Elective I or Elective II necessarily have to be taken in the same year.

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

**510117 ChE 511 Advanced Heat Transfer**

**510118 ChE 512 Advanced Heat Transfer**

**Hours**  
ChE 512 — 42 hours  
ChE 511 — 42 hours  
for course

**Content**

ChE 511  

ChE 512  
Studies in heat transfer in packed beds (e.g. blast furnaces, catalytic reactors) and in unsteady conditions.

**Text**

ChE 511  

**510122 ChE 513 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 ChE 514 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**

Trinck, W. & MacWhinney *Industrial Furnaces* (Wiley)

**510135 ChE 515 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 incubation, 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

Straus, W. (1967) Industrial Gas Cleaning (Pergamon)

References

Dept of Health Education & Welfare

Air Pollution Engineering Manual

Publication No. 99 — AP-40

Stern, A. C. (1965) Air Pollution (Pergamon)

510124 ChE522 Control of Industrial Liquid Effluents

Part I: The General Problem; chemical processes

Part II: Unit Operations

Part I:

Hours

Approx. 42 hours for course

Content


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


Texts

For Parts I & II


Reference

Nemerow, N. L. Liquid Waste of Industry (Addison-Wesley 1971)
Civil Engineering

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.

521101 CE111 Statics
Prerequisites Nil
Hours 1 lecture hour & 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
Meriam, J. L. *Statics* 2nd edn (S.I.) (Wiley 1975)

521104 CE171 Engineering Surveying I†
Prerequisites Nil
Hours 1½ lecture hours, ½ tutorial hour, 1 fieldwork hour per week & a 3 day survey camp during the last week of the August vacation.
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. *Surveying* (Pitman)

References
Barry, B. A. *Construction Measurements* (Wiley)
Clark, D. *Plane and Geodetic Surveying Vol. I (Plane Surveying)* (Constable)
† Part I of this subject may be taken as a one unit elective in the Department of Mechanical Engineering.

522408 CE201 Civil Engineering IS
Prerequisite Nil
Hours 2 lecture hours & 1 tutorial hour per week
Examination Progressive assessment
Content
Statics: force systems, equilibrium, frameworks
Dynamics: kinematics, rigid body motion, momentum and energy
Properties of Materials: behaviour of materials under static and dynamic loads
Mechanics of Solids: stress and strain, internal forces, moments and stresses, deflection of beams.

Text
Nash, W. A. *Strength of Materials* 2nd edn (Schaum 1972)

522107 CE212 Mechanics of Solids
Prerequisites CE111 and Maths I
Hours 1½ lecture hours & 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, deflexion of beams, torsion, buckling.

Text
Hall, A. S. *An Introduction to the Mechanics of Solids* S.I. edn (Wiley 1973)

References
522106 CE221 Properties of Materials

**Prerequisites**
Engineering I

**Hours**
1 lecture hour & ½ lab. tutorial hour per week

**Examination**
One 3-hour paper

**Content**

**Suggested Preliminary Reading**

**References**

522105 CE222 Materials Technology

**Hours**
1½ lecture hours & 1½ laboratory & tutorial hours per week.

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

**Content**
Metallurgy: basic structure of metals.
Brickwork, timber, ceramics, plastics: basic properties and uses.
Concrete technology: materials in concrete; concrete mix design; properties of plastic and hardened concrete; manufacturing and field control.

**Texts**
As for CE221 Properties of Materials plus
*Design Control and Characteristics of Concrete* (Cement & Concrete Assn)
*SAA Methods for Sampling and Testing Aggregates AS1141* (Standards Assn of Australia)
*SAA Dense Natural Aggregates for Concrete AS1465*

522003 CE223 Engineering Geology

**Prerequisites**
Maths I, ME131 Dynamics

**Hours**
1 lecture hour & 2 laboratory hours per week for 14 weeks & 2 days field work.

**Examination**
One 2-hour paper

**Content**
Introduction to principles of geology and their application to engineering problems.

**Text**
Krynine & Judd *Principles of Engineering Geology and Geotechnics*

522101 CE231 Fluid Mechanics I

**Prerequisites**
Maths I, ME131 Dynamics

**Hours**
1 lecture hour & ½ tutorial/laboratory hour per week

**Examination**
One 3-hour paper

**Content**

**Text**

References
Lea, F. M. & Desch, C. H. *Concrete Technology and Practice* (Angus & Robertson)
Taylor, W. H. *Basic Guide to Concrete Construction* (Cement & Concrete Assn)

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

732900 CE223J Engineering Geology (for students In Engineering)

**Hours**
1 lecture hour & 2 laboratory hours per week for 14 weeks & 2 days field work.

**Examination**
One 2-hour paper
References

52203 CE241 Water Resources Engineering
Hours 2 lecture hours & 1 tutorial hour per week
Examination One 3-hour paper

Content

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

References
Chow, V. T. Handbook of Applied Hydrology (McGraw-Hill)
Metcalfe & Eddy Jr Wastewater Engineering (McGraw-Hill 1972)

52332 CE301 Engineering for Surveyors
Prerequisite Engineering I
Hours 2 lecture hours & 1 tutorial hour per week
Examination Progressive assessment

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

References

52333 CE302 Civil Engineering II
Prerequisite CE201
Hours 2 lecture hours and 1 tutorial hour per week
Examination Progressive assessment

Content
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.

Text
Giles, R. V. Fluid Mechanics and Hydraulics 2nd edn (Schaum 1962)

523304 CE303 Structural Design
Prerequisites CE212 or ME214 & CE221 or ME241
Hours 2 lecture hours & 1 tutorial hour per week
Examination Two 3-hour papers (i) R. C. Design (ii) Steel Design

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

Texts
As for CE313 (Design)

523101 CE313 Structural Analysis and Design I
Prerequisites CE212 & CE221
Hours 4 lecture hours & 2 tutorial hours per week
Examination Three 3-hour papers (i) (Analysis) (ii) (R.C. Design) (iii) (Steel Design)
Analysis of elastic statically determinate and indeterminate systems by classical methods; limit analysis; basic design of steel and reinforced concrete structures.

Texts

Design

B.H.P.—A.I.S.

Bresler, B. et al.

McGuire, W.

Gorenc, B. E. & Tinyou, R.

Lay, M. G.

Warner, R. F. et al.

SAA

SAA

SAA

SAA

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.

Hot Rolled Carbon Steel Sections and Plates (B.H.P. Co. Ltd)

Design of Steel Structures (Wiley)

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

Code for Welding in Building AS1554, Pt 1

Manual Welding—1974


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)

SAA


AS1100

Metric Drawing Standard

SAA

Code for High Strength Bolts—AS1511—1973

SAA


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

Prerequisites

CE212 & Maths I

Hours

2 lecture hours & 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

As for CE313 (Analysis Component)

523102 CE324 Soil Mechanics†

Prerequisite

CE212

Pre- or Corequisite

CE332

Hours

2 lecture hours & 1 tutorial hour per week

Examination

One 2-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

Capper, P. L. & Cassie, W. F.

The Mechanics of Engineering Soils 6th edn (Spon 1976)

Lambe, T. W.

Soil Testing for Engineers (Wiley)
Methods of Testing Soils for Engineering Purposes AS1289

Wu, T. H.

Soil Mechanics 2nd edn (Allyn & Bacon 1966)

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

523301 CE332 Fluid Mechanics II

Prerequisite: CE231

Hours: 2 lecture hours & 1 tutorial/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)

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

References
Davis, C. V. & Sorenson Applied Hydraulics in Engineering (Ronald 1963)
Morris, H. M. Engineering Hydraulics (Wiley 1951)
Vallentine, H. R. Applied Hydrodynamics (Butterworths)

523108 CE372 Transportation Engineering

Hours: 1½ lecture hours per week

Examination: One 3-hour paper

Content
Elements of regional planning, land-use/transport interaction; transportation modes and system characteristics; transportation demand estimates, data collection, highway engineering; driver, vehicle and road characteristics, road geometries; traffic engineering; road construction, drainage, pavements, maintenance.

Preliminary Reading
Hay, W. W. An Introduction to Transportation Engineering (Wiley)

Texts
Oglesby, C. H. & Hewes, L. I. Highway Engineering (Wiley)

References
Blunden, W. R. Geometric Design of Rural Roads (NAASRA)

Traffic Engineering Practice (NAASRA)

The Land-Use/Transport System (Pergamon)

Blunden, W. R. Principles of Pavement Design (Wiley)
524101 CE414 Structural Analysis and Design II

**Prerequisites**  
CE313, Maths IIB

**Hours**  
$3\frac{1}{2}$ lecture-hours & $2\frac{1}{2}$ tutorial hours per week

**Examination**  
One 3-hour paper

**Content**  

**Text**  
SAA

**References**  
Coates, R. C. et al.  
Structural Analysis (Nelson 1972)  
Horne, M. R. & Merchant, W.  
The Stability of Frames (Pergamon 1965)  
Lay, M. G.  
Source Book for the Australian Steel Structures Code AS1250 (A.I.S.C.)  
Lin, T. Y.  
Design of Prestressed Concrete Structures (Wiley)  
Martin, H. C.  
Introduction to Matrix Methods of Structural Analysis (McGraw-Hill 1966)  
Norris, C. H. & Wilbur, J. B.  
Elementary Structural Analysis 2nd edn (McGraw-Hill 1960)

524104 CE414B Structural Design II

**Prerequisite**  
CE313

**Hours**  
$1\frac{1}{2}$ lecture hours & $1\frac{1}{2}$ tutorial hours per week

**Examination**  
Progressive assessment

**Content**  
Design component of CE414.

**Text**  
SAA

**References**  
Lay, M. G.  
Source Book for the Australian Steel Structures Code AS1250 (A.I.S.C.)  
Lin, T. Y.  
Design of Prestressed Concrete Structures (Wiley)  
Warner, R. F. et al.  
Reinforced Concrete (Pitman 1976)

524029 CE415 Elastic Continua

**Prerequisite**  
CE414 or CE414A

**Hours**  
1 lecture hour & $1\frac{1}{2}$ tutorial hour per week

**Examination**  
One 2-hour final paper

**Content**  

**References**  
Desai, C. S. & Abel, J. F.  
Introduction to the Finite Element Method (Van Nostrand-Reinhold 1972)  
Timoshenko, S. P. & Goodier, J. N.  
Timoshenko, S. P. & Woinowsky-Krieger, S.  
Theory of Plates and Shells 2nd edn (McGraw-Hill 1965)
524030 CE416 Plastic Frame Design

Pre(Requisite) CE414 or CE414A
Hours 1 lecture hour & \(\frac{1}{2}\) 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, subassemblies, unbraced frames.

References
Lehigh University *Plastic Design of Multi-story Frames* (1965)

524031 CE417 Steel Beams, Columns and Frames

Pre(Requisite) CE414
Hours 1 lecture hour & \(\frac{1}{2}\) 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)

524032 CE418 Brickwork and Timber Design

Pre(Requisite) CE414
Hours 1 lecture hour & \(\frac{1}{2}\) 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.

References
Pearson, R. G. *et al.* *Timber Engineering Design Handbook* (Jacaranda)

524033 CE419 Engineering Seismology — not offered in 1979

524403 CE425 Earth and Rock Engineering

Pre requisite CE324
Hours 1 lecture hour & \(\frac{1}{2}\) tutorial hour per week
Examination One 2-hour paper

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

References

524034 CE426 Advanced Properties of Materials

Pre requisite CE212, CE221
Hours 1 lecture hour & \(\frac{1}{2}\) 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 & 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

524036 CE428 Soil Mechanics

Prerequisite CE324

Hours 1 lecture hour & ¼ tutorial hour per week

Examination Progressive assessment

Content
Advanced numerical analyses applied to soil mechanics problems, including slip circle analysis, finite difference solutions to problems of consolidation and flow, and finite element solutions to problems of flow, stress analysis and consolidation.

Text Nil

References

524037 CE429 Foundation Engineering (not offered in 1979)

524038 CE433 Theoretical Hydrodynamics

Prerequisite CE332

Hours 1 lecture hour & 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)

Reference
Milne-Thompson, L. M. Theoretical Hydrodynamics (Macmillan)

524039 CE434 Open Channel Flow

Prerequisite CE332

Hours 1 lecture hour & 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 CE332

524040 CE435 River and Coastal Engineering I

Prerequisite CE332

Hours 1 lecture hour & ¼ tutorial hour per week

Examination Progressive assessment

Content

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

Leopold, L. B. et al. Fluvial Processes in Geomorphology (Freeman 1964)
Leliavsky, S. An Introduction to Fluvial Hydraulics (Dover 1966)
Muir Wood, A. M. Coastal Hydraulics (Macmillan 1969)
Wiegel, R. L. Oceanographical Engineering (Prentice-Hall 1964)

524041 CE442 Water Resources Engineering

Prerequisite CE241
Hours 1 lecture hour & 1 tutorial hour per week

Content
To be advised.

Texts

524042 CE443 Water Quality Management

Prerequisite CE241
Hours 1 lecture hour & 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 (Butterworths 1971)

Text

References

524102 CE452 Engineering Construction

Hours 2 lecture hours & 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.
524045 CE473 Engineering Surveying II

**Prerequisite**  
CE171 Engineering Surveying I

**Hours** 84

**Content**  
Precise levelling, plane triangulation with single second theodolites. Topics from underground surveying, hydrographic surveying, trigonometrical levelling, reciprocal levelling and barometric levelling.

**Texts**  
Bannister, A. & Raymond, S.  
*Surveying* 3rd edn (Pitman 1972)

Clarke, D.  

Clarke, D.  
*Plane and Geodetic Surveying for Engineers* Vol. II 6th edn (Constable 1973)

Cooper, M. A. R.  
*Modern Theodolites and Levels* (Crosby Lockwood 1971)

Hodges, D. J. & Greenwood, J. B.  
*Optical Distance Measurement* (Butterworths 1971)

Ingham, A. E.  
*Hydrographic Surveying for the Surveyor and Engineer* (Crosby Lockwood 1974)

524046 CE474 Transportation Planning

**Prerequisite**  
CE372

**Hours** 1 ½ 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.

**Texts**  
Bruton, M. J.  
*Introduction to Transportation Planning* (Hutchinson 1970)
520120 CE527 Concrete Technology
See CE427 Concrete Technology

520121 CE528 Soil Mechanics
See CE428 Soil Mechanics

520122 CE529 Foundation Engineering — not offered in 1979

520123 CE533 Theoretical Hydrodynamics
See CE433 Theoretical Hydrodynamics

520124 CE534 Open Channel Flow
See CE434 Open Channel Flow

520125 CE535 River and Coastal Engineering I
See CE435 River and Coastal Engineering I

520126 CE543 Water Quality Management
See CE443 Water Quality Management

520133 CE544 Civil Engineering Systems II
See CE444 Civil Engineering Systems II

520129 CE574 Transportation Planning
See CE474 Transportation Planning

520136 CE575 Highway Engineering
See CE475 Highway Engineering

520600 CE617 Prestressed Concrete Design
Hours 2 lecture hours & 1 tutorial hour per week
Examination One 3-hour paper

Content

Text SAA "Prestressed Concrete Code AS1481-1974" (Standards Assn of Australia)

References Bennett, W. "Structural Concrete Elements" (Chapman-Hall)

Leonhardt, W. "Prestressed Concrete Design and Construction" (Wilhelm Ernst)

520611 CE626 Theoretical Aspects of Fracture Mechanics
Hours 2 lecture hours & 1 tutorial hour per week
Examination One 3-hour paper

Contents

Texts Nil

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 & 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.

Texts Nil

References Nil

520602 CE635 River and Coastal Engineering II
Hours 1 lecture hour & 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 — not offered in 1979

520604 CE643 Water Pollution and Water Quality Management

Hours 1 lecture hour & 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 & 1 tutorial hour per week
Examination One 3-hour paper

Content

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

520606 CE645J Microbiology of Water Resources

Hours 2 lecture hours & 1 tutorial hour per week
Examination Progressive assessment & final examination

Content

Texts To be advised

520607 CE646 Public Health Science

Hours 1 lecture hour & ½ tutorial hour per week
Examination Progressive assessment & final examination

Content

Texts To be advised

520608 CE647 Unit Operations in Public Health Engineering

Hours 1 lecture hour & ½ tutorial hour per week
Examination Progressive assessment & final examination
Theory of treatment processes used in municipal water and waste-water 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.

Texts
Winfrey, R. *Economic Analysis for Highways* (Intext 1969)

531302-531306 EE092 to EE096 Industrial Experience

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. A student who wishes to study one of these units will be required to contact his adviser regularly and to present a report answering questions set by the adviser giving a connected account and critical evaluation of his engineering activities and experience during the year.

531307 EE097 Industrial Experience II (2 units)

This 2-unit elective is available to “sandwich” course students only. The student must be in appropriate full-time employment for one calendar year from 1st July in the year preceding enrolment to 30th June in the year of enrolment. A diary must be kept, a seminar presented, and a detailed report submitted to the student’s adviser. The report must indicate that the student has been engaged in a major engineering project.

531203 EE131 Circuit Fundamentals

Prerequisites
Nil

Hours
1½ hours of lectures, tutorials & laboratory work per week

Examination
Progressive assessment & final examination

Content
Part I (Introduction)
Introduction to Electrical Engineering, Model Theory, Units,
Part 2 (Resistive Circuits)
Ohms Law, Kirchoff’s Law, Parallel and Series resistive circuits, Nodal and Mesh Analysis, Thevenins and Norton’s Theorems,
Part 3 (Transient Circuits)
Inductance and Capacitance, Natural and Forced Response, Transients in RL, RC Circuits.
Part 4 (Sinusoidal Analysis)
The Phasor Concept, Complex Impedance and Admittance, Phasor diagrams.
Part 5 (Power in AC Circuits)
Power, Volt-Amps, Reactive Power, Power Factor.

Text

532106 EE211 Energy Conversion**

Prerequisite
EE131
Hours 3 hours of lectures & laboratory work per week

Examination Progressive assessment & final examination

Content 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.

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

532108 EE232 Electrical Circuits

Prerequisite EE131

Hours 1½ hours of lectures, tutorials & laboratory work per week

Examination Progressive assessment & final examination

Content Fourier Series, Fourier Analysis of Waveforms, Fourier Transforms as limit of Fourier Series, Laplace Transforms. RLC Circuits Transient and Sinusoidal Response, Resonance of Series and Parallel RLC Circuits, Poles and Zeros of Network Functions, General Frequency Response and Bode Diagrams, Two Port Networks, Maximum Power Transfer, Admittance and Impedance Parameters, Hybrid Parameters.

Texts Cooper, W. D. Electronic Instrumentation and Measurement Techniques (Prentice-Hall)


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

Close, C. M. The Analysis of Linear Circuits (Harcourt, Brace & World)

Skilling, H. H. Electrical Engineering Circuits (Wiley)

532113 EE262 Systematic Programming

Prerequisite Mathematics I

Hours 1 lecture hour and ½ tutorial or practical work per week

Examination One 2-hour paper

Content The case for high level programming languages. The formal definition of the syntax of high level languages. An overview and comparison of several high level languages, including FORTRAN, ALGOL 60, PL/I and COBOL. Comparison of compiler languages and interpretive languages. A brief introduction to list processing languages and macrogenerators.
Structured programming: its objectives and the techniques used to achieve them. Modular design, top-down programming, good coding style. The role of 'goto' constructs, conditional statements, looping, 'case' statements. The virtues and faults of existing programming languages.

Procedures, co-routines, re-entrancy. Recursive programming. Appropriate and inappropriate uses of recursion.

Text
Elson, M.

References
Bates, F. & Douglas, M. L.
Dahl, O. J. et al.
Guttmann, A. J.
International
Computers Ltd
International
Computers Ltd
Katzan, H. Jr
Kernighan, B. W.
Plauger, P. J.
Kreitzberg, C. B. & Shneiderman, B.
Wirth, N.
Yourdan, E. J.

Concepts of Programming Languages (Science Research Associates 1973)

Programming Language/One 3rd edn (Prentice-Hall 1975)

Structured Programming (Academic 1972)

Structuring and Algorithms (Heinemann 1977)

ALGOL Programming Manual

1900 series COBOL Manual

Introduction to Computer Science (Petrocelli-Charter 1975)

Software Tools (Addison-Wesley 1976)

The Elements of FORTRAN Style (Harcourt, Brace, Jovanovich 1972)

Systematic Programming (Prentice-Hall 1973)

Techniques of Program Structure and Design (Prentice-Hall 1975)

for complex data items. Scatter storage and hash addressing. Elementary string processing, and list processing.

Searching and sorting. A description of several sorting algorithms and comparison of their efficiencies.

Text
Elson, M.

References
Dahl, D. J. et al.
Horowitz, E. & Sahni, S.
Katzan, H. Jr
Knuth, D. E.
Wirth, N.

Data Structures (Science Research Associates 1975)

Structured Programming (Academic 1972)

Fundamentals of Data Structures (Pitman 1977)

Introduction to Computer Science (Petrocelli-Charter 1975)


Algorithms + Data Structures = Programs

532115 EE264 Introduction to Logic Assembly Language

Prerequisite
Mathematics I

Hours
1½ lecture and practical work hours per week

Examination
Progressive assessment and final examination

Content
Number systems: representation and arithmetic. Boolean algebra: combinatorial logic, Karnaugh maps, flip flops, sequential logic, counters.

Hardware components, processor structure, addressing modes. Assembly language. Instruction sets, pseudo ops, machine language macros, recursion, re-entry, linkers and loaders.

Lectures will be supplemented with practical assignments using PDP-11 computer.

Text
Eckhouse, R. H. Jr


References
Chu, Y. H.

Computer Organization and Micro Programming (Prentice-Hall 1972)

Donovan, J. J.

Systems Programming (McGraw-Hill 1972)
Friedman, A. D.  
Stone, H. S.  

Logical Design of Digital Systems (Computer Science)  
Introduction to Computer Organization and Data Structures (McGraw-Hill 1972)

533201 EE313 Power Systems**

Prerequisites  
EE211

Hours  
3 hours of lectures per week

Examination  
Progressive assessment & final examination

Content  
The functions and constraints relating to a power system. Energy sources: nuclear, fossil fuels, hydro. Review of the power formula, electric field energy and magnetic field energy. D.C. versus A.C. systems; single phase versus 3-phase transmission. The concept of complex power. Operational considerations: system structure; capacity of transmission lines, load characteristics, the real and reactive power balances. The high energy line: Design considerations, line parameters, bundle conductors and transposition. The long line theory. Stability of synchronous systems: synchronising power, synchronising torque, transient stability of synchronous machines and equal area criterion.
The energy system in the steady state: introduction to optimum operational conditions and to load flow techniques.

Text  
Stevenson, W. D.  
Elements of Power System Analysis 3rd edn (McGraw-Hill)

Reference  
Elgerd, O. I.  
Electric Energy Systems Theory (McGraw-Hill)

533106 EE314 Electrical Machines*

Prerequisites  
EE211

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

Examination  
Progressive assessment & final examination

Content  

Text  
O'Kelly, D. & Simmons, S.  
Introduction to Generalized Electric Machine Theory (McGraw-Hill)

Reference  
Thaler, G. J. & Wilcox, M. L.  
Electric Machines (Wiley)

533111 EE315 Power Electronics**

Prerequisites  
EE232

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

Examination  
Progressive assessment & 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  
Davis, R. M.  
Power Diode and Thyristor Circuits (IEE Monograph Series 7) (Peter Peregrinus Ltd)

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

533107 EE323 Linear Electronics*

Prerequisite  
EE221

Hours  
3 hours of lectures & tutorials per week

Examination  
Progressive assessment & final examination

Content  
Signal processing in electronic systems. Biasing requirements and techniques for BJT's and FET's. 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.

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

533115 EE325 Introduction to Digital Technology**

**Prerequisites**
Maths I, EE221

**Hours**
3 hours per week

**Examination**
Progressive assessment & final examination

Content
Logic families; characteristic, functions and interfacing.
Digital measurements; A/D, D/A conversion, rotational and translational encoders, time and frequency measurements.
Digital system interconnection; bus systems, interfacing, single and differential transmission.
Memory technology, solid state, core memory, RAM, ROM, magnetic surface memory systems.
Random logic and programmed logic systems, IC, MSI, LSI, micro-programmed systems, microprocessor systems.
Lectures will be supplemented by practical assignments on a microprocessor system.

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

References
Johnson, W. C. *Transmission Lines and Networks* (McGraw-Hill)
Moore, R. K. *Travelling Wave Engineering* (Wiley)

533213 EE341 Automatic Control* (Also see ME361)

**Prerequisites**
Maths II, Topics CO, D, E

**Hours**
3 hours of lectures, tutorials & laboratory work per week

**Examination**
Progressive assessment & final examination


533113 EE344 Communications**

Prerequisites EE331, Maths IIB

Hours 3 hours per week

Examination To be determined

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
Gregg, W. D. Analog and Digital Communications: Concepts, Systems, Applications and Services (Wiley)

References

533116 EE345 Digital Signal Processing**

Prerequisite EE341 or ME361

Hours 3 hours of lectures & tutorials per week

Examination Progressive assessment & final examination

Content

Discrete Random Signals, Power Spectrum Estimation; Application of Fast Fourier Transforms to Covariance and Spectrum estimation.

Text
Stanley, W. D. Digital Signal Processing (Reston 1975)

References


533218 EE351 Electromagnetic Propagation and Antennas**

Note Students who passed EE451 in 1977 or earlier will not be permitted to enrol in EE351.
Prerequisite

Mathematics IIB

Hours

3 hours of lectures, laboratory & tutorials per week

Examination

To be advised

Content
Revision of Maxwell's equations. Solutions in various media, reflection, polarization, Poyntings power flow theorem, Attenuation and surface impedance.

Free space and guided wave propagation including coaxial, waveguide and strip line configurations.

Electromagnetic sources and potential functions, radiation and elementary antenna theory. Techniques for obtaining the surface current distribution on an arbitrary antenna by analytic and computational methods. Solutions of the potential equations, near and far field distributions.

Characteristics of common antenna configurations including primary source wire antennas, antenna arrays and secondary source antennas.

Ground wave and ionospheric propagation.

Text

References

Ramo, S. et al Fields and Waves in Communication Electronics

Prerequisite

Maths I

Hours

3 hours of lectures, tutorials & practical work per week

Examination

Progressive assessment & 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
534144 EE416 Advanced Electrical Machine Theory*

Prerequisite
EE314

Hours
3 hours of lectures per week

Examination
Progressive assessment & final examination

Content

Text
Thaler, G. J. & Wilcox, M. L. Electric Machines (Wiley)

References
O'Kelly, D. & Simmons, S. Introduction to Generalized Machine Analysis (McGraw-Hill)
Say, M. G. Design of Alternating Current Machines 3rd edn (Pitmans)

534109 EE421 Electronics Design A*

Prerequisite
EE323

Hours
3 hours of lectures & laboratory work per week

Examination
Progressive assessment & final examination

Content
Operational amplifiers, design, characteristics and applications; differential amplifier, common mode response, input guarding, frequency compensation, Chopper stabilized amps, Comparators. Regulators; static switching, protection. Power stages; thermal stability, protection and techniques.

Text

References
Thornton, R. D. et al. SEEC Notes Volume I—Multistage Transistor Circuits (Wiley 1965)
RCA Solid State Power Circuits (1971)

534132 EE443 Optimization Techniques*

Prerequisites
Maths II, Topics CO, 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)

534141 EE446 Linear Optimal Control**  — not offered in 1979

534134 EE447 Digital Communications*

Prerequisite
EE344 or Consent of Instructor

Hours
3 hours of lecture & tutorial work per week

Examination
Progressive assessment & final examination

Content
Pulse modulation schemes, including pulse code modulation, multiplexing, matched filters.

Text
As for EE344

References
Wozencraft, J. M. & Jacobs, I. M.  *The Principles of Communication Engineering* (Wiley)

534145 EE462 Topics in Switching Theory

Prerequisite
EE362 or consent of instructor

Hours
Three hours of lectures and tutorials per week

Content

Text
Nil

References
Breuer & Frierman, A. D.
Mukhopadhyay, A. (ed.)
Friedman, A. D. & Menon, P. R.

Kohavi, Z.  *Switching and Finite Automata Theory* (McGraw-Hill)

534124 EE463 Computer Operating Systems**

Prerequisite
EE361 or consent of instructor

Hours
3 hours of lecture & tutorial work per week

Examination
Progressive assessment & 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.
Hansen, P. B.
Madnick, S. E. & Donovan, J. J.

534143 EE464 Compiler Construction*

Prerequisite
EE361

Hours
3 hours per week

Examination
Progressive assessment & final examination

Content

Text
Gries, D.  *Compiler Construction for Digital Computers* (Wiley)

References
Aho, A. V. & Ullman, J. D.
Donovan, J. J.  *Systems Programming* (McGraw-Hill)

Further references will be given in class.
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.

534106 EE481 Project/Directed Reading

Content
Similar to EE480

534101 EE491 Seminar*

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

530100 EE516 Computer-Aided Analysis of Power Systems (not offered in 1979)

530127 EE541 Sample Data Control Systems (Digital Signal Processing)*
See EE345

530102 EE542 Modern Control** (Nonlinear Optimal Control Theory)
(not offered in 1979)

530120 EE543 Optimization Techniques**
See EE443

530123 EE545 Communication Systems* (not offered in 1979)

530128 EE546 Modern Control (Linear Optimal Control Theory)
(not offered in 1979)

530129 EE547 Digital Communication** See EE447

530130 EE552 Advanced Topics in Communications Systems**
(not offered in 1979)

530117 EE563 Computer Operating Systems* See EE463

530132 EE562 Advanced Switching Theory and Logic Design*
(not offered in 1979)

530136 EE564 Compiler Construction** See EE464

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
### Inter-Departmental Subjects

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Prerequisites</th>
<th>Hours</th>
<th>Examination</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>501101</td>
<td><strong>GE112 Introduction to Engineering Design</strong></td>
<td>Nil</td>
<td>42</td>
<td>Progressive assessment</td>
<td><em>Australian Standard Engineering Drawing Practice C2I 1976</em> (Inst. of Engineers Australia)</td>
</tr>
</tbody>
</table>

**Content**
Philosophy and fundamentals of engineering design.

**Texts**
- *Australian Standard Engineering Drawing Practice C2I 1976* (Inst. of Engineers Australia)
- *Graphics* (Wiley)
- *Basic Graphics* (Prentice-Hall)
- *Introduction to Engineering Drawing* (Univ. of New South Wales Press 1974)
- *Engineermanship—A Philosophy of Design* (Brooks-Cole)

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<tr>
<th>Code</th>
<th>Title</th>
<th>Prerequisites</th>
<th>Hours</th>
<th>Examination</th>
<th>Text</th>
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<tbody>
<tr>
<td>523202</td>
<td><strong>GE350 Seminar</strong></td>
<td>Nil</td>
<td>42</td>
<td>Progressive assessment</td>
<td><em>To be advised</em></td>
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**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**
- *To be advised*

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Prerequisites</th>
<th>Hours</th>
<th>Examination</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>504101</td>
<td><strong>GE471 Energy</strong></td>
<td>Physics IA or IB, Maths IIB</td>
<td>3</td>
<td>Progressive assessment</td>
<td><em>To be advised</em></td>
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</table>

**Content**
History, distribution and forecasts of energy usage.
Overview of problems in energy management.
Basics of energy transformations and the applicability of the laws of thermodynamics in energy conversion.
Energy release from fundamental processes related to nuclear, solar, chemical, thermal, electrical and mechanical forms of energy.
Environmental aspects of energy usage and control of thermal, audio, gas and other forms of pollution.

**Texts**
- *To be advised*
Mechanical Engineering

Prerequisites marked thus † may, with the consent of the Head of the Department of Mechanical Engineering, be read concurrently with the subject named.

541302 ME092
541303 ME093
541304 ME094
541305 ME095

Industrial Experience Units

Examination Progressive assessment

Content

These subject units are designed to formalise periods of Industrial Experience gained by part-time students only. Each of the Industrial Experience units is equivalent to one unit of 42 hours. Students who wish to study any or all of the Industrial Experience units ME092-095 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 relating to aspects of his experience and to report to his industrial experience tutor twice per term. Some assignments relating to employment and experience will be set. Students will also be required to present a report giving a connected account and critical evaluation of his engineering activities and experience during the year. Such units may be used by students in lieu of electives (see Elective Requirements—Appendix A).

541307 ME097
541308 ME098

Industrial Experience Units

Examination Progressive assessment

Content

As above except that each of ME097-8 is the equivalent of two units. These Industrial Experience units are available to sandwich course students only and are designed to cover Industrial Experience gained over two years.

541104 ME111 Graphic and Engineering Drawing

Prerequisites Nil

Hours 42

Examination Progressive assessment plus examination.

Content

A study in communication and analysis by pictorial means. Methods of projection covering orthogonal projection of points, lines, planes and solids; lengths of lines, angles and intersection between lines, planes and contoured surfaces; orthographic projection, dimensioning and sectioning; isometric projection; perspective projection.

Text

1—To be advised.
2—Australian Standard Engineering Drawing Practice CZI 1976 (Inst. of Engineers Australia)

References

Levens, A. S. Graphics (Wiley)
Luzadder, W. J. Basic Graphics (Prentice-Hall)

541201 ME121 Workshop Practice

Prerequisites Nil

Hours 54

Examination Progressive 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

Tech. Education Trade Technology Notes

References

DeGarmo, E. P. Materials and Processes in Manufacturing (Macmillan)
Doyle, L. E. et al. Manufacturing Processes and Materials for Engineers (Prentice-Hall)
H. Ford Trade School Shop Theory (McGraw-Hill)—Trade Catalogues

541103 ME131 Dynamics

Prerequisites Nil

Hours 42

Examination Progressive 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.
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

542206 ME201 Experimental Methods I*
Prerequisites  †Maths I & †Physics IA or IB
Hours  42
Examination  Progressive assessment and examination

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)

542104 ME202 Dynamics of Engineering Systems*
Prerequisites  Maths I, †ME131, †CE111
Hours  42
Examination  Progressive assessment and examination

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
Ogata, K.  System Dynamics (Prentice-Hall 1978)

References
Haberman, C. M.  Engineering Systems Analysis (Merril)
Cannon, R. H.  Dynamics of Physical Systems (McGraw-Hill)

542207 ME203 Experimental Methods II**
Prerequisites  ME201
Hours  42
Examination  Progressive assessment

Content
Selected engineering experiments designed to extend the concepts of experimental procedures and to complement formal subject matter in the course.

Text
To be advised.
Reference  To be advised.

542208 ME212 Engineering Design I**
Prerequisites  †ME121, ME111, †ME214 or CE212
CE111, †Maths I, GE112
Hours: 42

Examination: Progressive assessment

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:
Design of Machine Elements 5th edn (Prentice-Hall 1978)

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

542109 ME223 Engineering Technology**
Prerequisites: 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)

542305 ME232 Dynamics of Machines I**
Prerequisites: Maths I, ME131, ME111, CE111, GE112

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)
542106 ME241 Properties of Materials I**

**Prerequisites**  Maths I, ME111, GE112, CE111

**Hours**  42

**Examination**  To be advised

**Content**

**Text**  Nil

**References**
D'Isa, F.  *Mechanics of Metals* (Addison-Wesley 1968)
McCintock & Argon  *Mechanical Behaviour of Materials* (Addison-Wesley 1966)

542210 ME251 Fluid Mechanics I*

**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. Bernouilli equation, energy equation. Linear momentum equation. The moment of momentum equation. Linear and angular momentum applications. Introduction to dimensional analysis. Viscous effects:— fluid resistance, laminar and turbulent flow, flow in pipes and conduits. Fluid measurement.


**References**
Streeter, V. L.  *Fluid Mechanics* 5th edn (McGraw-Hill)
543101 ME301 Engineering Computations

Prerequisite Maths I
Hours 42
Examination Progressive assessment

Content

Texts
Conte, S. D. & de Boor, C. Elementary Numerical Analysis (McGraw-Hill 1972)
Duncan, A. K. FORTRAN (ICL 1975)
Computing Centre Handbook

543104 ME302 Experimental Methods III**

Hours 42
Examination Progressive assessment

Content
Selected engineering laboratory experiments designed to extend the concepts of experimental procedures and to complement formal subject matter in the course.

Text
To be advised.
Reference To be advised.

543105 ME312 Engineering Design II*

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 As for ME212

References
Faires, V. M. Design of Machine Elements (Macmillan)
Hall, A. E. et al. Theory and Problems of Machine Design (Schaum)
Phelan, R. M. Fundamentals of Mechanical Design (McGraw-Hill)
Shigley, J. E. Mechanical Engineering Design I.S. edn (McGraw-Hill)
Siegal, W. J. et al. Mechanical Design of Machines (Internat. Textbook)
Stephenson, J. & Callander, R. A. Engineering Design (Wiley)

543106 ME313 Engineering Design III*

Prerequisites ME312, ME214, ME232, Maths I
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
Siegel, W. J. et al. Mechanical Design of Machines (Internat. Textbook)
Howarth, M. H. Design of High Speed Diesel Engines (Constable)
Lipson & Juvinal Handbook of Stress and Strength (Macmillan)
Matousek, R. Engineering Design (Blackie)
Purday Diesel Engine Design (Constable)
Seely & Smith Advanced Mechanics of Materials (Wiley)
### 543107 ME333 Dynamics of Machines II

**Prerequisites**  
Maths IIB, ME202, ME232.

**Hours**  
42

**Examination**  
Progressive assessment and examination

**Content**  
Kinematics and dynamics of radial cams and toothed gearing.  
Balancing of machinery.  
Vibrations — Review of one degree of freedom systems.  
Multi degree-of-freedom systems. Vibrations of continuous systems.

**Texts**  
Hirschhorn, J.  
*Dynamics of Machinery* (Nelson)  
or  
Church, A. H.  
*Mechanical Vibrations* (Wiley)

**References**  
Anderson, R.A.  
*Fundamentals of Vibrations* (Macmillan)  
Rothbart, H.B.  
*Cam Design and Accuracy* (McGraw-Hill)  
Seto, W. W.  
*Mechanical Vibrations* (Schaum)  
Shigley, J. E.  
*Theory of Machines* (McGraw-Hill)

### 543108 ME342 Properties of Materials II

**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.

**Texts**  
Nil

**References**  
Crandall, S. H. et al.  
*An Introduction to the Mechanics of Solids* (McGraw-Hill)  
D’Isa, F. A.  
*Mechanics of Metals* (Addison-Wesley)  
Drucker, D. C.  
Juvinall, R. C.  
*Stress, Strain and Strength* (McGraw-Hill)  
Long, R. R.  
*Mechanics of Solids and Fluids* (Prentice-Hall)  
McClintock, F. A. & Argon, A. S.  
*Mechanical Behaviour of Materials* (Addison-Wesley)  
Shanley, F. R.  
*Mechanics of Materials* (McGraw-Hill)  
Seely, F. B. & Smith, A. M.  
*Advanced Mechanics of Materials* (Wiley)

### 543109 ME343 Mechanics of Solids II

**Prerequisites**  
CE212 or ME214

**Hours**  
42

**Examination**  
Progressive assessment and examination

**Content**  

**Texts**  
Nil

**References**  
Broek, D.  
*Elementary Engineering Fracture Mechanics*  
Christensen, R. M.  
*Theory of Viscoelasticity — An Introduction* (Academic 1971)  
Knott, J. F.  
*Fundamentals of Fracture Mechanics* (Butterworths 1973)  
Lawn, B. R. & Wilshaw, T. R.  
*Fracture of Brittle Solids* (Cambridge U.P. 1975)  
Trelor, L. R. G.  

### 543110 ME352 Fluid Mechanics II

**Prerequisite**  
ME251
Hours 42
Examination Progressive assessment and examination

Content

Text

543204 ME361 Automatic Control*
Prerequisite Maths IIB
Hours 42
Examination Progressive assessment and examination

Content

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

Text

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

543111 ME373 Thermodynamics II**
Prerequisite ME271
Hours 42
Examination Progressive assessment

Content

Texts
Haywood, R. W. Analysis of Engineering Cycles (Pergamon 1975)
Goodger, E. M. Combustion Calculations (MacMillan 1977)

543501 ME381 Methods Engineering**
Prerequisites Maths I, ME223
Hours 42
Examination Progressive assessment

Content
543502 ME383 Quality Engineering**

**Prerequisites**
Maths IIB, ME223

**Hours**
42

**Examination**
Progressive assessment and examination

**Contents**
The application of economics, methods engineering, ergonomics and mechanical engineering to the development and design of products. Production, distribution and marketing of engineering products. Production, assembly and inspection methods in relation to scale of output. Principles of metrology and tool, jig and fixture design.

**Texts**
Nil

**References**
Kempster, M. H. A. *Principles of Jig and Tool Design* (English U.P.)

544451 ME401 Systems Analysis*

**Prerequisites**
Maths IIB, ME361

**Hours**
42

**Examination**
Progressive assessment and examination

**Contents**
System concepts and system classification. Mathematical modelling. Deterministic and probabilistic models, Stochastic models. Deterministic systems — Linear Graph theory and Network Analysis; Classical 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**
De Russo, P.M. et al. *State Variables for Engineers* (Wiley 1965)
544427 ME404 Mathematical Programming I

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. Transportation and assignment problems.

Texts

Nemhause, G. L. \textit{Introduction to Dynamic Programming} (Wiley 1966)

References

Kunzi, H. P. et al. \textit{Non-Linear Programming} (Blaisdell 1966)


Taha, H. A. \textit{Mathematical Programming} (Wiley 1970)

544426 ME410 Advanced Design Concepts I

Hours
42

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. Computer approach for mechanical design applications. The optimum design of typical mechanical components.

Texts
Nil

References
Furman, T. T. \textit{The Use of Computers in Engineering Design} (English U.P.)

Johnson, R. C. \textit{Optimum Design of Mechanical Elements} (Wiley)

Matousek, R. \textit{Engineering Design} (Blackie)

Morrison, D. \textit{Engineering Design} (McGraw-Hill)

544425 ME419 Bulk Material Handling Systems Analysis and Design

Prerequisites
ME313

Hours
42

Examination
Progressive assessment

Content

Text

N.S.W. State Pollution Control Commission Regulations

N.S.W. Health Commission Regulations

Beranek, L. L. \textit{Noise and Vibration Control} (McGraw-Hill 1971)
References
Reisner, W., Eisenhart, V.,
Rothe, M. &
Colijn, H.
Colijn, H. Weighing and Proportioning of Bulk Solids
(Trans Tech 1975)

544419 ME434 Advanced Kinematics and Dynamics of Machines
(not offered in 1979)

544401 ME444 Properties of Materials (not offered in 1979)

544402 ME445 Mechanics of Solids
Prerequisite ME343
Hours 42
Examination To be advised

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

Texts Nil

References
Timoshenko & Wainowsky-Krieger Theory of Plates and Shells (McGraw-Hill)
Zienkiewicz & Holister Stress Analysis (Wiley)

544416 ME448 An Introduction to Photomechanics
Prerequisites ME342/3
Hours 42
Examination Progressive assessment

Content
Model analysis for two or three dimensional problems which may involve static, dynamic or thermal loading conditions.
Calibration of material and solution of disc problem

Texts Nil

References
Dally, J. W. & Riley, W. F.
Introduction to Photomechanics
(Prentice-Hall 1965)

544418 ME449 Reliability Analysis for Mechanical Systems
Prerequisites ME313, Mathematics IIB
Hours 42
Examination To be advised

Content

Text

References
Haviland, R. P. Engineering Reliability and Long Life Design (Van Nostrand 1964)
Polovko, A. M. Fundamentals for Reliability Theory (Academic 1968)

544411 ME453 Fluid Mechanics
Prerequisite ME352
Hours 42
Examination To be advised

Content
Lectures and laboratory work dealing with a selection from the following topics:
Application of hydrodynamics
Hydraulic transients
Fractional analysis application
Cavitation studies
Topics in turbomachinery
One-dimensional compressible flow.

Texts
Nil

References
Brown, J. H.  *Hydro-electric Engineering Practice* Vol. 2 (Blackie)
Vallentine, H. R.  *Applied Hydrodynamics* (Butterworths)

544412 ME473 Thermodynamics (not offered in 1979)
544413 ME474 Heat Transfer (not offered in 1979)
544423 ME476 Development in the Use of Solar Energy (not offered in 1979)

5444101 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
Beach, D. S.  *Managing People at Work* (McMillan 1975)
Buffa, E. S.  *Modern Production Management* (Wiley 1973)
Byrt, W. J.  *People and Organizations* (McGraw-Hill 1971)

544433 ME482 Engineering Economics I*

Prerequisite
Maths I

Hours
42

Examination
Progressive assessment and examination

Content

Text

References

544463 ME483 Production Engineering

Prerequisites
Maths I, ME223

Hours
42

Examination
Progressive assessment and examination

Content
Production systems; job shop, line production, group technology; computer aided manufacture, numerically controlled systems; materials handling. Production planning and control; forecasting, inventory, scheduling and sequencing.

Text
Nil

References

544464 ME484 Engineering Economics II*

Prerequisite
ME482

Hours
42

Examination
Progressive assessment and examination

**Text**


**References**


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**

Vajda, S. *Readings in Mathematical Programming* (Pitman)


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. Queuing 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)


Hadley, G. & Whitin, T. M. *Analysis for Inventory Systems* (Prentice-Hall)

Taha, H. A. *Operations Research* (Macmillan)

544465 ME492 Special Topic

In 1979 it is proposed to offer the Special Topic as follows:

**Engineering Aspects of Biomedical Science**

**Prerequisite** Permission of Head of Department of Mechanical Engineering

**Hours** 42

**Examination** To be advised

**Content**

An introduction to the bioengineering problems related to the human body. The course has been prepared along the following four topics:

2. Properties and mechanics of bone fracture.
3. The design of human total-joint replacement.
4. Implant materials, their compatibility and the present trend of research.

**Text**

Nil

**References**

Institution of Mechanical Engineers *Human Locomotor Engineering* (London 1974)
Crouch, J. E. & McClintic, J. R.
Evans, F. G.
Liebowitz, H.

*Human Anatomy and Physiology* 2nd edn (Wiley 1971)
*Mechanical Properties of Bone* (Thomas 1973)

544203 ME496 Project/Seminar

**Hours** 126

**Examination** Progressive assessment

**Content** See Head of Department of Mechanical Engineering

540137 ME503 Design of Experiments for Engineering Research

**Prerequisites** Maths IIB

**Hours** 42 hours of lectures, seminars and tutorials

**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.

**Texts** Nil

**References**
Bright–Wilson
Cook & Rabinowicz
Ezekiel & Fox
Korn & Korn

*Introduction to Scientific Research* (McGraw-Hill)
*Physical Measurements and Analysis* (Addison-Wesley)
*Methods of Correlation Analysis and Regression Analysis* (Wiley)
*Mathematics Handbook for Scientists and Engineers* (McGraw-Hill)
*Experimental Statistics* Handbook 91 (U.S. Nat. Bur. of Standards)

540126 ME505 Systems Analysis, Organisation and Control

**Prerequisites** ME301

**Hours** 42

**Examination** Progressive assessment & examination

**Content**

**Texts**
Nil

**References**
Acknoff, R. L.
Carzo, R. & Yanouzas, J. V.
Citron, S. J.
Deutsch, R.
Kuester, J. L. & Mize, J. H.
Machol, R.
McMillan, C. & Gonzalez, R. F.
Taha, H. A.
Wayne-Weymores, A.

*A Concept of Corporate Planning* (Wiley 1970)
*Formal Organisation, A Systems Approach* (Irwin-Dorsey 1965)
*Elements of Optimal Control* (Holt, Rinehart & Winston 1969)
*Systems Analysis Techniques* (Prentice-Hall 1969)
*Optimization Techniques with Fortran* (McGraw-Hill 1973)
*Operations Research* (McMillan 1971)
*A Mathematical Theory of Systems Engineering* (Wiley 1967)

540127 ME508 Air Pollution Studies II

**Prerequisite** ME407

**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**
Seinfeld, J. H.

*Air Pollution—Physical and Chemical Fundamentals* (McGraw-Hill 1975)
References
Deminger, A. Models for Environmental Pollution Control (Ann Arbor Science Publishers 1973)
Stern, A. C. Air Pollution 3 Vols (Academic 1968)

540128 ME511 Experimental and Theoretical Stress Analysis

Hours 84
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
Durelli, A. J. & Riley, W. F. Introduction to Photomechanics (Prentice-Hall 1965)
McMillan, C. Mathematical Programming (Wiley 1970)
Southwell, R. V. An Introduction to the Theory of Elasticity (Dover 1969)

540129 ME515 Advanced Design Concepts II

Prerequisite ME410
Hours 42
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. (This subject continues on from ME410.)

Texts Nil

References
Arnold, P. C., McLean, A. G., Roberts, A. W.
Brown, R. L. & Richards, J. C.
Hawk, M. C.

540138 ME517 Materials Handling and Transportation Systems

Hours 42
Examination Progressive assessment
Prerequisite ME419

Content
Further studies in bulk solids handling. Analysis and optimization of materials handling and transportation systems. Examination of technical characteristics and economic factors involved in various types of transport systems. Examples considered will be selected from various types of conveyor systems, pipeline systems (pneumatic and hydraulic), capsule systems, road, rail and sea transport systems. Other studies may include stockpiling, unit handling, packaging and cargo systems.

Texts Nil

References
Principles of Powder Mechanics (Pergamon)
Bulk Materials Handling Vol. I (Univ. of Pittsburgh, School of Engineering, No. 3 1971)
Hawk, M. C.
Bulk Materials Handling Vols. I (3) & II (8) (Univ. of Pittsburgh, School of Engineering 1971)
Jenike, A. W.  
Wasp, E. J., 
Kenny, J. P., 
Gandhi, R. L.L.  

& Bull. 123 (1964)  
Storage and Flow of Solids (Utah Engineering 
Experiment Station)  
Solid Liquid Flow Slurry Pipeline Transportation 
(Trans Tech. Publications Vol. 1  
1975/77 No. 4)  
Selected Research Papers

540130 ME535 Vibration and Noise Problems in Industry  
**Prerequisite** ME409  
**Hours** 42  
**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:  
(i) Sound waves and their measurements. Fundamentals underlying 
noise control. Criteria for noise and vibration control. Practical 
noise control.  
(ii) Basic vibration theory. Vibration sources, vibration measure­ 
ment and analysis. Vibration control: shock and vibration isolation 
in machines and vehicles. Effects of shock and vibration on 
structures. (This subject continues on from ME409.)

**Texts**  
Anderson, R. A.  
Beranek  

References  
Harris & Crede  
Pestel, C. E. &  
Leckie, F. A.  

540131 ME554 Computation of Fluid Flows and Heat Transfer  
**Hours** 42  
**Examination** To be advised  

**Content**  
Review of relevant, probability and statistics theory; utility theory; 
Bayes' theorem; decision trees; decision models under risk and un­ 
certainty; queuing theory; Markov models, renewal theory; variable 
inventory models; forecasting; time series analysis; production-inventory 
models; quality assurance models; reliability.

540132 ME581 Mathematical Programming II  
**Prerequisite** ME404
540152 ME582D Industrial Computations

**Prerequisites**  
Nil

**Hours**  
42

**Examination**  
Progressive assessment and examination

**Content**  

**Text**  
Guttmann, I. & Wilks, S. S.  
Introductory Engineering Statistics (Wiley)

**References**  
Moroney, M. J.  
Facts from Figures (Pelican)

Paradine, C. G. & Rivett, B. H. P.  
Statistical Methods for Technologists (English U.P.)

Wadsworth, G. P. & Bryan, J. G.  
Probability and Random Variables (McGraw-Hill)

Walpole, R. E.  
Introduction to Statistics (Macmillan)

540134 ME583 Modelling of Management Problems

**Hours**  
42

**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)

540135 ME584 Simulation

**Prerequisite**  
ME487

**Hours**  
42

**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 (Wiley 1971)

Naylor, T. H. et al.  
Computer Simulation Techniques (Wiley 1966)

Tocher, K. D.  
The Art of Simulation (English U.P. 1963)

540136 ME597 Project/Seminar

**Hours**  
84, 126 or 168

**Examination**  
Progressive assessment

**Content**  
See Head of Department of Mechanical Engineering

433240 ME681D Industrial Law

For subject entry see Industrial Law entry in Section 4 Part II of this Handbook.

540173 ME684D Project

**Hours**  
84

**Examination**  
Progressive assessment
540176 ME685 Advanced Operations Research

Prerequisite
ME487/488

Hours
42

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)
111141 Met141 Mechanical Properties of Materials 1 unit

**Prerequisites**
Nil

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

**Examination**
One 1½ hour paper

**Content**

**Text**

**References**
Dieter, G.  *Mechanical Metallurgy* (McGraw-Hill)
Polakowski, N. H. & Ripling, E.  *Strength and Structure of Engineering Materials* (Prentice-Hall)

111151 Met151 Microstructure of Materials 1 unit

**Prerequisites**
Nil

**Hours**
About 21 lecture hours & 21 hours of tutorial, demonstration & 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 rule 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**
Cracknell, A. P.  *Crystals and their Structure* (Pergamon)
Van Vlack, L. H.  *Elements of Materials Science* (Addison Wesley)

111181 Met181 Atomic Structure of Materials 1 unit

**Prerequisites**
Nil

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

**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 & 21 hours of tutorial, demonstration & practical classes

**Examination**
One 1½ hour paper

**Content**
Atomic bonding and electron mobility. Electrons in a potential box, free electron model of a metal, effects of the lattice, alkali, noble and transition metals, insulators and semi conductors. Specific heat and

Text
Wulff, J. et al. *The Structure and Properties of Materials*
Vol. 4 (Wiley)

References
To be advised

112211 Met211 Metallurgical Computations 4 units
Prerequisite Maths I
Hours About 112 lecture hours & 56 tutorial hours
Examination As determined by the Faculty of Mathematics

Content
Consists of Topics A, CO and F of Mathematics II.

112212 Met212 Metallurgical Stoichiometry 1 unit
Prerequisites
Hours About 21 lecture hours and 21 tutorial hours
Examination One 1\textsuperscript{½} hour paper

Content

Text
To be advised

References
To be advised

112213 Met213 Applied Statistics 1 unit
Prerequisites Nil
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1\textsuperscript{½} hour paper

Content
References
Burke, J.
Welty, J. R. et al.

**Kinetics of Phase Transformations**
**Fundamentals of Momentum, Heat and Mass Transfer** (Wiley)

112241 Met 241 Microplasticity

**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.
Tegart, W. J. McG.

**Elements of Mechanical Metallurgy** (Macmillan)

112251 Met 251 Metallography

**Prerequisites**
Met121, Met151, Met181

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

**Examination**
One 1½ hour paper

**Content**

**Texts**
Cullity, B. D.

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

Reed-Hill, R.

**Physical Metallurgy Principles** (Van Nostrand)

References
Cottrell, A. H.
de Hoff, R. T.
Kehl, G. H.
Samuels, L. H.

**Metallographic Laboratory Practice** (McGraw-Hill)

**Metallographic Polishing by Mechanical Methods** (Pitman)

112261 Met 261 Extraction Metallurgy

**Prerequisite**
Met121

**Corequisite**
Met221

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

**Examination**
One 1½ hour paper

**Content**

**Text**
Rosenqvist, T.

**Principles of Extraction Metallurgy** (McGraw-Hill)

References
Gilchrist, J. D.
Pehlke, R. D.

**Extraction Metallurgy** (Pergamon)

**Unit Processes in Extraction Metallurgy** (Elsevier)

112271 Met 271 Fabrication Metallurgy

**Prerequisites**
Met141, Met151, Met181

**Hours**
About 21 lecture hours & 21 hours of tutorial, demonstration & 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)
References
Flinn, R. A. Fundamentals of Metal Casting (Addison Wesley)
Rowe, G. W. Principles of Metal Working (Arnold)

113301 Met301 Communication Skills 1 unit
Prerequisites Nil
Hours About 21 lecture hours & a student seminar
Examination Progressive assessment
Content Preparation of written and oral reports.
References Mitchell, J. H. A first course in technical writing (Chapman & Hall)
Swanson, R. For your information (Prentice-Hall)

113323 Met311 Statistical Design and Optimisation of Metallurgical Processes 1 unit
Prerequisites Met212, Met213
Hours About 21 lecture hours & 21 tutorial hours
Examination Progressive assessment and one 1½ hour paper
Content Experimental design: Randomised and randomised-block, factorial and fractional factorial designs applied to metallurgical situations. Optimisation: Method of formulation, single variable and multi-variable techniques. Linear and non-linear problems, constrained problems, confidence regions.
Text To be advised

113313 Met312 Modelling and Control of Metallurgical Processes 1 unit
Prerequisites Met212, Met213

Hours About 21 lecture hours & 21 hours of tutorial & practical classes
Examination Progressive assessment and final examination
Content Construction of models, use of models in prediction, identification and simulation, validity of models using examples from current metallurgical practice. Computer control systems, system components, advantages and justification of computer systems. Demonstration by use of simulation packages. Use of microcomputers in on line data logging and control. Application to a practical example in the laboratory.
References As for Met311 and Pehlke, R. D. Unit Processes of Extractive Metallurgy (American Elsevier)

113324 Met321 Heterogeneous Equilibria 1 unit
Prerequisite Met221
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination Progressive assessment and one 1½ hour paper
Content Condensed phase equilibria in ternary systems. Application to alloy steels, aluminium alloys, tungsten carbide and refractories. Gas/condensed phase equilibria in multicomponent systems. Applications to extraction metallurgy.
References Prince, A. Alloy Phase Equilibria (Elsevier 1966)
Levin, E. M. & Hall, F. D. Phase Diagrams for Ceramists (Amer. Ceramic Soc. 1956-69 3 vols)

113322 Met322 Electrochemistry and Corrosion 1 unit
Prerequisite Met221
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1½ hour paper
113331 Met331 Transport Processes in Metallurgical Systems  1 unit

**Prerequisites**  
Nil

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

**Examination**  
One 1½ hour paper

**Content**  
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.

**Text References**  
To be advised

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113332 Met332 Fluid Mechanics of Metallurgical Processes  1 unit

**Prerequisites**  
Nil

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

**Examination**  
One 1½ hour paper

**Content**  

**Text References**  
To be advised

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113341 Met341 Fracture and Failure Analysis  1 unit

**Prerequisite**  
Met241

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

**Examination**  
One 1½ hour paper

**Content**  
The unique features of various modes of failure are described and explained from a metallurgical and metallographic view point. The stress-strain situation at a stationary crack tip is explored and the Griffith's criterion developed. Failure analysis and case histories.

**Text**  
Nil

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

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113351 Met351 Metallography  1 unit

**Prerequisite**  
Met252

**Hours**  
About 21 lecture hours & 21 hours of tutorial, demonstration & 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, Quantimet, 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.  *Modern Metallography (Pergamon)*
Cullity, B. D.  *Elements of X-ray diffraction (Addison Wesley)*
Andrews, K. W.  *Physical metallurgy. Techniques and application (Allen & Unwin)*
Belk, J. A. & Davies, A. L.  *Electron microscopy and microanalysis of metals (Elsevier)*
Brandon, D. G.  *Modern techniques in metallography (Butterworths)*
113352 Met352 Physical Metallurgy 1 unit
Prerequisites Met241, Met252
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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
Honeycombe, R. W. K. *Plastic Deformation of Metals* (Arnold)

References
Smallman, R. E. *Modern Physical Metallurgy* (Butterworths)

113354 Met354 X-ray and Electron Metallography 1 unit
Prerequisites Met241, Met252
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1½ hour paper

Texts
Azaroff, L. V. *Elements of X-ray crystallography* (McGraw-Hill)
Thomas, G. *Transmission electron microscopy in metals* (Wiley)

113355 Met353 Solidification Processes 1 unit
Prerequisites Met151, Met181
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1½ hour paper

Text
Flemings, M. C. *Solidification Processing* (McGraw Hill)

References
Chadwick, G. A. *Metallography of Phase Transformations* (Butterworths)
Davies, G. J. *Solidification and Casting* (Halsted Press)

113356 Met361 Extraction Metallurgy
Prerequisite Met261
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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.)
113362 Met362 Hydro- and Electro- Extraction Metallurgy 1 unit

Prerequisite Met261

Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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 References To be advised

113366 Met363 Metallurgical Process Theory

Prerequisite Met212, Met261

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

Examination Progressive assessment and final examination


Pehlke, R. D. *Unit Processes of Extractive Metallurgy* (Elsevier 1973)
Richardson, F. D. *Physical Chemistry of Melts in Metallurgy Vols I & II* (Academic 1974)

113364 Met364 Refractories 1 unit

Prerequisite Met231

Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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 References Nil

References Chesters, J. H. *Refractories: Production and Properties* (Iron & Steel Inst.)

Grimshaw, R. W. *The Chemistry and Physics of Clays* (Benn)

113371 Met371 Materials Selection

Prerequisites Met241, Met252, Met271

Hours About 84 hours of lectures, tutorials & practical exercises

Examination Progressive assessment and final examination

Content An introduction to the metallurgy, properties and applications of common metals and polymers of industrial significance. Emphasis is given to techniques for critical comparison and evaluation. Extensive use is made of case histories and on-plant studies.

Text Rollason, E. C. *Metallurgy for Engineers* (Arnold)

Reference To be advised

113372 Met372 Fabrication Processes 1 unit

Prerequisite Met271

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

Examination One 1½ hour paper

Content Detailed examination of selected metal working processes from a fundamental and from a practical viewpoint.

Text References To be advised
113373 Met373 Polymer Technology 1 unit

Prerequisites Met141, Met151

Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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)

113374 Met374 Welding and Non Destructive Testing 1 unit

Prerequisites Met141, Met151 or Engineering I

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

Examination One 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.

Text
To be advised

References
Altmann, S. L. Bland theory of metals (Pergamon)
Elliot, 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.

114405 Met401 Directed Reading 2 units

Prerequisites Nil

Hours About 42 hours

Examination By written report and seminar

Content
Topics to be arranged.
Text References

114406 Met402 Metallurgy Seminar

Prerequisites Nil

Hours About 42 hours

Examination By seminar

Content
Topics in the general area of metallurgy and materials.

Text References

114434 Met411 Metallurgical Computations

Prerequisites Nil

Hours About 42 hours

Examination By written report and seminar

Content
Topics to be arranged.

Text References

114435 Met421 Heterogeneous Equilibria

Prerequisite Met221

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

Examination Progressive assessment and 1½ hour paper

Content
Condensed phase equilibria in ternary systems. Application to alloy steels, aluminum alloys, tungsten carbide and refractories. Gas/condensed phase equilibria in multicomponent systems. Applications to extraction metallurgy.

References
Prince, A. *Alloy Phase Equilibria* (Elsevier 1966)

Richardson, F. D. *The Physical Chemistry of Melts in Metallurgy* Vols I & II (Academic)
Wagner, C. *Thermodynamics of Alloys* (Addison-Wesley)

114431 Met431 Heat Transfer

Prerequisite Met331

Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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 Reference

To be advised

114436 Met432 Fluid Mechanics of Metallurgical Processes

Prerequisite Met332

Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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 Reference

To be advised

114433 Met433 Metallurgical Rate Processes

Prerequisite Met231

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

Examination One 1½ hour paper

Content
114442 Met441 Applications of Fracture Mechanics  2 units
Prerequisite  Met341
Hours  About 84 hours of lectures, tutorials & practical exercises
Examination  Progressive assessment and final examination
Content  Linear elastic and elastic-plastic fracture mechanics, fracture criteria, specimen designs and testing methods, data analysis, life predication techniques and fracture control plans, case histories.
References  Knott, J. F. Fundamentals of Fracture Mechanics (Butterworths)

114451 Met451 Electron Metallography  1 unit
Prerequisites  Met351, Met352, Met354
Hours  About 21 lecture hours & 21 hours of tutorial, demonstration & 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  Christian, J. W. The Theory of Phase Transformations in Metals and Alloys (Pergamon)
A.S.M. 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 & 21 hours of tutorial, demonstration & 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.
114462 Met462 Reactor Analysis 1 unit
Prerequisite Met363
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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.

114471 Met471 Materials Selection 1 unit
Prerequisite Met371
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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.

114472 Met472 Welding and Non-destructive Testing 1 unit
Prerequisite Met374
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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.

114481 Met481 Dislocation Theory 1 unit
Prerequisites Met352, Met241
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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.

114482 Met482 Metal Physics 1 unit
Prerequisites Met381, Met354
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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
References
A.S.M. Metals Handbook Vol. 1, 8th edn
Kennedy, G. A. Welding Technology (Sams)

Friedel, J. Dislocations (Gautier-Villars)
Nabarro, F. R. N. Dislocations (Oxford U.P.)

Kittel, C. Introduction to Solid State Physics (Wiley)
114483 Met491 Laboratory Project 2 units
Prerequisites Nil
Hours About 84 hours
Examination By written report and seminar
Content
Topic to be arranged.

Text References } Nil

115521 Met521 Metallurgical Thermodynamics
Prerequisite Met321
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination To be advised
Content

Text References } To be advised

Richardson, F. D. The Physical Chemistry of Melts in Metallurgy Vols I-II (Academic)
Wagner, C. Thermodynamics of Alloys (Addison-Wesley)

115531 Met531 Heat Transfer
Prerequisite Met331
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination To be advised
Content
Heat transfer modelling in casting and solidification, welding, pyrometallurgical reaction systems, heat treatment and fabrication systems.

Text References } To be advised

115532 Met532 Fluid Mechanics
Prerequisite Met332
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination To be advised
Content
Topics treated will include:
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.

Text References } To be advised

115533 Met533 Metallurgical Rate Processes
Prerequisite Met231
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination To be advised
Content

Text References } To be advised

115541 Met541 Fracture Mechanics
Prerequisite Met341
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination To be advised
Content
Text
Knott, J. F.  
*Fundamentals of Fracture Mechanics* (Butterworths)

References

115551 Met551 Electron Metallography

Prerequisites
Met351, Met352, Met354

Hours
About 21 lecture hours & 21 hours of tutorial, demonstration & 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 & 21 hours of tutorial, demonstration & 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)

115553 Met553 Metallography

Prerequisites
Met351, Met352, Met353

Hours
About 21 lecture hours & 21 hours of tutorial, demonstration & 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 & 21 hours of tutorial, demonstration & 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

References

115562 Met562 Reactor Analysis

Prerequisite
Met363

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

Examination
To be advised

Content
Modelling and analysis of processes in extraction pyro- hydro- and electro-metallurgy. Reactor kinetics of industrial reactors.
115571 Met571 Materials Selection
Prerequisite Met371
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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
Reference
A.S.M. Metals Handbook Vol. 6, 8th edn

115572 Met572 Welding and Non-destructive Testing
Prerequisite Met374
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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
Prerequisite Met352, Met241
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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
Reference
Friedel, J. Dislocations (Gautier-Villan)
Nabarro, F. R. N. Dislocations (Oxford U.P.)

115582 Met582 Metal Physics
Prerequisites Met381, Met354
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & 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)
521110 SV111 Surveying I
Prerequisites Nil
Hours Part A: Average 1½ lecture hours, ¼ tutorial hour & 2½ fieldwork hours per week
Part B: 1 lecture hour & ¼ 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
Whyte, W. S. Basic Metric Surveying (Butterworths 1969)

521111 SV121 Survey Camp I
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, ¼ tutorial hour & 2½ fieldwork hours per week
Part B: 1 lecture hour & ¼ tutorial hour per week
Examination Progressive assessment and final examination

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)
Clark, D. Plane and Geodetic Surveying for Engineers Vol. II 6th edn (Constable 1973)
References
— Admiralty Manual of Hydrographic Surveying Vols I & II (HMSO 1975)
Cooper, M. A. R. Modern Theodolites and Levels (Crosby Lockwood 1971)
Hodges, D. I. & Greenwood, J. B. Optical Distance Measurement (Butterworths 1971)
Ingham, A. E. Hydrographic Surveying for the Surveyor and Engineer (Crosby Lockwood 1974)
Smith, J. R. 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 centreline, 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 & 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
1. The University of Newcastle Computing Centre Handbook (Univ. of Newcastle 1975)
2. The Manual of the N.S.W. Integrated Surveys Grid (N.S.W. Govt Printer)

522410 SV271 Basic Regional and Urban Economics

Prerequisite
Economics I

Hours
2 lecture hours per week

Examination
To be advised

Content
Application of economic analysis to sub-national areas. Regional accounts—descriptions of regional economies—regional income determination and growth—impact of growth on regional economic structure—regional effects of national policy—design of regional policy under constraints of national objectives and regional structure. Selected case studies, stressing cross-country comparisons. Broad survey of economic issues within the urban or metropolitan environment—relation of cities to national and regional economy—interrelation of cities—central place theory and location analysis—housing and land use theory—urban economic development and growth—urban analysis, sociology and planning—public policy and welfare.

Text
Richardson, H. W.

References
Bish, R. L. & Nourse, H. O.

523305 SV313 Surveying III

Prerequisites
SV212 Surveying II
EE203 Introduction to Electrical Information
Hours

Average 1 lecture hour & 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.  
Electronic Distance Measurement  
(Crosby Lockwood 1971)

References

—  
Admiralty Manual of Hydrographic Surveying  
Vol. II (HMSO)

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 & 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 Computation I

Hours  
Average 2 lecture hours & 1 fieldwork hour per week

Examination  
Progressive assessment and final examination

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-elongation, circumpolar and sun observations — optimum position, balancing — position line methods.

Text

Nil

References

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

Roelofs, R.  
Astronomy Applied to Land Surveying  
(Ahrend 1970)

523328 SV351 Geodesy I

Prerequisite  
SV231 Survey Computation I  
SV212 Surveying II

Hours  
Average 2 lecture hours & 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)

Bomford, G.

The Australian Map Grid Technical Manual

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)

References

523329 SV361 Photogrammetry I

Prerequisite Nil

Hours Average 1½ lecture hours & 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)

433300 SV392 Property and Survey Law

Prerequisite SV291 Introduction to Legal Studies

Hours 2 lecture hours & 1 tutorial hour per week for
2nd half year

Examination One 3-hour paper

Content
The notion of property — classifications of property — estates in land — interests in land — systems of title to land — dealings with land — statutory control of land use, with particular reference to the Local Government Act 1919 (N.S.W.)
The regulation and legal liability of surveyors — survey investigations and searches.

Text
Hallmann, F. M.

Legal Aspects of Boundary Surveying as Apply
in New South Wales (Inst. of Surveyors, Aust. 1973)

Willis

Notes on Survey Investigation (N.S.W. Govt
Printer)

References

524125 SV414 Surveying IV

Prerequisites SV313 Surveying III

Corequisites SV332 Survey Computations II
SV392 Property & Survey Law

Hours 2 lecture hours & 1 tutorial hour per week

Examination One 3-hour paper

Content
Map reproduction — methods of preparation and reproduction of line maps — other map products.
Cadastral surveys in N.S.W. — survey practice law; professional ethics; surveyors' rights, powers and duties — Torrens and Common Law title surveys; searches — identification surveys, field records and plans — integrated surveys.
Tape standardisation, laboratory testing of instruments, error analysis in survey methods.

Text
Hallmann, F. M.

Legal Aspects of Boundary Surveying as Apply
in New South Wales (Inst. of Surveyors, Aust. 1973)

References

Keats, J. S.

Cartographic Design and Reproduction
(Longman 1976)

Richardus, P.

Project Surveying (North Holland 1966)

524126 SV415 Surveying V (Elective)

Prerequisite SV313 Surveying III

Corequisites SV414 Surveying IV
SV332 Survey Computations II

Hours 1 lecture hour and ¼ tutorial hour per week

Examination One 3-hour paper
Measurement of deflection and settlement of structures — survey methods in industry — relocation of lost marks — special surveying problems.

References
To be advised.

524127 SV442 Astronomy II (Elective)
Prerequisite
SV341 Astronomy I

Hours
Average 2 lecture hours & 1 fieldwork hour per week

Examination
One 3-hour paper

Content
Topics selected from:
Corrections to observations and calculations
Star co-ordinates
Meridian methods
Equal altitude methods
Precise timing

References
To be advised.

524128 SV452 Geodesy II
Prerequisite
SV351 Geodesy I

Corequisite
SV332 Survey Computations II

Hours
Average 1 lecture hour & 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
Heiskanen, W. A. & Moritz, H. Physical Geodesy (Freeman 1969)

524129 SV453 Geodesy III (Elective)
Corequisite
SV452 Geodesy II

Hours
Average 1 lecture hour & ½ tutorial hour per week

Examination
One 3-hour paper

Content
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
To be advised

References
To be advised.

524130 SV462 Photogrammetry II
Prerequisite
SV361 Photogrammetry I

Corequisite
SV462 Photogrammetry II

Hours
Average ½ lecture hour & ½ 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
Manual of Photogrammetry Vols I & II (Amer. Soc. of Photogrammetry)

524131 SV463 Photogrammetry III (Elective)
Corequisites
SV462 Photogrammetry II
SV332 Survey Computations II
**524133 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.
The subject descriptions set out below include subjects which are core in the various courses offered by the Engineering Faculty or which are commonly taken as electives from Departments outside the Faculty.

It should be noted that the list of subjects below is not exhaustive. Electives may be chosen from a number of other subjects whose descriptions are not included.

The descriptions of the subjects below are grouped on the basis of the Department offering the subject, the Departments being arranged alphabetically.

The following table is designed to assist in locating subject descriptions and consists of the complete list of subjects included in this sub-section. They are arranged alphabetically by title and show the Department responsible for offering the subject and the unit value assigned to the subject for the purposes of counting it in one of the undergraduate courses offered in the Faculty of Engineering.

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**DEPARTMENT OF BIOLOGICAL SCIENCES**

**711100 Biology I**

**Prerequisites**

Nil, but a series of 10 lectures in background chemistry will be offered in the last week of February (between 9.30 and 11.30 a.m. each day in the Department of Biological Sciences lecturing theatre, JLG08) for those students enrolling in Biology I who have done little chemistry. Attendance at the lectures is optional.

**Hours**

3 lecture hours and 3 hours of tutorial and laboratory classes per week. A two-day excursion.

**Examination**

One 3-hour paper
Content

Cells and Cell Constituents
Proteins, carbohydrates, lipids.
Organisation of cells, mitosis.

Fundamental Chemical Reactions
Photosynthesis. Respiration (aerobic and anaerobic).
Chemosynthesis. Production of ATP.

Diversity of Organisms

Plant Classification and Processes
Plant Kingdom. Structure, function and development of higher plants.

Animal Classification and Processes

Immunology
Antigens and antibodies. Blood groups.

Genetics and Development

Population Biology
An introduction to ecology, population genetics and evolution.

Human Biology
Population control.

The practical classes will present exercises relevant to these topics.

Preliminary Reading
White, E. H. Chemical Background for the Biological Sciences 2nd edn (Prentice-Hall 1973)

Texts
Abercrombie, M. Dictionary of Biology (Penguin 1973)
Keeton, W. J. Biological Science 2nd edn (Norton 1972)

References
Clarke, R. B. & Panchen, A. L. Synopsis of Animal Classification (Chapman & Hall)
Holloway, B. W. Genes and Chromosomes in Action (Thomas Nelson)
Moroney, M. J. Facts from Figures (Penguin)
Rayle, D. & Wedberg, L. Botany: A Human Concern (Houghton Mifflin 1975)
Srb, A. M. et al. General Genetics 2nd edn (Freeman)
Examination

Three 1-hour examinations held after the completion of each term and one 3-hour final examination.

Content

The course deals principally with material and energy resources.
One term is devoted to structures, properties and behaviour of inorganic materials, minerals and metals.
One term is devoted to chemical energetics and to chemical and physical equilibria.
One term is devoted to organic chemistry with special reference to petrochemicals, polymers, fuels and lubricants.
In all three terms tutorials designed to support the lecture material are held.

Texts

Aylward, G. H. & Findlay, T. J. V.
Pimental, G. C. & Spratley, R. D.
Steedman, W. et al.

722200 Chemistry IIA

Prerequisite

Chemistry I

Preparatory Subjects

Mathematics I & either Physics IA or IB

Hours

About 3 lecture hours & 6 hours of tutorial & laboratory classes per week

Examination

A student may satisfy the examiners: either by achieving an overall satisfactory performance in the two progressive examinations (Papers 1 & 2), or by achieving an overall satisfactory performance in the two final papers scheduled for the November examination period (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.

Inorganic Chemistry

Symmetry and structure; main group metal chemistry; types of co-ordination complexes; surface elucidation; transition metal chemistry.

Dynamics

Kinetics; chemical affinity; electrochemical cells.

Organic Chemistry

Aliphatic and aromatic chemistry.

Thermodynamics

Basic laws, and applications to ideal and non-ideal systems.

Texts

Cotton, F. A. & Wilkinson, G.
Geissman, T. A.
Shriner, R. L. et al.
Wentworth, W. E. & Ladner, S. J.

722200 Chemistry IIA

Prerequisite

Chemistry I

Preparatory Subjects

Mathematics I & either Physics IA or IB

Hours

About 3 lecture hours & 6 hours of tutorial & laboratory classes per week

Examination

A student may satisfy the examiners: either by achieving an overall satisfactory performance in the two progressive examinations (Papers 1 & 2), or by achieving an overall satisfactory performance in the two final papers scheduled for the November examination period (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.

Analytical Chemistry

Basic principles: spectroscopic procedures; separation methods.

Inorganic Chemistry

Symmetry and structure; main group metal chemistry; types of co-ordination complexes; surface elucidation; transition metal chemistry.

Dynamics

Kinetics; chemical affinity; electrochemical cells.

Organic Chemistry

Aliphatic and aromatic chemistry.

Thermodynamics

Basic laws, and applications to ideal and non-ideal systems.

Texts

Cotton, F. A. & Wilkinson, G.
Geissman, T. A.
Shriner, R. L. et al.
Wentworth, W. E. & Ladner, S. J.

722200 Chemistry IIA

Prerequisite

Chemistry I

Preparatory Subjects

Mathematics I & either Physics IA or IB

Hours

About 3 lecture hours & 6 hours of tutorial & laboratory classes per week

Examination

A student may satisfy the examiners: either by achieving an overall satisfactory performance in the two progressive examinations (Papers 1 & 2), or by achieving an overall satisfactory performance in the two final papers scheduled for the November examination period (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.

Analytical Chemistry

Basic principles: spectroscopic procedures; separation methods.
as sole Part III chemistry subject may substitute up to three topics from the Chemistry IIIB list (subject to satisfying topic prerequisites). Students enrolling in Chemistry IIIB must nominate nine topics from the IIIB listing.

All proposed programmes must be approved by the Head of Department (or his nominee) before the start of the academic year.

The following guidelines apply:

(a) There must be a reasonable spread of load over the full year.
(b) Not all the topics listed will be offered in any given year, and there may be substitutions. Accordingly students should check the list of topic summaries posted on Departmental notice boards before submitting their programme.
(c) The advisory recommendations re companion or prerequisite studies provided on the topic summaries should have been considered.
(d) The programme must be feasible in terms of timetabling (e.g. some topics offered on Thursday or Friday may clash with other part III subjects).

List of Topics

723100 Chemistry IIIA

Group A
Principles of Analysis
Separation Techniques
Applied Spectroscopy (compulsory)

Group P
Electrodes
Surface Chemistry
Molecular Spectroscopy

Group I
Inorganic Chemistry
Crystal Chemistry
Applied Inorganic and Organometallic Chemistry

Group O
Carbohydrates, amino acids, proteins
Heterocyclic Chemistry
Predicting reactivity in organic chemistry

723200 Chemistry IIIB

Radiocactivity
Thermodynamics
Organic Reaction Mechanisms
Biologically Important Organic Molecules
Biogenesis
Plant Growth Regulators, Insecticides & fungicides
Medicinal Chemistry
Trace Analysis
Lasers and Raman Spectroscopy
Zeolites
X-ray crystallography
Clinical & Automated Analysis or Instrumental Techniques
Aromaticity

Texts
To be advised: see departmental topic summaries.

411100 Accounting I

Prerequisites
Nil

Hours
2 lecture hours & 2 tutorial hours per week

Examination
Two 3-hour papers

Content

Texts
Colditz, B. T. & Gibbins, R. W.
Australian Accounting: The Basis for Business Decisions 2nd edn (McGraw-Hill)

Tilley, I. & Jubb, P.
Capital, Income and Decision Making (Holt, Rinehart and Winston)

—
Accountancy Exercises (Univ. of Newcastle)

References

Barton, A. D.
The Anatomy of Accounting (Queensland U.P.)

Buckley, J. W. & Lightner, K. M.
Accounting: An Information Systems Approach (Dickenson)

Burns, T. J. & Hendrickson, H. S.
The Accounting Sampler 2nd edn (McGraw-Hill)

Carey, J. L.
The Rise of the Accounting Profession Vols I & II (A.I.C.P.A.)

Carey, J. L. & Skousen, K. F.
Getting Acquainted with Accounting (Houghton Mifflin)

Cerepak, J. R.
Accounting for Business (Merrill)

Chambers, R. J.
Accounting and Action (Law Book Co.)

Colditz, B. T. & Gibbins, R. W.
Study Guide to Australian Accounting (McGraw-Hill)

Davidson, S. et al.
Financial Accounting (Dryden)
The Accounting Process (Butterworths)

Fitzgerald's Analysis and Interpretation of Financial and Operating Statements (Butterworths)

Accounting: A Management Approach (Irwin)

Financial Accounting: Principles and Issues (Prentice-Hall)

Accounting: A Direct Approach (Cheshire)

The Accounting Framework (Cheshire)

A New Introduction to Financial Accounting (Prentice-Hall)

The Impact of Computers on Accounting (Wiley)

Financial Accounting (Goodyear)

Financial Accounting 2nd edn (McGraw-Hill)

Financial Accounting Concepts and Procedures (Dryden)

Accounting Principles (Prentice-Hall)

Financial Accounting: The Main Ideas (Wadsworth)

Accounting Fundamentals (Law Book Co.)

416104 Accounting & Financial Studies

Note

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

First Semester — Financial Accounting

The nature and scope of accounting including a study of the use of accounting information for business decisions. Some basic accounting concepts. Preparation and analysis of accounting reports—profit and loss statement, balance sheet, funds statements and profit appropriation statements. Accounting for inflation, including a review of the historic cost valuation system and an analysis of alternative valuation systems.

Second Semester — Management Accounting


Texts

Barton, A. D. The Anatomy of Accounting (University of Queensland Press)

Tilley, I. & Jubb, P. Capital Income and Decision Making (Holt, Rinehart & Winston)

Moore, C. L. & Jaedicke, R. K. Managerial Accounting (South Western)

References


Colditz, B. T. & Gibbins, R. W. Accounting Communications and Control (Butterworths)

Clift, R. C. Cost Accounting: A Managerial Emphasis (Prentice-Hall)

Rosen, L. S. Topics in Managerial Accounting (McGraw-Hill)

410103 Commercial Programming

Part A — COBOL

Prerequisites

Commercial E.D.P. (Advisory)

Hours

2 lecture hours per week for 1st half year

Examination

One 3-hour paper at midyear

Content

Basic concepts of file handling and file maintenance, including file creation and processing.

Flow charting; file merging and updating of transactions; tape blocking and buffering.

General run types including editing, searching, and sorting. Direct access versus serial; random or sequential organisation; Rerun techniques; verifying programme accuracy; table lookup; programme documentation and use of test data.
DIBOL as a business data processing and file organisation language. Extensive practical work in DIBOL including case studies.

Texts
DIBOL—II Language Reference Manual
Feingold, C.

References
Chai, W. A. & H. W.
Clifton, H. D.
Davis, G. B. & Litecky, C. R.
DeRossi, C. J.
Kapur, G. K.
Laden, N. H. & Gildersleeve, T. R.
McC racken, D. D. et al.
Murach, M.
Sanders, D. H.
Sprowls, R. C.
Stern, N. B. & R. A.
Watters, J. L.

Part B — Social Implications of Computers

Prerequisites
Commercial Programming Part A

Hours
2 lecture hours per week for the 2nd half year

Examination
One 3-hour paper

Content
The spectrum of political, legal, managerial, philosophical, ethical and social issues; human variables associated with strategies of change; impact upon organisation structures; socio-technical systems; effects upon communication, privacy, public justification.

Texts

References
To be advised.

412600 Organisational Behaviour

Prerequisites
Nil

Hours
2 lecture hours per week

Examination
Two 2-hour papers (Terms 1 & 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
Gellerman, S. W.
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 Behaviour (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)

410104 Systems Analysis and Design

Part A — Systems Analysis

Prerequisites
Commercial Electronic Data Processing
(Advisory)

Hours
2 lecture hours per week for 1st half year

Examination
An examination at midyear

Content
This course seeks to fill a wide range of goals depending on the experience of the student. Systems analysis covers the activities which occur early in the life cycle of a computer-based business system. Individual topics include systems concepts, the systems analyst, the techniques of systems analysis, project control methods, report standards and structures.
The National Computing Centre Systems Analysis and Design Student Notes will be supplied

Gore, M. & Stubbe, J.

References
Chandor, A. et al. Practical Systems Analysis (Rupert, Hart & Davis)
Clifton, H. D. Systems Analysis for Business Data Processing (Wiley)
Daniels, A. & Yeates, D. Basic Training in Systems Analysis (Pitman)
Glans, T. B. et al. Management Systems (Holt, Rinehart & Winston)
Hare, Van Court Systems Analysis: A Diagnostic Approach (Harcourt, Brace & World)
Kindred, A. R. Data Systems and Management (Prentice-Hall)
Optner, S. L. Systems Analysis for Business Management (Prentice-Hall)
Weiss, E. A. Computer Usage/Applications (McGraw-Hill)

Part B — Systems Design

Prerequisites Commercial Programming (Advisory)
Hours 2 lecture hours per week for 2nd half year
Examination An examination at end of year

Content
This subject is a development of Systems Analysis, with the inclusion of the following topics: input design, output design, file design, detailed systems design, systems implementation.

An appreciation of the detailed techniques of Systems Design involved in the development of computer-based information systems from a range of applications — i.e. Inventory and production control; order entry and processing; general ledger accounting systems; sales analysis; payroll.

At least one such system will be observed in depth, as an attempt at detailed systems design.

Texts
— As for Systems Analysis

References

413612 Theories of Organisation

Prerequisites Organisational Behaviour

Hours 2 lecture hours per week

Examination One 3-hour paper

Content
The influence of politics, power and conflict: topics include organisations and the rationalisation of work; organisational structures; bureaucracies as working communities; the scientific management movement; Mayo and the Hawthorne experiments; Kurt Lewin and field theory; group membership and intergroup conflict; search for principles of management; worker participation models; organisational development; and propositions of organisational behaviour.

Texts
Lupton, T. Management and the Social Sciences (Penguin)
Poole, M. Worker Participation in Industry (Routledge & Kegan Paul)
Sofer, C. or Mouzelis, N. P. Organisations in Theory and Practice (Heinemann)

References
Anthony, P. D. The Ideology of Work (Tavistock)
Argyle, M. The Psychology of Interpersonal Behaviour (Penguin)
Brown, W. Organisations (Heinemann)
Katz, D. & Kahn, R. L. The Social Psychology of Organisations (Wiley)
Klein, L. New Forms of Work Organisation (Tavistock)
March, J. G. & Simon, H. A. Organisations (Wiley)
Silverman, D. The Theory of Organisations (Heinemann)

DEPARTMENT OF ECONOMICS

421100 Economics I

Prerequisites Nil
Hours 3 lecture hours and 1 tutorial hour per week
Examination One 3-hour paper and progressive assessment

Content
This is a course in the principles of micro- and macro-economics and how these principles operate in the Australian economy. For example, why do some of our exports sell more cheaply abroad than domestically? Is our volunteer army really more expensive than a conscripted army? Is it true that our unemployment can’t be reduced without increasing inflation? How much does Australian tariff policy cost Australians? The principles taught in Economics I help in answering these questions.

The first few lectures are in the way of an introduction to the discipline of Economics and simple examples are given to show how Economics can be applied.

Then follows a series of lectures concerning income determination for the economy as a whole. The basic Keynesian theory is considered and is compared with the monetarist approach. Various theories of business cycles are reviewed and the roles of monetary and fiscal policy in stabilizing economic activity are considered. The causes and consequences of inflation are examined.

Next the individual markets which make up the economy as a whole are examined. Attention focuses on how prices for products and productive factors (including labour) are determined and how this determination is governed by the market structure. Perfect competition, monopoly, oligopoly and other types of imperfect competition are considered.

The final section of the course covers international trade and looks at questions such as why countries specialise in certain products (theory of comparative advantage) and why countries erect trade barriers (tariffs and quotas). Some attention is given to the determination of exchange rates and the institutions responsible for facilitating international trade.

Background Reading

Heyne, P. The Economic Way of Thinking (Science Research Association)

Texts

Lipsey, R. Positive Economics 4th edn (Weidenfeld & Nicholson)

Tisdell, C. Economics of Markets: An Introduction to Economic Analysis (Wiley 1974)

Workbook to Accompany the Economics of Markets (Wiley 1975)

References


Hirschleifer, J. Price Theory and Applications (Prentice-Hall 1976)


Mansfield, E. Microeconomics, Theory and Application 2nd edn (Norton 1975)


Notes will be distributed on topics not covered by the above texts.

422203 Economics II

Prerequisites Economics I

Hours 3 lecture hours & 1 tutorial hour per week
Examination One 3-hour paper

Content

(i) Microeconomics: (5 weeks of lectures only)
This section covers some specialised topics not covered in Economics I. The following subjects are amongst those considered: Pareto optimality conditions, market failure, philosophical challenges to traditional microeconomics, selected topics in microeconomic policy such as the control of pollution.

(ii) Macroeconomics:
The principal part of the course deals with the determination of the level of economic activity in the macroeconomy. This work stresses the interdependent nature of economic activity, the linkages between the major macroeconomic markets, and the implications of these linkages and interdependencies for the effective operation of macroeconomic policy.

Following a brief discussion of the national income and other accounts which are used to measure the more important macroeconomic variables, models which seek to explain the determination of aggregate economic activity are developed. The role of the Government in influencing aggregate demand for goods in the economy is examined together with the implications of alternative theories of consumption and investment expenditures. Analysis of the determinants of the supply and demand for money provides an understanding of the linkages between the real and financial sectors of the economy. Alternative theories of inflation are examined and the influence of external factors on the domestic economy considered.
The models of macroeconomic activity provide a foundation for the discussion of macroeconomic policy. Beginning with the theory of macroeconomic policy, the nature of the instruments/targets problem is discussed. In the context of the “Keynesian”/“Monetarist” controversy, the need for discretionary policy is examined. The effectiveness of fiscal, monetary and incomes policies in the Australian institutional environment is considered with specific reference made to the Balance of Payments constraint and exchange rate policy.

Text

References
(i) Microeconomics:
Tisdell, C. A. Economics of Markets (Wiley 1974) Chapters 13-16
Tisdell, C. A. Microeconomics (Wiley) 1972

A list of further references will be distributed in class.

(ii) Macroeconomics:
Shaw, G. K. Macroeconomic Policy 2nd edn (Robertson 1974)
Stanford, J. Money, Banking and Economic Activity (Wiley 1973)
Trevithick, J. A. & Mulvey, C. The Economics of Inflation (Martin Robertson 1975)
Wonnacott, P. Macroeconomics (Irwin 1974)

421107 Introductory Quantitative Methods
Prerequisites Nil
Hours 3 hours of lectures & tutorials per week
Examination One final 3-hour paper & 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 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, M. J. Facts from Figures (Penguin)

Texts
Newton, B. L. Statistics for Business (S.R.A. 1973)

References
Pollard, A. H. An Introduction to the Mathematics of Finance (Pergamon 1968)
Shao, S. P. Statistics for Business and Economics (Merrill)
Yamane, T. Statistics—An Introductory Analysis (Harper)
Labour Economics

Prerequisites
Economics I

Hours
2 lecture hours per week

Examination
One 3-hour paper and progressive assessment

Content
This subject deals with the multi-faceted economic perspectives that can be taken of labour. Areas examined include: the supply of labour; the nature and operation of labour markets including dual, radical and search models; labour market policy; the determination of wage rates and wage structures; theoretical approaches to the question of income distribution; wage criteria and wage fixation in the context of arbitration; inflation and the wage-price issue; prices and incomes policies.

Preliminary Reading
Portus, J. H.
Australian Compulsory Arbitration 1900-1970
(Hicks Smith 1971)

Horn, R. V.
Labour Market Economics — Australia
(Cheshire 1975)

Niland, J. R. & Isaac, J. E. (eds.)
Australian Labour Economics: Readings (new edn)
(Sun Books 1975)

McConnell, C. R. (ed.)
Perspectives on Wage Determination: A Book of Readings
(McGraw-Hill 1970)

Reynolds, L. G.
Labor Economics and Labor Relations
7th edn
(Prentice-Hall 1978)

References
Carter, A. M. & Marshall, F. R.
Labour Economics: Wages Employment and Trade Unionism
rev. edn
(Irwin 1972)

Davidson, P.
Theories of Aggregate Income Distribution
(Rutgers U.P. 1960)

Jones, A.
The New Inflation: The Politics of Prices and Incomes
(Penguin 1973)

Marshall, R. & Perlman, R. (eds.)
An Anthology of Labor Economics: Readings and Commentary
(Wiley 1972)

Perlman, R.
Labor Theory
(Wiley 1969)

Rees, A.
The Economics of Work and Pay
(Harper & Row 1973)

Reynolds, L. G. et al.
Readings in Labor Economics and Labor Relations
(Prentice-Hall 1974)

Taylor, G. W. & Pierson, F. C. (eds.)
New Concepts in Wage Determination
(McGraw-Hill 1957)

Wage Determination: Papers presented at an International Conference, Paris, July, 1973
(O.E.C.D. 1974)
Students will be required to attend a series of film screenings at the Friday lecture times. Harrington, The Rhetoric of Film (Holt, Rinehart & Winston)

DEPARTMENT OF GEOGRAPHY

351100 Geography I

Prerequisites
Nil

Hours
2 lecture hours and 3 hours practical work per week, 1 tutorial hour per fortnight and 3 days of field work.

Examination
To be advised

Content
A study of the structure and interaction of two major systems: the ecological system that links man and his environment, and the spatial system that links one region with another in a complex interchange of flows. The study explores the internal structure and the linkages between each of the basic components in the two systems. The practical programme is designed to enable students to gain proficiency in and understanding of the tools of geographical analysis. Methods in the cartographic and statistical organization of geographic data are studied.

Texts

References
To be advised

Part II Subjects
The Geography Department offers three Part II subjects each comprising three topics chosen from the list below. Students selecting two or more topics from Topics A-D to make up a subject must nominate that subject Geography IIA; those selecting Topics E and F for one subject must nominate that subject Geography IIB. Topics G and H cannot be taken singly and students selecting them to make up a subject must nominate that subject Geography IIC.
Examination
Content
Three topics selected from the list above and not included in Geography IIA or IIB.

Part II Topics

352101 Topic A—Economic Geography—M. R. Hall
Content
An introduction to the methods and concepts of economic geography. The relevant variables in the location decision making process are discussed in the context of various theories of location with reference to specific case studies in both developed and developing worlds.

Text
Nil

352102 Topic B—Historical and Political Geography—J. C. R. Camm
Content
An introduction to the methods and concepts of historical and political geography. These are explored with reference to aspects of the geography of Western Europe and the British Isles.

Text
To be advised

352103 Topic C—Urban Social Geography—D. N. Parkes
Content
An introduction to the study of intra-urban problems and processes in advanced scale societies. Urbanisation processes, urban growth and urban morphology are examined with particular emphasis on residential areas. These are examined in respect of their sociogeographic structure. Attention is given to urban social behaviour, including the nature of urban adaptive social systems and of urban images, especially as a framework for investigating residential mobility.

Text
To be advised

352104 Topic D—Development Geography—W. A. Jonas
Content
An examination of a number of theories and models which have been put forward to explain why some areas of the world are more or less developed than others. The emphasis is on development as a totality and the works treated have, explicitly or implicitly, a spatial component or they offer reasons for spatial inequalities. Empirical evidence is drawn from both so-called advanced and less developed countries.

Text
To be advised

352201 Topic E—Climatology—R. W. Kidd, G. N. McIntyre
Content
A study of processes and patterns in man's physical environment. The course examines the behaviour of the atmosphere, including its interaction with the earth's surface over wide ranges of scale in space and time.

Text
Linacre, E. & J. Hobbs
The Australian climatic environment
(Wiley 1977)

352202 Topic F—Geomorphology—R. W. Kidd, R. J. Loughran
Content
Geomorphologic processes and problems of historical geomorphology.

Text
Nil.

352301 Topic G—Monsoon Asia I—P. G. Irwin
Content
A study of the broad patterns of the physical and human geography of Monsoon Asia with particular reference to China and Japan.

Text
Nil.

352302 Topic H—Monsoon Asia II—R. E. Barnard, K. W. Robinson
Content
A study of the broad patterns of the physical and human geography of Monsoon Asia with particular reference to South and Southeast Asia.

Text
Nil.

352303 Topic I—Geographic Data Processing—R. W. Kidd, D. N. Parkes
Content
The elements of geographic data processing.

Text
To be advised.
DEPARTMENT OF GEOLOGY

731100 Geology I

Prerequisite Nil
Hours 3 lecture hours and 2½ laboratory hours per week and 2 days field work.

Examination Two 3-hour papers, class assignments and practical examinations.

Content

Material Geology
Introductory crystallography; mineralogy and petrology; classification of rocks; economic mineral deposits; applications of geology to engineering.

Physical Geology
Erosion cycle; agents of erosion; diastrophism; structural geology; marine geology; geomorphology.

Historical Geology
Introductory palaeontology and stratigraphy; brief geological history of New South Wales.

Texts
Black, R. M. *The Elements of Palaeontology* (Cambridge U.P. 1970)
Press, F. & Siever, R. *Earth* (Freeman 1974)

431100 Legal Studies I

Prerequisites Nil
Duration One full academic year
Hours 2 lecture hours & 1 tutorial hour per week

Examination Progressive assessment & end of year examination

Content
This subject consists of a study of some basic legal concepts, the divisions of law, and the institutions of the Australian legal system. It also enables students to 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. The foundation of the processes of law-making through judicial decisions, and primary and delegated legislation are considered in detail.

Suggested Preliminary Reading
Nettheim, G. & Chisholm, R. *Understanding Law* (Butterworths)
Sawer, G. *The Australian and the Law* (Pelican)
Shtein, B. J. L. & Lindgren, K. E.  
Introduction to Business Law (Law Book Co.)

Prescribed Texts
(It is envisaged that these will be as follows but students should check with the notice board of the Department of Legal Studies before buying).

Vermeesch, R. B. & Lindgren, K. E.  
Business Law of Australia (Butterworths)


Printed materials to be issued to students at the commencement of the course.

Further References
Derham, D. P. et al.  
An Introduction to Law (Law Book Co.)

Enright, C.  
Constitutional Law (Law Book Co.)

Sawer, G.  
Australian Government Today (Melbourne U.P.)

Sawer, G.  
The Australian Constitution (Aust. Govt Publishing Service)

432117  Engineering & Industrial Law
Prerequisites  Introduction to Legal Studies

Duration  Second half of academic year

Hours  2 lecture hours per week

Examination  To be advised

Content
This subject will cover commercial arbitration; the building, subdivision and town planning provisions of the Local Government Act 1919; and aspects of industrial law.

Texts/References  To be advised

Note.—Further information on this subject may be obtained from the Head of the Department of Legal Studies.

433200  Industrial Law
Prerequisite  Legal Studies I (advisory)

Duration  One full academic year

Hours  2 lecture hours and 1 tutorial hour per week

Examination  Assessment to be advised

Content
The subject is divided into five parts: Relationship of Employer and Employee; Contract of Employment; Statutes Regulating Employment; Collective Aspects of Industrial Law; Compensation for Injuries. The student will examine the principles involved in identifying and defining the relationship of employer and employee; the formation, termination and terms of contracts of employment with particular reference to the terms relating to the duration of the contract and duties of the employer and the employees; some of the important statutes regulating the employment relationship e.g. Annual Holidays Act 1944 Long Service Leave Act 1955; the division of power to regulate industrial matters between the Commonwealth and States and also the status of trade unions, strikes and lockouts, award making and award fixing and the legal framework of the Commonwealth and State systems of conciliation and arbitration; the two methods of compensation presently used, common law action for negligence and the Workers' Compensation Scheme and the now abandoned reforms proposed in the Woodhouse Report.

Suggested Preliminary Reading
Cullen, C. L. & Macken, J. J.  
The Employer, the Employee and the Law 3rd edn (Law Book Co.)

Sykes, E. I.  
An Outline of Industrial Law (Law Book Co.)

Texts/References  To be advised

STATUTES
— Annual Holidays Act, 1944 (N.S.W. Govt Printer)
— Conciliation and Arbitration Act, 1904 (Aust. Govt Printer)
— Industrial Arbitration Act, 1940 (N.S.W. Govt Printer)
— Long Service Leave Act, 1955 (N.S.W. Govt Printer)
— Workers' Compensation Act, 1926 (N.S.W. Govt Printer)

422110  Industrial Relations II
Prerequisites
One of: Economics I, Economic History I or Legal Studies I. Additionally, students are advised to read in Labour Economics and Organisational Behaviour prior to, or concurrently with Industrial Relations II.
Hours
2 lecture hours per week.

Examination
One 3-hour paper plus assignments

Content
This course aims to provide students with an introduction to industrial relations concepts and tools of analysis in the Australian context. The approach taken is explicitly of an interdisciplinary nature, teaching duties being shared among the three Department of the Faculty. Although the course is concerned with the basic framework of industrial relations in Australia an important objective is to present these in their wider social, economic and legal settings. Besides dealing with trade unions, employers' associations, management and the various industrial tribunals, the course gives specific attention to the emerging nature of industrial society, collective bargaining, arbitration, industrial democracy, union democracy and industrial conflict.

Preliminary Reading
Child, J. 
Unionism and the Labour Movement (Macmillan 1971)
Cullen, C. L. & Macken, J. J. 
An Outline of Industrial Law (Law Book Co. 1972)
Portus, J. H. 
Australian Compulsory Arbitration 1900-1970 (Hicks Smith 1971)

Texts
Hagen, J. J. 
The ACTU: A Short History (Reed 1977)
Hyman, R. 
Strikes 2nd edn (Fontana 1977)
Martin, R. 
Trade Unions in Australia (Penguin 1977)
Matthews, P. W. D. & Ford, G. N. (eds.) 
Australian Trade Unions 2nd edn (Sun Books forthcoming)
Parker, S. R. et al. (eds) 
The Sociology of Industry 3rd edn (George Allen & Unwin 1977)
Sykes, E. I. & Glasbeek, H. J. 
Labour Law in Australia (Butterworths 1972)

References
Macken, J. J. 
Australian Industrial Laws: The Constitutional Basis (Law Book Co. 1974)
Sheridan, T. 
Mindful Militants (Cambridge U.P. 1975)

Students are advised that considerable use will be made of journal articles in this course.
Part I Topics

Algebra (topic AL)—R. B. Eggleton

Prerequisites
Nil

Hours
1 lecture hour per week & 1 tutorial hour per fortnight

Content

Text
Anton, H.

References
Brisley, W.

Kolman, B.

Liebeck, H.

Lipschutz, S.

Troppier, M. A.

Real Analysis (Topic AN)—R. F. Berghout

Prerequisites
Nil

Hours
1 lecture hour per week & 1 tutorial hour per fortnight

Content

Text
Toepfritz, O.

References
Apostol, T.

Giles, J. R.

Spivak, M.

Calculus (Topic CA)—M. J. Hayes

Prerequisites
Nil

Real Analysis (Topic AN)—R. F. Berghout

Prerequisites
Nil

Hours
1 lecture hour per week & 1 tutorial hour per fortnight

Content

Text
Toepfritz, O.

References
Apostol, T.

Giles, J. R.

Spivak, M.

Calculus (Topic CA)—M. J. Hayes

Prerequisites
Nil

Statistics and Computing (Topic SC)—A. J. Dobson

Prerequisites
Nil

Hours
1 lecture hour per week & 1 tutorial hour per fortnight

Content

Text
Blatt, J. M.

References
Conte, S. D. & de Boor, C.

Basic Fortran IV Programming: Version MIDITRAN (Computer Systems of Aust. 1969)

An Introduction to Computer Programming in Fortran (mones Fortran) (Monash Uni. Comp. Centre 1976)

Elementary Numerical Analysis (McGraw-Hill 1972)
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 eleven 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.

When selecting topics for Part II subjects, students are advised to consider the prerequisites needed for the various Part III subjects offered in the Faculty of Mathematics (Mathematics IIIA, Mathematics IIIB, Statistics III and Computer Science III).

Engineering students may take individual topics from Part II subjects as electives (1 unit). When taken in this manner each topic is given the prefix EM2. For details see page 77 of this handbook.

List of Topics for Part II Mathematics

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<th>Corequisite or Prerequisite Topic</th>
<th>Part III Topics requiring this Part II Topic</th>
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<td>CO</td>
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<td>D</td>
<td>Linear Algebra</td>
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<td>F</td>
<td>Numerical Analysis &amp; Computing</td>
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<td>G</td>
<td>Finite Mathematics</td>
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<td>H</td>
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<td>I</td>
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<tr>
<td>K</td>
<td>Topic in Pure Mathematics</td>
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<tr>
<td>L</td>
<td>Analysis of Metric Spaces</td>
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</tbody>
</table>

The selection rules and definitions of the Part II subjects follow.

662100 Mathematics IIA

Prerequisite: Mathematics I

Hours: 4 lecture hours & 2 tutorial hours per week

Examination: Each topic is examined separately

662200 Mathematics IIB

Prerequisite: Mathematics I

Hours: 4 lecture hours & 2 tutorial hours per week

Examination: Each topic is examined separately

Content

Topics B, CO and D. 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.

662300 Mathematics IIC

Prerequisite: Mathematics I

Pre- or Corequisite: Mathematics IIA

Hours: 4 lecture hours & 2 tutorial hours per week

Examination: Each topic is examined separately

Content

Four topics chosen from A to H, where CO counts as two topics, 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.

Texts for Part II Topics

662101 Topic A—Mathematical Models

Nil

662102 Topic B—Complex Analysis


662109 Topic CO—Vector Calculus and Differential Equations

Either

or both
and

662104 Topic D—Linear Algebra
Lipschutz, S. Linear Algebra (Schaum 1974)
Rorres, C. & Anton, H. Applications of Linear Algebra (Wiley 1977)

662204 Topic F—Numerical Analysis and Computing
Conte, S. D. & deBoor, C. Elementary Numerical Analysis (McGraw-Hill 1972)

662203 Topic G—Finite Mathematics
Nil

662204 Topic H—Probability and Statistics
Freund, J. E. Mathematical Statistics 2nd edn (Prentice-Hall 1971)
Mendenhall, W. & Schaeffer, R. L. Mathematical Statistics with Applications (Duxbury 1973)

662301 Topic I—Applied Statistics

662302 Topic J—Topic in Applied Mathematics e.g. Dynamics
Nil

662303 Topic K—Topics in Pure Mathematics e.g. Group Theory
Nil

662304 Topic L—Real Analysis
Giles, J. R. Analysis of Metric Spaces (University of Newcastle 1974)

Part III Subjects

The Mathematics Department offers two Part III subjects, each comprising four topics chosen from the list below and he subject Statistics III.

Students wishing to proceed to Honours in Mathematics are required to take both Mathematics IIIA and IIIB or Mathematics IIIA and Computer Science III.

Passes in both Mathematics IIIA and IIIB are prerequisite for entry to Mathematics IIIA and Mathematics IIIA is pre- or corequisite for Mathematics IIIB. It will be assumed that students taking a Part III subject in 1979 have already studied topics C, D, K and L in 1978 or (C, D, E, K and L if done prior to 1978) in their Part II subjects.

Students wishing to enrol in Statistics III should avoid taking topics R, U and Y as Mathematics IIIA topics, and students wishing to enrol in Computer Science III should note that topics Q, PL, TC and Z may be chosen as topics in either Mathematics IIIA or Computer Science III, but not both.

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

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<tr>
<th>Topic</th>
<th>Prerequisites</th>
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<td>Foundations of Mathematics</td>
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<td>Variational Methods</td>
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<td>Mathematical Logic</td>
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<td>Ordinary Differential Equations</td>
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<td>Partial Differential Equations</td>
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<td>Z</td>
<td>Mathematical Principles of Numerical Analysis</td>
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</table>

The selection rules and definitions of the Part III subjects follow

*This topic will not be offered in 1979.

663100 Mathematics IIIA

Prerequisites Mathematics IIIA & IIIC
Hours 4 lecture hours & 2 tutorial hours per week
Examination Each topic is examined separately

Content A subject comprising four topics, which must include O or FM or both, and at least 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.

663200 Mathematics IIIB

Pre- or Corequisite Mathematics IIIA
Hours 4 lecture hours & 2 tutorial hours per week
Examination Each topic is examined separately
Content A subject comprising four topics chosen from the unstarred topics listed above.

66300 Statistics III
Prerequisites Mathematics IIA and IIC (including topics H, I and CO).
Hours Four lecture hours and two tutorial hours per week.
Examination Each topic is examined separately.
Content A subject comprising four topics: Topics R, U, Y and one other Part III Mathematics topic. Before selecting a particular topic as the optional fourth topic in Statistics III, students should seek advice from a lecturer giving one of the compulsory topics, or from the Head of the Department.

Notes 1. In order to take both Mathematics IIA and Mathematics IIB, a student must study eight topics from the above with the restriction that Topic O or Topic FM, and at least one of P, PD, Q, R, U or Y must be included in these eight topics.
2. Students whose course includes a subject from Schedule B may have their choice of topics further restricted.
3. Students aiming to take Mathematics IV may be required to undertake study of more topics than the eight comprising the two part III subjects.

Texts for Part III Topics
66310 Topic FM—Foundations of Mathematics
Enderton, H. B. Elements of Set Theory (Academic 1977)
663101 Topic M—General Tensors
Nil
663102 Topic N—Variational Methods
Nil
663103 Topic O—Mathematical Logic
Mendelson, E. Introduction to Mathematical Logic (Van Nostrand 1964)
663104 Topic P—Ordinary Differential Equations
663108 Topic PD—Partial Differential Equations
Nil
663111 Topic PL—Programming Languages & Advanced Applications in Computing
Nil
663105 Topic Q—Fluid Dynamics—not offered in 1978
Nil
663106 Topic R—Theory of Statistics
Nil
663107 Topic S—Geometry
663108 Topic T—Group Theory
Baumslag, B. & Group Theory (Schaum 1968)
Chandler, B.
663209 Topic TC—Theory of Computing
663202 Topic U—Design and Analysis of Experiments
Nil
663203 Topic V—Measure Theory & Integration
Nil
663204 Topic W—Analysis of Normed Linear Spaces
Giles, J. R. Analysis of Normed Linear Spaces (University of Newcastle 1976)
663205 Topic X—Rings and Fields
Nil
663206 Topic Y—Theory of Probability
Nil
663207 Topic Z—Mathematical Principles of Numerical Analysis
Nil

Elective Units in Mathematics
Subject to meeting any pre- or corequisite requirements, students may take additional Part II Mathematics 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:
662105 EM2A Mathematical Models
662106 EM2B Complex Analysis
662108 EM2D Linear Algebra
662206 EM2F Numerical Analysis & Computing
662211 EM2G Finite Mathematics
662208 EM2H Probability & Statistics
662313 EM2I Applied Statistics
662306 EM2J Topic in Applied Mathematics
662307 EM2K Topic in Pure Mathematics
662308 EM2L Analysis of Metric Spaces
662400 Computer Science II

**Prerequisite**  
Mathematics I

**Hours**  
168 hours of lectures, tutorials and practical work as listed below

**Examination**  
See component descriptions below

**Content**

- ML — Introduction to Structuring of Information
- SI — Systematic Programming
- SP — Introduction to Logic and Assembly Languages
- F — Numerical Analysis and Computing

For further details see Faculty of Mathematics Handbook.

Note:  
(i) Topic SI is EE263  
(ii) Topic SP is EE262  
(iii) Topic ML is EE264

(ii) Electrical and Computer Engineering students may not enrol in Computer Science II.

663400 Computer Science III

**Prerequisites**  
Computer Science II, Mathematics IIA and Mathematics IIC

**Hours**  
Not less than 110 hours of lectures plus any other required tutorials and practical work, from the list of topics given below, provided that at least two of the three topics numbered 1, 3 and 7 are included. (It is recommended that a student should include all three of these topics in his programme.)

**Examination**  
See information given in descriptions of individual topics

**Content**

A selection, limited by the considerations under Hours above, from the following topics:

**Topics**

1. Compiler Construction (EE464)
2. Commercial Programming (CS — Diploma course)
3. Computer Operating Systems (EE463)
4. Switching Theory & Logical Design (EE362)
5. Mathematical Logic (O)
6. Mathematical Principles of Numerical Analysis (Z)
7. Programming Languages & Advanced Applications in Computing (PL)
8. Theory of Computing (TC)
9. Systems Analysis & Design (CS — Diploma course; one topic composed of the combination of (i) Systems Analysis and (ii) Systems Design on that course)

For further information on this subject see the Faculty of Mathematics Handbook.

660112 CS—Data Structures and Programming—D. W. Blatt

**Assumed Standard of Attainment**  
CS — Programming and Algorithms

**Hours**  
2 lecture hours and 1 tutorial hour per week for 2nd half year

**Examination**  
One 2-hour paper

**Content**

Introduction to data structures: lists, strings, arrays, trees, graphs, searching and sorting; list processing.


Study and comparison of data structures in several languages, e.g. ALGOL 60, ALGOL 68, COBOL, FORTRAN, LISP, etc.

**Text**

Nil

**References**

Berztiiss, A. T.  
Data Structures: Theory and Practice  
(Academic 1971)

Day, A. C.  
FORTAN Techniques: with Special Reference to Non-Numerical Applications  
(Cambridge U.P. 1972)

Galler, B. A. & Perlis, A. J.  
A View of Programming Languages  
(Addison-Wesley 1970)

Gear, W.  
Computer Organization and Programming  
(McGraw-Hill 1969)

Knuth, D. E.  
(Addison-Wesley)

McCameron, F. A.  
COBOL Logic and Programming  
(Irwin-Dorsey 1974)

Page, E. S. & Wilson, L. B.  
Information Representation and Manipulation in a Computer (Cambridge U.P. 1973)

Sammet, J. E.  
Programming Languages: History and Fundamentals  
(Prentice-Hall 1969)

660111 CS—Programming and Algorithms—D. W. Blatt

**Assumed Standard of Attainment**  
Mathematics I
**Hours**  
2 lecture hours and 1 tutorial hour per week for the 1st half year

**Examination**  
One 3-hour paper. Programming assignments are an integral part of the course.

**Content**  

**Text**  
Guttmann, A. J.  
*Programming and Algorithms* (Heinemann 1977)

**References**  
Day, A. C.  
*Fortran Techniques: with Special Reference to Non-numerical Applications* (Cambridge U.P. 1972)

Kernighan, B. W. & Plauger, P. J.  

Kernighan, B. W. & Plauger, P. J.  
*Software Tools* (Addison-Wesley 1976)

Knuth, D.  

Yourdon, E.  
*Techniques of Program Structure and Design* (Prentice-Hall 1975)

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**DEPARTMENT OF PHILOSOPHY**

**381100 Philosophy I**

**Prerequisites**  
Nil

**Hours**  
3-4 hours per week

**Examination**  
See below

**Assignments**  
One essay (Maximum length: 2000 words)  
Two shorter pieces of writing for the seminars.  
Marks awarded for assignments will be included in the mark for the year's work.
Second half-year: two of a series of options.

Examination   One 3-hour paper for the 2 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. The availability of options, both day and evening, is subject in each case to the availability of staff and to the enrolment of a sufficient number of students.

Section 3: 381104 Seminars (Mr Sparkes)

Hours Each group will meet approximately fortnightly in the first half of the year. A detailed programme will be issued at the beginning of the first term.

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.

DEPARTMENT OF PHYSICS

741200 Physics IA

Prerequisite Nil

Hours 3 lecture hours & 3 hours of laboratory & 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, 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 Nil

Hours 3 lecture hours & 3 hours laboratory or demonstrations 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 Dept. notice board.

742100 Physics II

Prerequisites Mathematics I, Physics IA or normally a credit pass or better in Physics IB

Hours 3 lecture hours & 3 laboratory hours per week

Examination Equivalent of 6 hours total examination

Content
Mechanics
Thermal Physics
Quantum Physics
Electromagnetics
Physical Optics

Physics II students who have completed only Mathematics I, should include a Mathematics II subject. It is suggested that in addition to Topic CO this should include 2 topics chosen from H, B, D or F.

Texts Texts will be listed on the Physics Dept notice board
743100 Physics IIIA

**Prerequisites**
Physics II, a Mathematics subject with Topics C, E, G, and H or B or D recommended. For Mathematics II in 1978 Topics C or 2 from H, or B or D or F are recommended.

**Hours**
120 lecture hours & 240 laboratory & tutorial hours

**Examination**
Assessment to the equivalent of 10 hours 25 minutes of examination time.

**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.

A. **Classical Physics**
Mathematical methods, advanced mechanics, special theory of relativity, electromagnetics including waveguide and antenna theory.

B. **Modern Physics**
Quantum mechanics, atomic and molecular physics, statistical physics, solid state physics, nuclear physics, electronics.

C. **Laboratory**
Parallels the lecture course in overall content, with at least one experiment available in each topic, although students are not expected to carry out all the experiments available.

**Texts**
Refer to the Physics Department notice board. Students should retain their Physics II texts.

742100 Electronics & Instrumentation II

**Prerequisites**
Physics IA or IB

**Hours**
3 lecture hours, 4 laboratory hours and 2 tutorial hours with directed assignments each week.

**Examination**
One 2-hour paper on each of the 3 topics selected.

**Content**

- **Topic A** — Basic Theory of Techniques; Instrumentation Practice; Specialist Instrumentation.
- **Topic B** — Instrumentation Theory.
- **Topic C** — Electrical Measurement Principles; Digital and Linear Integrated Circuits; Instrumentation Systems.
- **Topic D** — Basic Device Physics; Measurement Devices.

Students taking Physics II (either previously or concurrently) will be examined in Topics B, C and D. They must also attend the lectures on Instrumentation Practice in Topic A as part of the directed assignments requirements.

Students who have not taken Physics II will be examined in Topics A, C and D.

**Texts**
Malmstadt, H. V. *Instrumentation for Scientists Series, Texts with Experiments* Modules 1, 2, 3 & 4 (Benjamin)

**Other 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 & 45 laboratory hours

**Examination**
3 hours

**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**
Tets will be listed on the Physics Dept notice board.

DEPARTMENT OF PSYCHOLOGY

751100 Psychology I

**Prerequisites**
Nil

**Hours**
3 lecture hours, one hour practical session and one hour tutorial per week.

**Examination**
One 3-hour paper and an assessment of practical work.

**Content**
A general introduction to psychology and includes such topics as social psychology, learning theory, perception, developmental psychology, physiological psychology, theory of measurement and descriptive statistics and statistical analysis of data.

**Texts**
To be advised.
301100 Sociology I

**Prerequisites**
Nil

**Hours**
2 lectures and 1 seminar and/or tutorial each week.

**Examination**
To be advised

**Content**
Introduction to sociological perspectives — social institutions, social structures and social change. Attention will be given to non-literate, "developing" and to modern urban and industrial societies, with special reference to social aspects of contemporary Australia.

**Texts**
To be advised

**References**
To be advised

**Preliminary Reading**
Berger, P. *Invitation to Sociology* (Pelican)

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Section 5

COMBINED DEGREE PROGRAMMES
INTRODUCTION

Part 7 of the Degree Requirements for Undergraduate Courses in the Faculty of Engineering provide for the offering of combined courses leading to the degree of Bachelor of Engineering in any specialisation and the degree of Bachelor of Arts, Bachelor of Commerce, Bachelor of Economics, Bachelor of Mathematics, or Bachelor of Science. There is also provision for a combined course leading to the degrees of Bachelor of Metallurgy and Bachelor of Mathematics. Admission to such combined courses will normally be allowed after the completion of the first year of a degree course and is restricted to students who have obtained a minimum average standard of credit. Only in exceptional circumstances will a student be allowed to transfer to a combined degree course after 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 or the Faculty Secretary before attempting to enrol in a combined course.

The following combined course programmes are arranged so as to group together the courses relating to one particular engineering speciality.

(i) Bachelor of Engineering in Chemical Engineering

The following combined courses have been approved by the relevant Faculty Boards leading to the degree of Bachelor of Engineering in the speciality of Chemical Engineering and the degree of Bachelor of Arts, Bachelor of Commerce, Bachelor of Economics, Bachelor of Mathematics or Bachelor of Science.

Year I

Year I is similar for all combined courses involving the Chemical Engineering speciality and consists of the following subjects:

- ChE101 Industrial Process Principles
- CB111 Statics
- GEI11 Introduction to Engineering Design
- MEI11 Graphics and Engineering Drawing
- MB121 Workshop Practice
- Mathematics IA
- Physics IA or IB
- Chemistry I

<table>
<thead>
<tr>
<th>Bachelor of Arts/Bachelor of Engineering</th>
<th>Bachelor of Commerce/Bachelor of Engineering</th>
<th>Bachelor of Economics/Bachelor of Engineering</th>
<th>Bachelor of Mathematics/Bachelor of Engineering</th>
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<tbody>
<tr>
<td><strong>Year II</strong></td>
<td><strong>Chemistry IIA pt. 1</strong></td>
<td><strong>Mathematics IIB pt. 1</strong></td>
<td><strong>Chemistry IIA</strong></td>
<td>Two courses have been approved</td>
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<td><strong>Chemistry IIA</strong></td>
<td><strong>Chemistry IIA</strong></td>
<td><strong>Chemistry IIA</strong></td>
<td>(i) Maths. IIB  (ii) Maths IIB</td>
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<td><strong>Chemical Engineering I</strong></td>
<td><strong>Mathematics IIB</strong></td>
<td>Chem. IIA</td>
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<tr>
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<td><strong>Accounting I</strong></td>
<td><strong>Chemical Engineering I</strong></td>
<td><strong>Chemistry IIA</strong></td>
<td>Chem. Eng.</td>
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<td><strong>Chemical Engineering I</strong></td>
<td><strong>Chemical Engineering I</strong></td>
<td>IIA pt. 1</td>
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<td><strong>Elective I</strong></td>
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<td>Science</td>
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<td><strong>Elective I</strong></td>
<td><strong>Elective I</strong></td>
<td>Subj. pt. I</td>
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<tr>
<td>Year IV</td>
<td><strong>Chemical Engineering IIA pt. 1</strong></td>
<td><strong>Chemical Engineering IIA</strong></td>
<td><strong>Chemical Engineering IIA</strong></td>
<td>Science</td>
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<td><strong>Elective I</strong></td>
<td><strong>Elective I</strong></td>
<td><strong>Elective I</strong></td>
<td>Subj. pt. III</td>
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<td><strong>Elective I</strong></td>
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<td><strong>Elective I</strong></td>
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<tr>
<td>Year V</td>
<td><strong>Chemical Engineering III</strong></td>
<td><strong>Chemical Engineering II</strong></td>
<td><strong>Chemical Engineering II</strong></td>
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<tr>
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<td><strong>Projects II</strong></td>
<td><strong>Chemical Engineering III</strong></td>
<td><strong>Chemical Engineering III</strong></td>
<td>IIA pt. 2</td>
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<td><strong>Projects II</strong></td>
<td><strong>Chemical Engineering III</strong></td>
<td><strong>Chemical Engineering III</strong></td>
<td>Science</td>
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<td><strong>Projects II</strong></td>
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<td>Subj. pt. III</td>
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<td><strong>Projects II</strong></td>
<td><strong>Chemical Engineering III</strong></td>
<td><strong>Chemical Engineering III</strong></td>
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</tbody>
</table>

Part III Subject from B. Math, Schedule of Subjects

- Chemical Engineering IIA pt. 2
- Chemical Engineering IIA pt. 3

Chemical Engineering II

- 3 Bachelor of Economics Subjects

Elective I

- Projects II
- 2 Bachelor of Economics Subjects
(ii) Bachelor of Engineering in Civil Engineering

The following combined courses have been approved by the relevant Faculty Boards leading to the degrees of Bachelor of Engineering in the speciality of Civil Engineering and the degree of Bachelor of Arts, Bachelor of Commerce, Bachelor of Economics, Bachelor of Mathematics or Bachelor of Science.

Year I

Year I is similar for all combined courses involving the Civil Engineering speciality and consists of the following subjects:

**CE111 Statics**
**CE171 Engineering Surveying I**
**GE112 Introduction to Engineering Design**
**ME111 Graphics and Engineering Drawing**
**ME131 Dynamics**
**Physics IA**
**Chemistry IA**

<table>
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</thead>
<tbody>
<tr>
<td>Year II</td>
<td>Mathematics IIB</td>
<td>Mathematics IIB</td>
<td>Mathematics IIA</td>
<td>Mathematics IIB</td>
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<tr>
<td>Technology</td>
<td>CE222 Materials of Technology</td>
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<td>CE223 Engineering</td>
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<tr>
<td>Geology</td>
<td>CE223 Engineering</td>
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<tr>
<td>CE231 Fluid Mechanics I</td>
<td>CE231 Fluid Mechanics I</td>
<td>CE231 Fluid Mechanics I</td>
<td>CE231 Fluid Mechanics I</td>
<td>CE231 Fluid Mechanics I</td>
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<tr>
<td>EE131 Circuit Fundamentals</td>
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<td>EE131 Circuit Fundamentals</td>
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<td>ME121 Workshop Practice</td>
<td>ME121 Workshop Practice</td>
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<tr>
<td>ME271 Thermodynamics I</td>
<td>ME271 Thermodynamics I</td>
<td>ME271 Thermodynamics I</td>
<td>ME271 Thermodynamics I</td>
<td>ME271 Thermodynamics I</td>
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</tbody>
</table>

| Year III                                | CE313 Structural Analysis & Design I        | CE313 Structural Analysis & Design I         | Mathematics IIB                                | CE313 Structural Analysis & Design I         |
| CE351 Civil Engineering Systems I      | CE351 Civil Engineering Systems I           | CE351 Civil Engineering Systems I           | CE351 Civil Engineering Systems I              | CE351 Civil Engineering Systems I           |
| CE372 Transportation Engineering       | CE372 Transportation Engineering            | CE372 Transportation Engineering            | CE372 Transportation Engineering              | CE372 Transportation Engineering            |
| GE350 Seminar                          | GE350 Seminar                               | GE350 Seminar                               | GE350 Seminar                                 | GE350 Seminar                               |
| ME301 Engineering Computation          | ME301 Engineering Computation               | ME301 Engineering Computation               | ME301 Engineering Computation                 | ME301 Engineering Computation               |
| Arts Subject Part I                    | Arts Subject Part I                         | Arts Subject Part I                         | Arts Subject Part I                            | Arts Subject Part I                         |

| Year IV                                 | CE414 Structural Analysis & Design II       | CE414 Structural Analysis & Design II       | Mathematics IIIA                               | CE414 Structural Analysis & Design II       |
| CE452 Engineering Construction         | CE452 Engineering Construction              | CE452 Engineering Construction              | CE414 Structural Analysis & Design II          | CE452 Engineering Construction              |
| ME482 Engineering Economics I          | ME482 Engineering Economics I               | ME482 Engineering Economics I               | CE414 Structural Analysis & Design II          | ME482 Engineering Economics I               |
| Arts Subject Part II                   | Arts Subject Part II                        | Arts Subject Part II                        | CE414 Structural Analysis & Design II          | Arts Subject Part II                        |

| Year V                                  | Arts Subject Part I                         | Arts Subject Part II                        | CE453 Project                                  | Arts Subject Part III                       |
|                                        | 4 Bachelor of Commerce Subjects              | 4 Bachelor of Commerce Subjects              | Part III Subject from B, Math Schedule of Subjects Electives — 4 units | 4 Bachelor of Commerce Subjects              |
|                                        | 4 Bachelor of Economics Subjects             | 4 Bachelor of Economics Subjects             | 4 Bachelor of Economics Subjects                | 4 Bachelor of Economics Subjects             |
(iii) Bachelor of Engineering in Electrical Engineering

The following combined courses have been approved by the relevant Faculty Boards leading to the degree of Bachelor of Engineering in the specialty of Electrical Engineering and the degree of Bachelor of Arts, Bachelor of Commerce, Bachelor of Economics, Bachelor of Mathematics or Bachelor of Science.

### Year I

Year I is similar for all combined courses involving the Electrical Engineering specialty and consists of the following subjects:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CE111</td>
<td>Statics</td>
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<tr>
<td>EE131</td>
<td>Circuit Fundamentals</td>
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<tr>
<td>EE112</td>
<td>Introduction to Engineering Design</td>
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<tr>
<td>ME111</td>
<td>Graphics and Engineering Drawing</td>
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<td>ME121</td>
<td>Workshop Practice</td>
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<td>ME131</td>
<td>Dynamics</td>
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<td>Mathematics I</td>
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<td>Physics I</td>
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<td>Chemistry I</td>
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### Bachelor of Arts/Bachelor of Engineering

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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EE221</td>
<td>Energy Conversion</td>
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<tr>
<td>EE231</td>
<td>Semiconductor Devices</td>
</tr>
<tr>
<td>EE232</td>
<td>Electrical Circuits</td>
</tr>
<tr>
<td>EE262</td>
<td>Systematic Programming</td>
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<tr>
<td>EE264</td>
<td>Introduction to Logic &amp; Assembly Language</td>
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<tr>
<td>EE281</td>
<td>Electromagnetics &amp; Quantum Mechanics</td>
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<tr>
<td>Mathematics IIA</td>
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<td>Arts Subject Part I</td>
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### Bachelor of Commerce/Bachelor of Engineering

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<tr>
<th>Course Code</th>
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<tr>
<td>EE221</td>
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<td>Arts Subject Part I</td>
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### Bachelor of Economics/Bachelor of Engineering

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<tbody>
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<td>EE221</td>
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### Bachelor of Mathematics/Bachelor of Engineering

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### Bachelor of Engineering in Industrial Engineering

The following combined courses leading to the degrees of Bachelor of Engineering in the speciality of Industrial Engineering and the degree of Bachelor of Arts, Bachelor of Commerce, Bachelor of Economics, Bachelor of Mathematics or Bachelor of Science have been approved by the relevant Faculty Boards.

#### Year I

Year I is similar for all combined courses involving the Industrial Engineering speciality and consist of the following subjects:

- CE111 Statics
- EE131 Circuit Fundamentals
- GE112 Introduction to Engineering Design
- ME111 Graphics and Engineering Drawing
- ME121 Workshop Practice
- ME131 Dynamics
- Mathematics I
- Physics I
- Chemistry I

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**Bachelor of Engineering in Mechanical Engineering**

The following combined courses leading to the degree of Bachelor of Engineering in the speciality of Mechanical Engineering and the degree of Bachelor of Arts, Bachelor of Commerce, Bachelor of Economics, Bachelor of Mathematics or Bachelor of Science have been approved by the relevant Faculty Boards.

**Year I**

Year I is similar for all combined courses involving the Mechanical Engineering speciality and consists of the following subjects:

- CE111 Statics
- EE131 Circuit Fundamentals
- GE112 Introduction to Engineering Design
- ME111 Graphics and Engineering Drawing
- ME121 Workshop Practice
- ME131 Dynamics
- Mathematics I
- Physics I
- Chemistry I

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Section 6

SUBJECT COMPUTER NUMBERS

Subject Computer Numbers for Engineering Courses

The subjects selected should be written on the enrolment form in the following manner:

B.E. and B.Sc. (Eng.) in Chemical Engineering

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**Other 300-400 Level Subjects**

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### B.E. in Mechanical & Industrial Engineering

#### Years I & II

- **721900** Chemistry I
- **661100** Mathematics I
- **741200** Physics IA
- **521101** CE111 Statics
- **541104** ME111 Graphics & Engineering Drawing
- **501101** GE112 Introduction to Engineering Design
- **541201** ME121 Workshop Practice
- **541303** ME131 Dynamics
- **531306** EE131 Circuit Fundamentals
- **662200** Mathematics II
- **662105** EE211 Energy Conversion
- **111151** ME111 Microstructure of Materials
- **542205** ME212 Engineering Design I
- **542105** ME214 Mechanics of Solids I
- **542209** ME223 Engineering Technology
- **542305** ME232 Dynamics of Machines I
- **542106** ME241 Properties of Materials I
- **542210** ME251 Fluid Mechanics I
- **542205** ME271 Thermodynamics I

#### B.E. in Mechanical Engineering

#### Years III & IV

- **532202** GE350 Seminar
- **543101** ME301 Engineering Computations
- **543105** ME312 Engineering Design II
- **543104** ME302 Experimental Methods III
- **543106** ME313 Engineering Design III
- **543107** ME333 Dynamics of Machines II

### Industrial Experience Units

- **541302** ME092 Industrial Experience
- **541303** ME093 Industrial Experience
- **541304** ME094 Industrial Experience
- **541305** ME095 Industrial Experience
- **541307** ME097 Industrial Experience

### Departmental Technical Electives

- **544451** ME401 System Analysis
- **544427** ME404 Mathematical Programming I
- **544426** ME410 Advanced Design Concepts I
- **544425** ME419 Bulk Materials Handling Systems—Analysis & Design
- **544402** ME445 Mechanics of Solids
- **544416** ME488 An Introduction to Photomechanics
- **544418** ME499 Reliability Analysis for Mechanical Systems
- **544411** ME453 Fluid Mechanics
- **544463** ME483 Production Engineering
- **544464** ME484 Engineering Economics II
- **544465** ME492 Special Topic
- **540126** ME505 System Analysis, Organisation & Control
- **544841** ME487 Operations Research—Deterministic Models
- **544842** ME488 Operations Research—Probabilistic Models
### B.E. in Industrial Engineering

**Years III & IV**

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#### General Engineering Subjects

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