AN INTRODUCTION TO THE FACULTY AND ITS DEPARTMENTS

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.

To new and prospective students may I begin by briefly acquainting you of the structure of the Faculty of Engineering. The Faculty comprises five Departments: Chemical, Civil, Electrical and Mechanical Engineering and Metallurgy. In addition to the Bachelor's degree programmes offered in these five major areas, the Department of Electrical Engineering offers the B.E. in Computer Engineering, the Department of Mechanical Engineering the B.E. in Industrial Engineering, while the Department of Civil Engineering now offers a complete four-year Bachelor of Surveying course. Courses are available on a full-time or part-time basis, or a combination of these, and, in 1978 Sandwich Patterns will be available in the Electrical and Mechanical degree courses. In each degree programme the opportunity for some specialization exists in the later course years through a wide selection of technical electives. The Faculty is also active at the postgraduate level, offering formal courses leading to the Diploma in Industrial Engineering and Master of Engineering Science, as well as providing opportunities for postgraduate research at Masters and Doctorate levels. Through the specialized research interests of the various Departments, a wide range of study areas is available.

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

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

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

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

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

A. W. Roberts
Dean
Faculty of Engineering
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Department of Chemical Engineering

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

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

Three types of course are available:—

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

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

**Bachelor of Science (Engineering)** is normally a six year part-time degree. The syllabus has been developed to provide for some specialization in the fields of Applied Chemistry, Fuel Technology or Mineral Processing with the objective of professional recognition in these fields. It is recognised by the Royal Australian Chemical Institute and the Institute of Fuel. The Institution of Chemical Engineers recognises it as exempting from two of their examinations.

All courses are broadly based on a foundation of Chemistry, Mathematics, Physics and general Engineering Science. In his professional subjects, the Chemical Engineer studies the application of scientific method and knowledge to chemical processes and equipment. Electives are available permitting students to widen their education or deepen their specialist ability by selection from subjects throughout the whole university.

**Department of Civil Engineering**

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

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

The Department also offers a complete Bachelor of Surveying degree course.

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

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

**Department of Electrical Engineering**

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

In preparation for a career in any branch of Electrical Engineering, the student must acquire a knowledge of the basic sciences of Mathematics and Physics. Electrical Engineering, perhaps more than most other branches of engineering, is closely linked with the pure sciences and requires a scientific outlook and approach for the proper understanding of the problems involved.
During the early stages of the undergraduate courses, students concentrate on acquiring a knowledge of the basic science subjects of mathematics, physics and chemistry, together with an introduction to engineering. Then students are introduced to the basic electrical engineering subjects, including electric circuit theory, electric power engineering and electronics. Advanced students study specialised subjects on power, control, computers, electronics or communication in their final year. Final year students may also broaden their knowledge by taking courses such as Industrial Law, Production Control, Economics or Accounting.

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

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

**Department of Mechanical Engineering**

The Department of Mechanical Engineering offers courses in Mechanical and Industrial Engineering leading to the award of the degree of Bachelor of Engineering. These courses involve a total of 4 years full-time study or 7 years part-time study. Normally part-time students complete their courses in under 7 years by completing one or more years on a full-time basis.

Mechanical Engineering is essentially concerned with the creative use of materials, motion and energy.

**Mechanical engineering** is probably the broadest in scope of all the branches of engineering. Basically it is concerned with all aspects of the production and use of mechanical energy. This involves activities such as the design and operation of machinery and mechanisms but the range of activities for which mechanical engineers are responsible is much wider covering many fields.

**Industrial engineering** is closely related to mechanical engineering but the emphasis is shifted towards management science, industrial psychology and economics. The industrial engineer is concerned with the design improvement and installation of integrated systems of men, materials and equipment.

Courses of study currently available in the Department are:

(i) **Bachelor of Engineering degree course in Mechanical Engineering**

This course is designed to give a basic training in the activities followed by professional mechanical engineers. It is oriented towards design, plant operation and control, manufacturing methods, material usage and energy conversion and utilisation.

(ii) **Bachelor of Engineering degree course in Industrial Engineering**

Years I and II of this course are similar to the full-time degree course in Mechanical Engineering. In the later years the course is oriented towards the study of production techniques and their control and the application of scientific principles to administration and industrial management. The course is thus designed for those engineers who wish to make their career in the planning, supervision and administration of industrial undertakings.

(iii) **Bachelor of Arts/Bachelor of Engineering degree course in Industrial Engineering AND**

(iv) **Bachelor of Arts/Bachelor of Engineering degree course in Industrial Engineering comprising 5 years of full-time study in the Faculties of Arts & Engineering.**

These courses (ii) & (iv) have been designed for those engineers who require a broader base for their education and training programme. This broader base is considered important in the areas of planning, organisation and management.

(v) **Bachelor of Science/Bachelor of Engineering degree course in Mechanical Engineering AND**

(vi) **Bachelor of Science/Bachelor of Engineering degree course in Industrial Engineering comprising 5 years of full-time study in the Faculties of Science & Engineering.**

(vii) **Bachelor of Commerce/Bachelor of Engineering, Bachelor of Economics/Bachelor of Engineering degree courses in Mechanical Engineering AND**

(viii) **Bachelor of Commerce/Bachelor of Engineering, Bachelor of Economics/Bachelor of Engineering degree courses in Industrial Engineering comprising 5 years of full-time study in the Faculties of Economics & Commerce, & Engineering.**

(ix) **Bachelor of Mathematics/Bachelor of Engineering degree in Mechanical Engineering**

(x) **Bachelor of Mathematics/Bachelor of Engineering degree course in Industrial Engineering comprising 5 years of full-time study in the Faculties of Mathematics & Engineering.**

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

(xi) **Diploma in Industrial Engineering**

This is a two-year part-time course for graduates in any branch of Engineering or Applied Science with appropriate experience or for persons otherwise acceptably qualified. The successful completion of the course leads to the award of a diploma in Industrial Engineering. Those wishing to enrol in this course should write to the Head of the Department of Mechanical Engineering for further details.

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

**Note**

The first two years of this University's Bachelor of Engineering degree in Mechanical is accepted by the University of New South Wales as exemption from the first two years of that University's degree course in Naval Architecture.

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

A student is permitted to continue in the course for as long as he has passed sufficient subjects in the course to enable him to complete all requirements for admission to the degree before the end of the 1979 academic year.

**Department 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.

The courses available in metallurgy endeavour to set a broad common base for all these interests in the early years and allow the possibility of some specialization in later years.

Two degrees at Bachelor level in Metallurgy are available in the Faculty of Engineering. These are the B.Sc.(Met.) and the B.Met.

The B.Sc.(Met.) is a part-time degree and may be taken out after the successful completion of the equivalent of three years full-time study and fulfilment of the requirements of industrial experience. Candidates achieving a high overall standard may be awarded the degree with Merit. The standard required is calculated on a grade point average system.
The B.Met. 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 fulfilment of the requirements of industrial experience. Candidates achieving a high overall 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. Details may be obtained from the Student Advisor.

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

**Degrees with Merit and Honours**

The award of Merit for B.Sc.(Met.) and Honours for B.Met. is broadly guided by the grade point average score for the student. In this system each unit is weighted according to the (full-time) year of the course it belongs to. The weightings for first, second, third and fourth year are 1, 1, 2 and 3 respectively.

The points are awarded on grading such that fail, pass (and pass conceded), credit, distinction and high distinction attract 0, 1, 2, 3 and 4 points respectively.

The grade point average corresponding to Merit in B.Sc.(Met.) is equal or greater than 2.0.

The grade point averages corresponding to Honours Class I, Honours Class II level one, Honours Class II level two are 2.5, 2.0 and 1.5 respectively.

**Industrial Experience Requirements**

Industrial experience requirement for the B.Sc.(Met.) degree is that the student should have had three years of full-time approved industrial employment. A year’s industrial experience is reckoned from November 1st to October 31st. To be recorded the student must supply:

1. A form signed by his industrial supervisor indicating that he has been employed for the approved period. The form is available from the departmental office.
2. A substantial report concerning the industrial experience and its relation to the industry concerned. These will be submitted between October 31st and January 31st following the period of employment.

B.Met. industrial experience required is that the student should have had at least twenty weeks full-time approved industrial employment. To be recorded the student must supply:

1. A form signed by his industrial supervisor indicating the period of full-time employment.
2. A substantial report concerning the industrial experience and its relation to the industry concerned. This is to be submitted by March 1st following the employment period.

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.
5. **A Subject**

(a) To complete a subject qualifying towards a degree, hereinafter called a subject, a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and carry out such other work as the Department offering the subject may require.

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

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

6. **Annual Examinations**

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

7. **Special and Deferred Examinations**

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

8. **Examination Grades**

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

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

9. **Withdrawal**

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

(b) A candidate who after:

- the eighth Monday in First Term, in the case of a Type A subject;
- the sixth Monday in Second Term, in the case of a Type AB subject;
- the second Monday in Third Term, in the case of a Type B subject;

withdraws from any subject shall be deemed to have failed in that subject, unless granted permission by the Dean to withdraw without penalty.

10. **Unsatisfactory Progress**

A candidate whose progress is unsatisfactory will be dealt with under the provisions of By-laws 5.4.1, 5.4.2 and 5.4.3.

11. **Prerequisites and Corequisites**

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

12. **Standing**

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

(ii) A candidate may be granted credit for elective units in recognition of subjects passed elsewhere which are not offered in this University.

13. **Progression**

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

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

14. **Mutually Exclusive Subjects or Part Subjects**

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

15. **Alternative Subjects**

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

2. **BACHELOR OF ENGINEERING**

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

- Bachelor of Engineering in Chemical Engineering
- Bachelor of Engineering in Civil Engineering
- Bachelor of Engineering in Electrical Engineering
- Bachelor of Engineering in Industrial Engineering
- Bachelor of Engineering in Mechanical Engineering
- Bachelor of Engineering in Naval Architecture
- Bachelor of Engineering in Computer Engineering

3. **BACHELOR OF METALLURGY**

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

4. **BACHELOR OF SURVEYING**

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

5. **BACHELOR OF SCIENCE (ENGINEERING)**

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

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

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

- (i) No candidate shall be permitted to enrol or re-enrol in these courses unless he was enrolled in the course prior to the 1st January, 1974.
- (ii) A candidate who was enrolled in the course prior to the 1st January, 1974, may either
  - (a) transfer to the Bachelor of Engineering course with the transition arrangements as set out in Appendix B to the Requirements or
  - (b) continue in the course to enable him to complete all requirements for admission to the degree before the end of the 1979 academic year.

6. **BACHELOR OF SCIENCE (METALLURGY)**

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

7. **COMBINED DEGREE COURSES**

- (i) Admission to a combined course shall normally be at the end of the first year and shall be subject to the approval of the Deans of the two Faculties concerned.
- (ii) Admission to combined courses will be restricted to students with an average of Credit level.
- (iii) The Deans of both Faculties, after consultation with the Heads of Departments concerned, shall certify that the work in the combined degree is no less in quantity and quality than if the two degrees were taken separately.

(iv) **Bachelor of Engineering**

A candidate may satisfy the requirements for admission to the degree of Bachelor of Engineering in any specialisation together with the requirements for admission to the degree of Bachelor of Arts or Bachelor of Commerce or Bachelor of 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 degree 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.

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 hours/week) taken from other departments in the University. Normally students will include EE203 Introduction to Electrical Information — EE204 Introduction to Electrical Energy and materials science and structural mechanics (e.g. CE202). Students of a sufficient level of achievement may, with the approval of the Head of Department of Chemical Engineering, replace these topics with advanced work in Chemistry, Mathematics, Metallurgy or Industrial Engineering.
Elective IA
Elective IA consists of six units to be taken between Stage 5 and Stage 6 and may include up to four units of advanced topics in Chemical Engineering III for students who wish to specialise in some particular field of Process Engineering (e.g. Fuels and High temperature Processes, Hydrometallurgy, etc.). In this case the remaining units of this elective must be selected appropriately by consultation with the Head of Department of Chemical Engineering.

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

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

2. DEPARTMENT OF CIVIL ENGINEERING

(a) Bachelor of Engineering and Bachelor of Science (Engineering)
Electives may consist of any subject(s) or part subjects offered within the Faculty or by other faculties, subject to the approval of the Heads of Department of Civil Engineering and of any other department responsible for the subject or part subject, except that up to three units of Industrial Experience may be taken as Electives after completion of the First Year of the course or its equivalent. Any student wishing to receive credit for three units must complete the third unit during his final year of enrolment.

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

3. DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of Engineering in Electrical or Computer Engineering
The twelve units of electives shall be chosen in accordance with the following rules:

1. Four elective units must be taken in the Faculty of Engineering.
2. Eight elective units must be taken outside the Faculty of Engineering, and must include one first-year Arts subject or the equivalent in a non-technical area. The latter will be counted as four elective units.
3. If a student elects to do a subject at one level which is required at a later level, the latter requirement is to be replaced with elective units.
4. A first-year subject in another faculty taken as an elective is normally equivalent to four units. Half a first-year subject in these faculties is normally equivalent to two units.
5. Chemistry I may be taken in lieu of Chemistry IS and two non-engineering electives and Physics II in lieu of PH221 and two non-engineering electives.
6. For the Bachelor of Arts/Bachelor of Engineering degree in Electrical Engineering, the rules are as for the Bachelor of Engineering degree save that the eight elective units to be taken outside the Faculty of Engineering must all be applied to Arts subjects.
7. For the Bachelor Science/Bachelor of Engineering degree in Electrical Engineering, the rules are as for the Bachelor of Engineering degree save that the eight elective units to be taken outside the Faculty must be applied to four units of Arts, two units towards Physics II and two units of second year Mathematics topics.
8. In any year, except the first year of the course, when a student enrols on a part-time basis, one year of industrial experience may be substituted for one elective subject for non-engineering units and no more than four such units may be substituted for non-engineering units and not more than four such units may be substituted for units within the six engineering elective units. A first year Arts subject or the equivalent in a non-technical area must still be taken. To earn this substitution, the student must submit a report concerning his practical experience for the year to the department secretary by the 31st October of the year for which the substitution is being sought and such other reports as may be required.
9. Exclusion classes—see note 6 next page.

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

1. A minimum of four elective units are to be taken within the Faculty of Engineering, at least two of which must be from outside the Department of Electrical Engineering.
2. One first-year Arts subject or the equivalent must be taken in a non-technical area.
3. It will be counted as four elective units.
4. If a student elects to do a subject at one level which is required at a later level, the latter requirement is to be replaced with elective units.
5. One first-year subject in another faculty taken as an elective is normally equivalent to four units. Half a first-year subject in these faculties is normally equivalent to two units.
6. A number of subjects offered outside the Faculty of Engineering are not acceptable as electives for Electrical Engineers. A list of these subjects is held in the Department of Electrical Engineering and should be consulted prior to enrolment.

4. DEPARTMENT OF MECHANICAL ENGINEERING

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.
2. At least three units shall be selected from the Departmental List of Technical Electives.
3. For students in full employment proceeding as part-time students, each year of appropriate employment that is supervised and approved by the Head of Department is credited as 1 unit of elective.
4. A maximum of five such units is allowed, described as:
   ME092 Industrial Experience 1 unit
   ME093 Industrial Experience 1 unit
   ME094 Industrial Experience 1 unit
   ME095 Industrial Experience 1 unit
   ME096 Industrial Experience 1 unit

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

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

1. At least four units shall be chosen from the Industrial Engineering Elective List approved by the Head of Department.
2. Not more than eight units (including the four units in Clause 1 above) shall be taken outside the Faculty.
3. At least three units shall be selected from the Departmental List of Technical Electives.
4. For students in full employment proceeding as part-time students, each year of appropriate employment that is supervised and approved by the Head of Department is credited as one unit of elective.

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

- ME092 Industrial Experience 1 unit
- ME095 Industrial Experience 1 unit
- ME094 Industrial Experience 1 unit
- ME095 Industrial Experience 1 unit
- ME096 Industrial Experience 1 unit

These elective units may be used to meet any elective requirements except the Industrial Engineering Elective requirement (Clause 1 above) and the Departmental Technical Elective requirement (Clause 3 above).

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)
- Introduction to Electrical Information (1)
- Fluid Mechanics (1) or
- Fluid Mechanics (1) or
- Fluid Statics & Dynamics (1)
- Heat Transfer (1) or
- Heat Transfer (1) or
- Mechanical Technology (1)
- Dynamics (1)
- Graphics/Engineering Drawing & Elementary Design (2)
- Statics (1)
- Properties of Materials (1) or
- Properties of Materials (1) or
- 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 1976

(a) DEPARTMENT OF CIVIL ENGINEERING

Bachelor of Engineering & Bachelor of Science (Engineering)

Any candidate currently enrolled for the degree of Bachelor of Engineering (Civil) or Bachelor of Science (Engineering) (Civil) and who has not completed the requirements for admission to that degree by the end of 1975 shall, subject to Section (b) (ii) (b) of the Requirements, be deemed to be enrolled thereafter for the new degree course introduced in 1976, with credit for the number of units passed in the old course, subject to the following conditions:

Any candidate who has passed or has been granted standing in a subject or part subject shall be given standing as shown below:

Subject already passed or credited Standing to be granted

<table>
<thead>
<tr>
<th>Course</th>
<th>Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME121 Workshop Practice</td>
<td>ME121 Workshop Practice</td>
</tr>
<tr>
<td>EE101 Introduction to Electrical Engineering</td>
<td>EE203 Introduction to Electrical Information</td>
</tr>
<tr>
<td>EE201 Principles of Electrical Engineering</td>
<td>EE204 Introduction to Electrical Energy</td>
</tr>
<tr>
<td>GE350J General Studies Seminar</td>
<td>GE350 Seminar</td>
</tr>
<tr>
<td>ME350I Engineering Administration</td>
<td>CE352 Civil Engineering Systems I</td>
</tr>
<tr>
<td>ME212 Engineering Design</td>
<td>ME271 Thermodynamics</td>
</tr>
<tr>
<td>CE211 Properties of Materials I</td>
<td>CE212 Mechanics of Solids</td>
</tr>
<tr>
<td>CE212 Mechanics of Solids (3 units)</td>
<td>CE212 Properties of Materials &amp; 1 unit of Elective I</td>
</tr>
</tbody>
</table>

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 the number of 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>Course</th>
<th>Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME201 Engineering for Surveyors</td>
<td>CE301 Civil Engineering IS</td>
</tr>
<tr>
<td>EE201 Civil Engineering I</td>
<td>CE302 Civil Engineering II</td>
</tr>
<tr>
<td>EE202 Transportation Engineering</td>
<td>CE372</td>
</tr>
<tr>
<td>GE350 Seminar</td>
<td>1 unit of elective</td>
</tr>
<tr>
<td>CE372 Town Planning A (prior to 1977)</td>
<td>SV473 Town Planning</td>
</tr>
</tbody>
</table>

(b) DEPARTMENT OF ELECTRICAL ENGINEERING

Any candidate currently enrolled for the degree of Bachelor of Engineering or Bachelor of Science (Engineering) in Electrical Engineering
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 shown below shall be given standing as shown.

Subject already passed or credited | Standing to be granted
--- | ---
EE325 Introduction to Digital Systems | EE325 Introduction to Digital Technology
EE332 Electrical Circuits | EE333 Advanced Circuit Analysis
EE345 Sample Data & Digital Control | EE345 Digital Signal Processing
EE361 Computer Structure: Machine & Assembly Language | EE361 Introduction to Logic & Assembly Language
EE411 Electrical Machines | EE416 Advanced Electrical Machine Theory
EE421 Electronics | EE421 Electronics Design A
EE442 Modern Control | EE442 Nonlinear Optimal Control
EE445 Communications Systems | EE441 Sample Data Control Systems
EE446 Advanced Topics in Control | EE446 Linear Optimal Control
EE451 Field Theory | EE451 Electromagnetic Propagation & Antennas
EE452 Microwave Measurements | EE453 High Frequency Circuits & Devices
EE464 Compilers, Assemblers & Interpreters | EE464 Compiler Construction

(c) DEPARTMENT OF MECHANICAL ENGINEERING
See transition arrangements in the 1976 Faculty Handbook (pp. 23 to 26).

(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.

### Schedule 1.1

**Bachelor of Engineering in Chemical Engineering**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE101 Industrial Process Principles</td>
<td>Year I</td>
<td>4</td>
</tr>
<tr>
<td>ME111 Graphics</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CF111 Statics</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Mathematics I</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Physics IA or IB</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Chemical Engineering I</td>
<td>Year II</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry IIA</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Mathematics IIB</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Industrial Experience</td>
<td>Year III</td>
<td>7</td>
</tr>
<tr>
<td>Chemical Engineering IIA</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Chemical Engineering IIB</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Elective I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Industrial Experience</td>
<td>Year IV</td>
<td>5</td>
</tr>
<tr>
<td>Chemical Engineering III</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Projects II</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Elective II</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

1. Standing may be granted in all or part of ME121 Workshop Practice on production of a certificate that equivalent training has been obtained.
2. Students, if they wish, may offer study in ME121 workshop practice until Year II.
3. See Elective Requirements—Appendix A.
4. Mathematics IIB may be taken in two parts of three terms duration.

### 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>Stage 1</td>
<td>ChE101 Industrial Process Principles</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME111 Statics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME121 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Physics IA or IB</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ME112 Workshop Practice</td>
<td>1</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>Subject</td>
<td>Stage 3</td>
<td>Units</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>Chemistry IIA</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB Part 1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering I Part 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stage 4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB Part 2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering I Part 2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIA Part I</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stage 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIA Part 2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIB</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Elective I</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Elective-Industrial Experience</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year VI Full Time</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering III</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Projects II</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Elective I (allowing for Industrial units)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Elective II (allowing for Industrial units)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></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. Any student who is unable to complete Year VI as a full-time student may do so over two part-time years.
4. See Elective Requirements—Appendix A.

**SCHEDULE 3.1**

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

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE101</td>
<td>Industrial Process Principles</td>
<td>1</td>
</tr>
<tr>
<td>CE111</td>
<td>Statics</td>
<td>1</td>
</tr>
<tr>
<td>ME111</td>
<td>Graphics</td>
<td>1</td>
</tr>
<tr>
<td>ME112</td>
<td>Engineering Drawing &amp; Elementary Design</td>
<td>1</td>
</tr>
<tr>
<td>ME121</td>
<td>Physics IA or IB</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 2</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 3</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry IIA</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIB Part 1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering I Part 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Stage 4</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIB Part 2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering I Part 2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering IIA Part I</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
### BACHELOR OF SCIENCE (ENGINEERING) IN CIVIL ENGINEERING

#### Stages 1-5 will not be offered after 1977

<table>
<thead>
<tr>
<th>Stage 6</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CE414B</td>
<td>Structural Design II</td>
</tr>
<tr>
<td></td>
<td>CE452</td>
<td>Engineering Construction</td>
</tr>
<tr>
<td></td>
<td>CE241</td>
<td>Water Resources Engineering</td>
</tr>
<tr>
<td></td>
<td>GE350</td>
<td>Seminar</td>
</tr>
<tr>
<td>Select 2 units from —</td>
<td>CE425</td>
<td>Earth &amp; Rock Engineering (I)</td>
</tr>
<tr>
<td></td>
<td>CE351</td>
<td>Civil Engineering Systems (I)</td>
</tr>
<tr>
<td></td>
<td>ME482</td>
<td>Engineering Economics (I)</td>
</tr>
<tr>
<td></td>
<td>CE414A</td>
<td>Structural Analysis II (II)</td>
</tr>
</tbody>
</table>

#### SCHEDULE 4.1

**BACHELOR OF SURVEYING**

#### Full-time Course

<table>
<thead>
<tr>
<th>Year I</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Economics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV111</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV121</td>
<td>4</td>
</tr>
</tbody>
</table>

**Year II**

<table>
<thead>
<tr>
<th>Mathematics IIB</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SV231</td>
<td>2</td>
</tr>
<tr>
<td>SV212</td>
<td>2</td>
</tr>
<tr>
<td>CE201</td>
<td>2</td>
</tr>
<tr>
<td>SV291</td>
<td>1</td>
</tr>
<tr>
<td>SV271</td>
<td>2</td>
</tr>
<tr>
<td>EE203</td>
<td>1</td>
</tr>
<tr>
<td>SV222</td>
<td>2</td>
</tr>
</tbody>
</table>

### SCHEDULE 3.2

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE414</td>
<td>4</td>
</tr>
<tr>
<td>CE425</td>
<td>1</td>
</tr>
<tr>
<td>CE452</td>
<td>2</td>
</tr>
<tr>
<td>CE453</td>
<td>2</td>
</tr>
<tr>
<td>ME482</td>
<td>1</td>
</tr>
<tr>
<td>Structural Analysis &amp; Design II</td>
<td>4</td>
</tr>
</tbody>
</table>

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

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.

#### PART-TIME STUDY IN CIVIL ENGINEERING & SURVEYING

**Recommended Programmes**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Civil Engineering</th>
<th>Surveying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>Engineering I</td>
<td>Mathematics I</td>
</tr>
<tr>
<td></td>
<td>Mathematics IIB</td>
<td>8 units</td>
</tr>
<tr>
<td></td>
<td>Economics I</td>
<td>8 units</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Physics IA</td>
<td>Physics IA</td>
</tr>
<tr>
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CE324
CE332
ME301
9 units

Stage 6
CE414
CE425
9 units

Stage 7
CE452
CE453
ME482
Elective II
9 units

Elective
CE452
CE453
ME482

Any student who is unable to undertake Years V and VI as a full-time student may do so over 3 part-time years. Such a student may be required to attend day classes in most subjects.

SCHEDULE 1.3
BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

Subject
Year I
Mathematics I
4
EE131
Circuit Fundamentals
1
CE111
Statics
1
ME111
Graphics
1
ME112
Engineering Drawing & Elementary Design
1
Physics IA
4
ME131
Dynamics
1
Met82
Electronic Structure of Materials
1
Chemistry IS
2
ME121
Workshop Practice
1
17

Year II
EE211
Energy Conversion
1**
EE221
Semiconductor Devices
1*
EE232
Electrical Circuits
1
Mathematics II B
4
PH221
Electromagnetics & Quantum Mechanics
2
Electives
6
15

Year III
EE313
Power Systems
1**
EE314
Electrical Machines
1*
EE323
Linear Electronics
1*
EE325
Introduction to Digital Technology
1*
EE333
Advanced Circuit Analysis
1*
EE341
Automatic Control
1*
EE344
Communications
1**
EE361
Introduction to Logic & Assembly Languages
1*
GE350
Seminar
1
2 from EE300, EE400
2**
Electives
4
15

Units
3
9
2
15

During the course each full-time student should complete periods of practical experience acceptable to the Faculty Board totalling 20 weeks before 31st January in the year in which the degree is to be awarded. Each student should hand in a report concerning his practical experience to the Department secretary during the first term but not later than the last week of the term.
* First half year
** Second half year
1 See Elective Requirements—Appendix A.
2 The completion of this unit may be delayed to second year if desired.
3 Mathematics II B may be taken in two parts each of three terms duration.
4 Students may, if they wish, defer study in ME121 workshop practice until after Year II.

SCHEDULE 3.3
BACHELOR OF SCIENCE (ENGINEERING) IN ELECTRICAL ENGINEERING

Stage 6
GE350
Seminar
1
4 of EE400 or EE500
4
Electives
9

During the course each part-time student should complete periods of practical experience acceptable to the Faculty Board totalling three years before 31st January in the year in which the degree is to be awarded.
* First half year
** Second half year
1 See Elective Requirements—Appendix A.

SCHEDULE 1.7
BACHELOR OF ENGINEERING IN COMPUTER ENGINEERING

Year I of the degree of Bachelor of Engineering in Computer Engineering is common with Year I of the degree of Bachelor of Engineering in Electrical Engineering.

Year II
EE211
Energy Conversion
1**
EE221
Semiconductor Devices
1*
EE232
Electrical Circuits
1
EE261
Information Structures & Programming
2
Mathematics II B (Topics B, C, D, E)
4
Ph221
Electromagnetics & Quantum Mechanics
2
Electives
4
15

30
LIST 1:  Fourth Year Subjects for Computer Engineering

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<td>EE443**</td>
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<td>EE462**</td>
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During the course each full-time student should complete periods of practical experience acceptable to the Faculty Board totalling 20 weeks before the 31st January in the year in which the degree is to be awarded. Each student should hand in a report concerning his practical experience to the departmental secretary during the first term but not later than the last week of the term.

* First half year
** Second half year
1 See Elective Requirements—Appendix A.

Mathematics Topics with approval of the Head of the Department of Electrical Engineering

Note
1 Not all subjects are necessarily offered in any given year,
2 Students must satisfy prerequisite requirements before enrolling in any subject.

PART-TIME AND SANDWICH COURSES IN ELECTRICAL & COMPUTER ENGINEERING

Recommended Programmes

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<th>Computer Engineering by</th>
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PART-TIME AND SANDWICH COURSES IN ELECTRICAL & COMPUTER ENGINEERING

Recommended Programmes

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**SCHEDULE 1.5**

**BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

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**SCHEDULE 1.4**

**BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING**

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<td>ME232 <strong>Dynamics of Machines</strong></td>
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</tr>
<tr>
<td>ME241 <em>Properties of Materials</em></td>
<td>1</td>
</tr>
<tr>
<td>ME251 <em>Fluid Mechanics</em></td>
<td>1</td>
</tr>
<tr>
<td>ME271 <strong>Thermodynamics</strong></td>
<td>1</td>
</tr>
<tr>
<td><em>Mathematics IIB</em></td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>
Subject

Year III

GE350 Seminar 1
ME301 Engineering Computations 1
ME313 **Engineering Design 1
ME333 **Dynamics of Machines 1
ME342 *Properties of Materials 1
ME343 **Mechanics of Solids 1
ME361 *Automatic Control 1
ME381 *Methods Engineering 1
ME383 **Quality Engineering 1
ME384 **Design for Production 1
ME387 *Operations Research—Deterministic Models 1
ME388 *Operations Research—Probabilistic Models 1

*Electives 1

Year IV

ME385 Accounting & Financial Studies 2
ME496 Project/Seminar 4
*Electives 8

1 First half year
2 Second half year

1 With approval of the Head of Department, Chemistry 1 (4 units) may be taken in lieu of Chemistry IS, ME151 and ME122.
2 Maths 1B 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.

PART-TIME STUDY FOR B.E. IN MECHANICAL & INDUSTRIAL ENGINEERING

Recommended Programmes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>normal part-time</td>
<td>Sandwich</td>
<td>normal part-time</td>
<td>Sandwich</td>
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<tr>
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<td>Stage 1</td>
<td>Stage 1</td>
<td>Stage 1</td>
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<tr>
<td>CB111</td>
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<td>Same as Mech.</td>
<td>Same as Mech.</td>
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<tr>
<td>ME111</td>
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<tr>
<td>ME112</td>
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<td>part-time</td>
<td>part-time</td>
</tr>
<tr>
<td>ME121</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME131</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Maths I</td>
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<td>9 units</td>
<td>9 units</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Stage 2</td>
<td>Stage 2</td>
<td>Stage 2</td>
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<tr>
<td>ME122</td>
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<td>Same as Mech.</td>
</tr>
<tr>
<td>ME151</td>
<td>part-time</td>
<td>Eng. normal</td>
<td>Eng. normal</td>
</tr>
<tr>
<td>Physics IA</td>
<td></td>
<td>part-time</td>
<td>part-time</td>
</tr>
<tr>
<td>ME092</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 units</td>
<td>9 units</td>
<td>9 units</td>
<td>9 units</td>
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<td>Stage 3</td>
<td>Stage 3—</td>
<td>Stage 3—</td>
<td>Stage 3—</td>
</tr>
<tr>
<td>1st Semester</td>
<td>1st Semester</td>
<td>1st Semester</td>
<td></td>
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<tr>
<td>Maths II</td>
<td>ME201</td>
<td>Same as Mech.</td>
<td>Same as Mech.</td>
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<tr>
<td>ME202</td>
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<tr>
<td>ME214</td>
<td>part-time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME212</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME223</td>
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<td>ME234</td>
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<td>ME241</td>
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<td>ME251</td>
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<td></td>
</tr>
<tr>
<td>EE203</td>
<td></td>
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</tr>
<tr>
<td>9 units</td>
<td>10 units</td>
<td>9 units</td>
<td>10 units</td>
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</tbody>
</table>

Stage 4

EE203 GE350
EE204 GE350
EE205 Same as Mech.
ME201 ME213 Eng. normal
ME212 ME233 part-time
ME213 ME235 Eng. sandwich
ME242 ME241
ME252 ME271
ME271 ME097
ME094 9 units

Stage 5

ME301 ME313
ME342 ME343
ME343 ME351
ME361 ME361
ME372 ME481
ME373 ME488
ME095 2 units
ME095 9 units

Stage 6

ME313 ME333
ME333 ME343
ME343 ME381
ME384 ME384
ME387 ME384
ME482 ME094
ME096 (if only Electives—4 units taken in Stage 5) 2 electives (Industrial Eng. Elective) 8 units
ME096 7 or 9 units
ME096 7 units
ME096 10 units

Stage 7

ME496 ME496
ME496 Accounting &
ME496 Financial Studies
ME496 Electives—3 units
ME496 Electives—3 units
ME097 9 units
ME098 8 units
ME095 9 units

BACHELOR OF SCIENCE (ENGINEERING) IN MECHANICAL OR INDUSTRIAL ENGINEERING

Stages 1-5 not offered in 1978
For schedules see 1977 Handbook

SCHEDULE 1.6

BACHELOR OF ENGINEERING IN
NAVAL ARCHITECTURE

Years I & II are identical with full-time B.E. in Mechanical & Industrial Engineering
Year 3 not offered in 1977
BACHELOR OF SCIENCE (ENGINEERING) IN NAVAL ARCHITECTURE

Stages 1-5 will not be offered in 1978

For schedules see 1977 Handbook

Departmental Technical Electives

The following subjects have been approved as Departmental Technical Electives. Those subjects which will not be offered in 1978 are marked †. The other subjects will not be offered subject to adequate enrolments.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME401 Systems Analysis</td>
<td>1</td>
</tr>
<tr>
<td>ME402 Systems Planning, Organization &amp; Control</td>
<td>1</td>
</tr>
<tr>
<td>†ME404 Mathematical Programming</td>
<td></td>
</tr>
<tr>
<td>ME405 Advanced Engineering Computations</td>
<td>1</td>
</tr>
<tr>
<td>†ME407 Environmental Engineering</td>
<td></td>
</tr>
<tr>
<td>†ME413 Design of Crankshafts, Flywheels &amp; other Rotating Members</td>
<td></td>
</tr>
<tr>
<td>†ME414 Design of Hydraulic &amp; Pneumatic Power Systems</td>
<td>1</td>
</tr>
<tr>
<td>†ME415 Design of Crane &amp; Hoist Equipment</td>
<td></td>
</tr>
<tr>
<td>†ME416 Design of Pressure Vessels, High Pressure Pipelines, Plates &amp; Shells</td>
<td>1</td>
</tr>
<tr>
<td>†ME417 Design of Worm &amp; Special Purpose Gear Reduction Units</td>
<td>1</td>
</tr>
<tr>
<td>†ME419 Design of Conveyors &amp; Materials Handling Equipment</td>
<td>1</td>
</tr>
<tr>
<td>†ME434 Advanced Kinematics &amp; Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>†ME444 Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>†ME445 Mechanics of Solids</td>
<td>1</td>
</tr>
<tr>
<td>†ME448 An Introduction to Photomechanics</td>
<td>1</td>
</tr>
<tr>
<td>†ME449 Reliability Analysis for Mechanical Systems</td>
<td>1</td>
</tr>
<tr>
<td>†ME453 Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>†ME454 Turbomachinery</td>
<td>1</td>
</tr>
<tr>
<td>†ME474 Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>†ME476 Developments In the Use of Solar Energy</td>
<td>1</td>
</tr>
<tr>
<td>†ME483 Production Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME487 Operations Research—Deterministic Models</td>
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</tr>
<tr>
<td>ME488 Operations Research—Probabilistic Models</td>
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</tr>
<tr>
<td>ME489 Operations Research—Applications in Industry</td>
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</tr>
<tr>
<td>GE471 Energy</td>
<td>1</td>
</tr>
<tr>
<td>GE472 Energy</td>
<td>1</td>
</tr>
</tbody>
</table>

Subjects deemed relevant and not appearing in the above list may be taken as Departmental Technical Electives on the approval of the Head of Department. Should other departments or faculties select three or more of the subject units from the above list to form a subject, the subject so formed shall be called Mechanical Engineering III

Industrial Engineering Electives

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>Psychology I</td>
<td>4</td>
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<tr>
<td>Sociology I</td>
<td>4</td>
</tr>
<tr>
<td>Economics I</td>
<td>4</td>
</tr>
<tr>
<td>Legal Studies I</td>
<td>4</td>
</tr>
<tr>
<td>Organisational Behaviour</td>
<td>4</td>
</tr>
<tr>
<td>Industrial Law</td>
<td>4</td>
</tr>
<tr>
<td>Industrial Relations I</td>
<td>4</td>
</tr>
<tr>
<td>Theories of Organisation</td>
<td>4</td>
</tr>
<tr>
<td>Labour Economics</td>
<td>4</td>
</tr>
</tbody>
</table>

Subjects deemed to be relevant to the Industrial Engineering course and not appearing in the above list may be taken as an Industrial Engineering Electives on the approval of the Head of Department.

Students wishing to read these subjects must make sure they fulfill the appropriate pre-requisite conditions prior to enrolling in them.

SCHEDULE 2.1

BACHELOR OF METALLURGY & BACHELOR OF SCIENCE (METALLURGY)

Year I

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Physics I</td>
<td>4</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td></td>
</tr>
<tr>
<td>CheE101 Industrial Process Principles</td>
<td>1</td>
</tr>
<tr>
<td>Met121 Chemical Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met141 Mechanical Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>Met151 Microstructure of Materials</td>
<td>1</td>
</tr>
<tr>
<td>Met181 Atomic Structure of Materials</td>
<td>1</td>
</tr>
<tr>
<td>Met182 Electronic Structure of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME111 Graphics</td>
<td>2</td>
</tr>
<tr>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
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</tr>
</tbody>
</table>

Year II

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Met211 Metallurgical Computations</td>
<td>4</td>
</tr>
<tr>
<td>Met212 Metallurgical Stoichiometry</td>
<td>1</td>
</tr>
<tr>
<td>Met213 Applied Statistics</td>
<td>1</td>
</tr>
<tr>
<td>Met221 Metallurgical Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td>Met231 Rate Processes</td>
<td>1</td>
</tr>
<tr>
<td>Met241 Microplasticity</td>
<td>1</td>
</tr>
<tr>
<td>Met251 Metallography</td>
<td>1</td>
</tr>
<tr>
<td>Met261 Extraction Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met271 Fabrication Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>†Elective I</td>
<td></td>
</tr>
</tbody>
</table>

See Elective Requirements—Appendix A.
To qualify for admission to the Bachelor of Science (Metallurgy) the candidate must satisfy the requirements for the first three years of the course and the industrial experience requirements prescribed by the Faculty Board.

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

1 See Elective Requirements—Appendix A.
2 To be chosen after consultation with the Head of Department;
3 Students may, if they wish, defer study in MET41 workshop practice until Year II.

List of MET300 Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET301 Communication Skills</td>
<td>1</td>
</tr>
<tr>
<td>MET311 Statistical Design &amp; Optimisation of Metallurgical Processes</td>
<td>1</td>
</tr>
<tr>
<td>MET312 Modelling &amp; Control of Metallurgical Processes</td>
<td>1</td>
</tr>
<tr>
<td>MET321 Heterogeneous Equilibria</td>
<td>1</td>
</tr>
<tr>
<td>MET322 Electrochemistry &amp; Corrosion</td>
<td>1</td>
</tr>
<tr>
<td>MET331 Transport Processes in Metallurgical Systems</td>
<td>1</td>
</tr>
<tr>
<td>MET332 Fluid Mechanics of Metallurgical Processes</td>
<td>1</td>
</tr>
<tr>
<td>MET341 Fracture &amp; Failure Analysis</td>
<td>1</td>
</tr>
<tr>
<td>MET342 Metallography</td>
<td>1</td>
</tr>
<tr>
<td>MET352 Physical Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>MET353 Solidification Processes</td>
<td>1</td>
</tr>
<tr>
<td>MET354 X-ray &amp; Electron Metallography</td>
<td>1</td>
</tr>
<tr>
<td>MET361 Extraction Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>MET362 Hydro- &amp; Electro- Extraction Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>MET363 Metallurgical Reactor Analysis</td>
<td>1</td>
</tr>
<tr>
<td>MET364 Refractories</td>
<td>1</td>
</tr>
<tr>
<td>MET371 Materials Selection</td>
<td>2</td>
</tr>
<tr>
<td>MET372 Fabrication Processes</td>
<td>1</td>
</tr>
<tr>
<td>MET373 Polymer Technology</td>
<td>1</td>
</tr>
<tr>
<td>MET374 Welding &amp; Non-Destructive Testing</td>
<td>1</td>
</tr>
<tr>
<td>MET381 Metal Physics</td>
<td>1</td>
</tr>
<tr>
<td>MET391 Physical Metallurgy Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>MET392 Chemical Metallurgy Laboratory</td>
<td>2</td>
</tr>
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</table>

B. POSTGRADUATE COURSES

Diploma in Industrial Engineering

General

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 persons 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.

Scope of Course

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.

As specified in the degree Requirements, the basic unit involves a student in a total of approximately 120 hours’ work. This total period includes all formal course work plus assignments and study. For a formal instructional course the unit includes 42 hours of lectures or the equivalent.

List of MET400 Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met401 Directed Reading</td>
<td>2</td>
</tr>
<tr>
<td>Met402 Metallurgy Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Met411 Metallurgical Computations</td>
<td>1</td>
</tr>
<tr>
<td>Met421 Heterogeneous Equilibria</td>
<td>1</td>
</tr>
<tr>
<td>Met431 Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>Met432 Fluid Mechanics of Metallurgical Processes</td>
<td>1</td>
</tr>
<tr>
<td>Met433 Metallurgical Rate Processes</td>
<td>1</td>
</tr>
<tr>
<td>Met441 Applications of Fracture Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>Met451 Electron Metallography</td>
<td>1</td>
</tr>
<tr>
<td>Met452 Physical Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met453 Metallography</td>
<td>1</td>
</tr>
<tr>
<td>Met461 Extraction Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met462 Reactor Analysis</td>
<td>1</td>
</tr>
<tr>
<td>Met471 Materials Selection</td>
<td>1</td>
</tr>
<tr>
<td>Met472 Welding &amp; Non-Destructive Testing</td>
<td>1</td>
</tr>
<tr>
<td>Met481 Dislocation Theory</td>
<td>1</td>
</tr>
<tr>
<td>Met482 Metal Physics</td>
<td>1</td>
</tr>
<tr>
<td>Met491 Laboratory Project</td>
<td>2</td>
</tr>
<tr>
<td>Met092-6 Industrial Experience</td>
<td>1 each</td>
</tr>
</tbody>
</table>

After discussion with the Head of Department, certain of these subjects may be offered at a higher level and at an increased unit value.
The approved subjects for the Diploma are arranged in three Groups and are listed in the schedule that follows. The Group I subjects are those required for a basic understanding of the principles of Industrial Engineering while the Groups II and III subjects permit a wider selection for those students already trained in the basic principles. The programme selected in every case is subject to the approval of the Faculty Board on the recommendation of the Head of the Department.

The general requirements concerning the conditions of award of the Diploma in Industrial Engineering are set out on the following pages.

**REQUIREMENTS FOR THE DIPLOMA IN INDUSTRIAL ENGINEERING**

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

2. An applicant for registration as a candidate for the Diploma shall complete the prescribed application form and lodge it with the Secretary at least one calendar month before the commencement of first term. In exceptional circumstances applications will be accepted after that date.

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

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

5. (a) To complete a subject qualifying towards the Diploma, a candidate shall attend such lectures, tutorials, seminars, laboratory classes, field work and submit such written work and pass such examinations as the Department may require.
   (b) Under no circumstances will a subject qualify for the Diploma for more than ten years from the year in which it is passed.

6. An applicant for registration as a candidate for the Diploma may be granted standing on conditions to be determined by the Faculty Board.

7. The Faculty Board shall approve a programme of studies for each candidate. This programme may be varied only with the approval of the Dean.

8. **Withdrawal**
   (a) A candidate may withdraw from a subject or course only by informing the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification.
   (b) A candidate who withdraws from any subject after the sixth Monday in second term shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty.

9. To qualify for a Diploma a candidate shall, in not less than two years of part-time study, or in special cases approved by the Faculty Board, one year full-time study, complete satisfactorily a course of studies comprising twelve units composed as follows:

   **Formal Course Work**
   (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
   - 10 units

   (b) The approved subjects have been arranged in three Groups. Group I contains subjects required for basic understanding of the principles of Industrial Engineering while Groups II and III contain a wider selection of subjects for those already trained in the subject areas of Group I.

   The selection of subjects shall normally be made from those in Group I of the Schedule, unless in order to satisfy the conditions of subsection (c) of this Clause or where a broader training is deemed to be desirable, the Faculty Board on the recommendation of the Head of Department, has prescribed a course of study including subjects from Groups II and III.

   In any event not more than three units may be selected from Group III.

   (c) Notwithstanding the requirements of parts (a) and (b) and except where standing is approved by the Board, no subject shall be included such that in the opinion of the Board, the subject concerned substantially overlaps in content that of a similar subject completed or work presented and for which credit has been given in the award of another degree or diploma.

10. All subjects listed in the Schedule may not necessarily be offered in any one year.

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group I</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME381</td>
<td>Methods Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME385</td>
<td>Production Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME401</td>
<td>Accounting &amp; Financial Studies</td>
<td>1</td>
</tr>
<tr>
<td>ME481</td>
<td>Systems Analysis</td>
<td>1</td>
</tr>
<tr>
<td>ME482</td>
<td>Engineering Administration</td>
<td>1</td>
</tr>
<tr>
<td>ME483</td>
<td>Engineering Economics</td>
<td>1</td>
</tr>
<tr>
<td>ME487</td>
<td>Operations Research—Deterministic Models</td>
<td>1</td>
</tr>
<tr>
<td>ME488</td>
<td>Operations Research—Probabilistic Models</td>
<td>1</td>
</tr>
<tr>
<td>ME582D</td>
<td>Industrial Computations</td>
<td>1</td>
</tr>
<tr>
<td>ME681D</td>
<td>Industrial Law</td>
<td>2</td>
</tr>
<tr>
<td><strong>Group II</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME402</td>
<td>Systems Planning, Organization &amp; Control</td>
<td>1</td>
</tr>
<tr>
<td>ME404</td>
<td>Mathematical Programming</td>
<td>1</td>
</tr>
<tr>
<td>ME407</td>
<td>Environmental Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME419</td>
<td>Design of Conveyors &amp; Materials Handling Equipment</td>
<td>1</td>
</tr>
<tr>
<td>ME444</td>
<td>Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME449</td>
<td>Reliability Analysis for Mechanical Systems</td>
<td>1</td>
</tr>
<tr>
<td>ME489</td>
<td>Operations Research—Applications in Industry</td>
<td>1</td>
</tr>
<tr>
<td>ME685D</td>
<td>Industrial Process Control</td>
<td>1</td>
</tr>
<tr>
<td>ME686D</td>
<td>Industrial Psychology</td>
<td>1</td>
</tr>
<tr>
<td>ME503G</td>
<td>Design of Experiments for Engineering Research</td>
<td>1</td>
</tr>
<tr>
<td>ME505G</td>
<td>Systems Analysis &amp; Design</td>
<td>2</td>
</tr>
<tr>
<td>ME507G</td>
<td>Resources Planning &amp; Allocation</td>
<td>2</td>
</tr>
<tr>
<td>ME517G</td>
<td>Materials Handling &amp; Transportation Systems</td>
<td>2</td>
</tr>
<tr>
<td>ME555G</td>
<td>Vibration &amp; Noise Problems in Industry</td>
<td>2</td>
</tr>
<tr>
<td>ME584G</td>
<td>Modelling of Management Problems</td>
<td>1</td>
</tr>
<tr>
<td><strong>Group III</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjects approved by the Faculty Board for an individual course but not included in Group I or Group II. The number of units to be assigned to these subjects will be determined by the Board.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Except where indicated the prerequisites will be those indicated in the Faculty of Engineering Handbook.

## Conditions for Granting of Standing

1. Standing in a subject in the Diploma in Industrial Engineering shall require the approval of the Faculty Board on the recommendation of the Dean of the Faculty of Engineering.

2. A candidate will not be eligible for standing in any subject for which credit has been given for the award of another degree or diploma except as otherwise provided for in succeeding clauses.

3. A candidate from the Master of Engineering Science course of the University of Newcastle who desires to transfer to the Diploma course in Industrial Engineering may be granted standing in those subjects of the Diploma deemed to be equivalent to any of the subjects already completed in the Master's programme.

4. A candidate from another university or approved tertiary institution may be granted standing by the Faculty Board in up to six units in recognition of postgraduate course work degree or diploma subjects completed in such university or institution provided that the subjects are equivalent to any of those listed in Groups I and II of the Schedule.

5. Where a candidate has completed the first part-time year of the Diploma course he may be granted standing by the Faculty Board in respect of another subject subsequently passed at another university or approved tertiary institution under the following conditions:

   (a) the subject for which standing is granted shall have a reasonable correspondence with a subject of the Diploma in Industrial Engineering; and

   (b) standing shall not be granted in more than three subject units.

## Higher Degrees

### Introduction

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

The Master of Engineering Science degree has the primary aim of increasing the knowledge of the student in a specific and professional area, and therefore places more emphasis on course work; nevertheless it includes project work for its own value both in the broadening and consolidation of knowledge, and as an introduction to research. The Master of Engineering degree has the primary aim of introducing the student to research, and bringing him to the point where he will be able to conduct research effectively under direction. Course work will normally be included in the programme with a normal minimum amount of three postgraduate "units", as defined on page 63 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.

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**Approved Diploma Subjects Offered by Other Faculties**

(a) **Faculty of Economics and Commerce**

<table>
<thead>
<tr>
<th>Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ME385D</td>
<td>Accounting &amp; Financial Studies</td>
</tr>
<tr>
<td>ME681D</td>
<td>Industrial Law</td>
</tr>
<tr>
<td></td>
<td>Commercial Programming</td>
</tr>
</tbody>
</table>

(b) **Faculty of Mathematics**

| CS | Programming & Algorithms | 1 |
| CS | Data Structures & Programming | 1 |

1 Refer to Diploma in Industrial Engineering
2 Refer to Diploma in Business Studies
3 Refer to Diploma in Computer Science
In general, students holding an Honours Degree in Engineering will be encouraged to complete the course in the minimum time of one year.

MASTER OF ENGINEERING SCIENCE
(M.Eng.Sc.) Degree Course

The Faculty of Engineering offers a group of subjects which comprise the major part of the Master of Engineering Science formal Master's degree programme.

The Master of Engineering Science degree course is offered on both a part-time and full-time basis in order to give graduate engineers the opportunity to update themselves in technological areas of interest.

This degree course is flexible in that candidates for the degree may select from a large number of subject combinations which may span one or more engineering Departments. Some undergraduate or postgraduate diploma material may be taken from inside or outside the Faculty of Engineering as credit for the degree, provided that such material is relevant to the programme as a whole. This possibility offers the advantage of advanced training and education which is broad in scope. The course supplements existing Master of Engineering and Doctor of Philosophy programmes which are usually of a research nature.

Scope of Course

Subject units will be offered on a Faculty-wide basis in areas of existing academic specialisation. It will be necessary for the Dean, as administrative head of the Faculty, to approve the programme.

In general the basic “unit” specified in the degree Requirements is a programme which involves the student in a total of approximately 120 hours’ work. This total includes all formal course work plus assignments and study. If the “unit” is a formal instructional course the 120-hour total includes 42 hours of lectures or the equivalent.

A number of the topics offered consist of two units. A complete M.Eng.Sc. programme normally consists of ten units of formal course work and two units of project work although in special cases the size of the project may be increased to three or four units, with a corresponding reduction in the formal course work.

Under normal circumstances, the course may be completed in one year when taken on a full-time basis, and two years when taken on a part-time basis.

The following pages contain departmental listings of approved M.Eng.Sc. subjects and some suggested programmes for integrated courses in various areas of interest. A student may, however, select any combination of the listed topics subject to the approval of the Head(s) of the relevant Department(s) and the Dean.

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 photo-stat 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>Department of Civil Engineering</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES15 Elastic Continua</td>
<td>1</td>
</tr>
<tr>
<td>CES16 Plastic Frame Design</td>
<td>1</td>
</tr>
<tr>
<td>CES17 Steel Beams, Columns &amp; Frames</td>
<td>1</td>
</tr>
<tr>
<td>CES55 Civil Engineering Systems II</td>
<td>2</td>
</tr>
<tr>
<td>CES617 Prestressed Concrete Design</td>
<td>2</td>
</tr>
<tr>
<td>CES626 Theoretical Aspects of Fracture Mechanics</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

**Department of Mechanical Engineering**

| ME503G Design of Experiments for Engineering Research | 2 |
| ME511G Experimental & Theoretical Stress Analysis | 2 |
| ME515G Advanced Design Concepts in Mechanical Engineering | 2 |
| ME517G Materials Handling & Transportation Systems | 2 |
| ME535G Vibration & Noise Problems in Industry | 2 |
| ME536G Advanced Dynamics of Machines | 1 |
| ME546G Elasticity, Plasticity & Applications | 2 |
| ME581G Mathematical Programming | 2 |

**Department of Metallurgy**

| Met541 Fracture Mechanics | 1 |
| Met571 Materials Selection | 1 |

**B. Computer Science**

**Department of Electrical Engineering**

| EE516 Computer-Aided Analysis of Power Systems | 1 |
| EE549 Applied Information Theory | 1 |
| EE562 Advanced Topics in Switching Theory | 1 |
| EE563 Computer Operating Systems | 1 |
| EE564 Compilers, Assemblers & Interpreters | 1 |
| EE565 Pattern Recognition | 1 |
| EE566 Automata & Computing Machines | 1 |
| EE567 Computer Process Control | 1 |
| EE568 Advanced Computer Architecture | 1 |
| EE569 Formal Languages & Automata | 1 |

**Department of Mechanical Engineering**

| ME581G Mathematical Programming | 2 |

**Subjects offered by other Faculties**

**Department of Mathematics**

| CS Programming & Algorithms | 1 |
| CS Data Structures & Programming | 1 |
| Mathematics III, Topic Z | 1 |

**Department of Commerce**

| Commercial Programming | 1 |

**C. Engineering Materials**

**Department of Civil Engineering**

| CE526 Advanced Properties of Materials | 1 |
| CE527 Concrete Technology | 1 |
| CE528 Soil Mechanics | 1 |
| CE529 Foundation Engineering | 1 |
| CE574 Transportation Planning | 1 |
| CE674 Traffic Engineering | 1 |
**Department of Mechanical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME503G</td>
<td>Design of Experiments for Engineering Research</td>
<td>2</td>
</tr>
<tr>
<td>ME511G</td>
<td>Experimental &amp; Theoretical Stress Analysis</td>
<td>2</td>
</tr>
<tr>
<td>ME517G</td>
<td>Materials Handling &amp; Transportation Systems</td>
<td>2</td>
</tr>
<tr>
<td>ME546G</td>
<td>Elasticity, Plasticity &amp; Applications</td>
<td>2</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
<td>2</td>
</tr>
</tbody>
</table>

**Department of Metallurgy**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>Met541</td>
<td>Applications of Fracture Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>Met551</td>
<td>Electron Metallurgy</td>
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</tr>
<tr>
<td>Met552</td>
<td>Physical Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met553</td>
<td>Metallurgy</td>
<td>1</td>
</tr>
<tr>
<td>Met571</td>
<td>Materials Selection</td>
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</tr>
<tr>
<td>Met582</td>
<td>Metal Physics</td>
<td>1</td>
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</tbody>
</table>

Together with approved topics and subjects which may be offered from the Faculty of Science.

**D. Environmental Studies/Environmental Engineering**

**Department of Chemical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE501</td>
<td>Chemical Process Principles for Effluent Control</td>
<td>1</td>
</tr>
<tr>
<td>ChE513</td>
<td>Advanced Combustion</td>
<td>2</td>
</tr>
<tr>
<td>ChE521</td>
<td>Air Pollution Effluent Control</td>
<td>2</td>
</tr>
<tr>
<td>ChE522</td>
<td>Control of Industrial Liquid Effluents</td>
<td>2</td>
</tr>
<tr>
<td>ChE623</td>
<td>Advanced Topics in Effluent Control</td>
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**Department of Civil Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE543</td>
<td>Water Quality Management</td>
<td>1</td>
</tr>
<tr>
<td>CE643</td>
<td>Water Pollution &amp; Water Quality Management</td>
<td>1</td>
</tr>
<tr>
<td>CE644</td>
<td>Water &amp; Wastewater Treatment</td>
<td>2</td>
</tr>
<tr>
<td>CE645J</td>
<td>Microbiology of Water Resources</td>
<td>2</td>
</tr>
<tr>
<td>CE646</td>
<td>Public Health Science</td>
<td>1</td>
</tr>
<tr>
<td>CE647</td>
<td>Unit Operations in Public Health Engineering</td>
<td>1</td>
</tr>
</tbody>
</table>

**Department of Mechanical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ME503G</td>
<td>Design of Experiments for Engineering Research</td>
<td>2</td>
</tr>
<tr>
<td>ME505G</td>
<td>Systems Analysis &amp; Design</td>
<td>2</td>
</tr>
<tr>
<td>ME506G</td>
<td>Air Pollution Studies II</td>
<td>2</td>
</tr>
<tr>
<td>ME535G</td>
<td>Vibration &amp; Noise Problems in Industry</td>
<td>2</td>
</tr>
<tr>
<td>ME575G</td>
<td>Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
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</table>

**Interepartmental Subjects**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>GE501G</td>
<td>Air Pollution Studies I</td>
<td>1 or 2</td>
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</tbody>
</table>

**E. Fluid Mechanics/Water Resources Engineering**

**Department of Civil Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE533</td>
<td>Theoretical Hydrodynamics</td>
<td>1</td>
</tr>
<tr>
<td>CE534</td>
<td>Open Channel Flow</td>
<td>1</td>
</tr>
<tr>
<td>CE535</td>
<td>River &amp; Coastal Engineering I</td>
<td>1</td>
</tr>
<tr>
<td>CE543</td>
<td>Water Quality Management</td>
<td>1</td>
</tr>
<tr>
<td>CE634</td>
<td>Advanced Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>CE635</td>
<td>River &amp; Coastal Engineering II</td>
<td>1</td>
</tr>
<tr>
<td>CE636</td>
<td>Water Reticulation &amp; Wastewater Collection</td>
<td>1</td>
</tr>
<tr>
<td>CE643</td>
<td>Water Pollution &amp; Water Quality Management</td>
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</tr>
<tr>
<td>CE644</td>
<td>Water &amp; Wastewater Treatment</td>
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<tr>
<td>CE645J</td>
<td>Microbiology of Water Resources</td>
<td>2</td>
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<tr>
<td>CE646</td>
<td>Public Health Science</td>
<td>1</td>
</tr>
<tr>
<td>CE647</td>
<td>Unit Operations in Public Health Engineering</td>
<td>1</td>
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</tbody>
</table>

**F. Furnace Engineering**

**Department of Chemical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE502</td>
<td>Reaction Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE511/512</td>
<td>Advanced Heat Transfer</td>
<td>2</td>
</tr>
<tr>
<td>ChE513</td>
<td>Advanced Combustion</td>
<td>2</td>
</tr>
<tr>
<td>ChE514</td>
<td>Furnace Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE521</td>
<td>Air Pollution Effluent Control</td>
<td>2</td>
</tr>
<tr>
<td>ChE542</td>
<td>Communion</td>
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**Department of Electrical Engineering**

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EE542</td>
<td>Modern Control</td>
<td>1</td>
</tr>
<tr>
<td>EE546</td>
<td>Modern Control</td>
<td>1</td>
</tr>
<tr>
<td>EE641</td>
<td>Multivariable Control Systems</td>
<td>1</td>
</tr>
<tr>
<td>EE642</td>
<td>Stochastic Control</td>
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**Department of Mechanical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ME503G</td>
<td>Design of Experiments for Engineering Research</td>
<td>2</td>
</tr>
<tr>
<td>ME554</td>
<td>Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME555</td>
<td>Advanced Turbo Machinery</td>
<td>2</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
<td>2</td>
</tr>
</tbody>
</table>

**G. Operations Research/Management Science**

**Department of Chemical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE531</td>
<td>Process Optimization</td>
<td>2</td>
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</table>

**Department of Civil Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CE554</td>
<td>Civil Engineering Systems II</td>
<td>1</td>
</tr>
<tr>
<td>CE654</td>
<td>Construction Management</td>
<td>1</td>
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</tbody>
</table>

**Department of Mechanical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME502G</td>
<td>Operations Research &amp; Decision Theory</td>
<td>2</td>
</tr>
<tr>
<td>ME505G</td>
<td>Systems Analysis &amp; Design</td>
<td>2</td>
</tr>
<tr>
<td>ME581G</td>
<td>Mathematical Programming</td>
<td>2</td>
</tr>
<tr>
<td>ME582G</td>
<td>Probabilistic Models in Operations Research</td>
<td>2</td>
</tr>
<tr>
<td>ME583G</td>
<td>Modelling of Management Problems</td>
<td>1</td>
</tr>
<tr>
<td>ME584G</td>
<td>Simulation</td>
<td>1</td>
</tr>
<tr>
<td>ME685G</td>
<td>Advanced Operations Research</td>
<td>2</td>
</tr>
</tbody>
</table>

**Subjects offered by other Faculties**

**Department of Mathematics**

Selected Topics in Mathematics IV.

**Department of Commerce**

Selected topics from Diploma in Business Studies.

Where possible it is recommended that students who wish to study in this area undertake subjects ME581G to ME584G inclusive as a first year programme.

**H. Mineral Process Engineering**

**Department of Chemical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE502</td>
<td>Reaction Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE513</td>
<td>Advanced Combustion</td>
<td>2</td>
</tr>
<tr>
<td>ChE514</td>
<td>Furnace Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ChE523</td>
<td>Particulate Separations</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE531</td>
<td>Process Optimization</td>
<td>2</td>
</tr>
<tr>
<td>ChE542</td>
<td>Communion</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ChE603</td>
<td>Advanced Problems in Mass Transfer &amp; Reaction</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>
Department of Electrical Engineering
EE542 Modern Control 1
EE546 Modern Control 1
EE641 Multivariable Control Systems 1
EE642 Stochastic Control 1

Department of Mechanical Engineering
ME502G Operations Research & Decision Theory 2
ME503G Design of Experiments for Engineering Research 2
ME546G Elasticity, Plasticity & Applications 2
ME581G Mathematical Programming 2
ME685G Advanced Operations Research 2

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 Multi-variable Control Systems 1
EE642 Stochastic Control 1

Department of Mechanical Engineering
ME404 Mathematical Programming 2
ME505G Systems Analysis & Design 2
ME581G Mathematical Programming 2

Subjects offered by other Faculties
Department of Mathematics
Stochastic Processes
Signal Detection

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

Approval for any course chosen from the 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.
(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.

**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.
   (iv) Every candidate shall submit annually a report on his work to his supervisor for transmission to the Higher Degree Committee.
   (v) Every candidate shall submit three copies of the thesis as provided under paragraph 6 (i). All copies of the thesis shall be double-spaced typescript, shall include a summary of approximately 200 words, and a certificate signed by the candidate to the effect that the work has not been submitted for a higher degree to any other university or institution. The ORIGINAL copy of the thesis for deposit in the Library shall be prepared and bound in a form approved by the University. The other two copies of the thesis shall be bound in such a manner as allows their transmission to the examiners without possibility of their disarrangement.
(vi) It shall be understood that the University retains the three copies of the thesis and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act (1968) the University may issue the thesis in whole or in part in photostat or microfilm or other copying medium.

7. No candidate shall be considered for the award of the degree until the lapse of six complete terms from the date from which the registration becomes effective, save 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.

**FACULTY POLICIES**

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

**Award of Merit and Honours**

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:

   \[
   \begin{align*}
   \text{HD} &= 4 \\
   \text{D} &= 3 \\
   \text{C} &= 2 \\
   \text{P and P*} &= 1 \\
   \text{FF, WF, AF and EF} &= 0
   \end{align*}
   \]

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.

   \[
   \text{That is } W_{ni} = \text{Unit grade point product for subject } i
   \]

   \[
   \text{Where } W_i = \text{Grade points assigned to subject } i \\
   n_i = \text{Unit value for subject } i
   \]

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

   \[
   \text{GPA}(t) = \frac{\left(\sum W_{ni}\right)_{t}}{\left(\sum n_i\right)_{t}}
   \]

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

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

   \[
   \begin{align*}
   \text{WGPA} \geq 2.5 & \quad \text{Honours Class I} \\
   2.0 \leq \text{WGPA} < 2.5 & \quad \text{Honours Class II (Division 1)} \\
   1.5 \leq \text{WGPA} < 2.0 & \quad \text{Honours Class II (Division 2)}
   \end{align*}
   \]

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
   \[ WGPA = \frac{1}{4} (GPA(1) + GPA(2) + 2GPA(3)) \]
3. The unweighted overall grade point average is calculated thus
   \[ GPA = \frac{1}{3} \sum GPA(t) \]
4. The weighted overall grade point average to be used as a guide for the recommendation of a merit grade is \( WGPA \geq 2 \).

Example

<table>
<thead>
<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>
</tr>
</thead>
</table>
| Year I
| Engineering I   | C     | 2         | 4         | 8            | 1.70   |
| Mathematics I    | C     | 2         | 4         | 8            |        |
| Physics IA       | C     | 2         | 4         | 8            |        |
| Chemistry IS     | P     | 1         | 1         | 1            |        |
| ME121            | P     | 1         | 1         | 1            |        |
| ME122            | P     | 1         | 1         | 1            |        |
| Met151           | P     | 1         | 1         | 1            |        |
|                  |       | \( \sum 17 \) |         | \( \sum 29 \) | 1.70   |
| Year II
| Mathematics IIIB| P     | 1         | 4         | 4            |        |
| EE203            | C     | 2         | 1         | 2            |        |
| EE204            | C     | 2         | 1         | 2            |        |
| ME201            | P     | 1         | 1         | 1            |        |
| ME202            | P     | 1         | 1         | 1            |        |
| ME212            | C     | 2         | 1         | 2            |        |
| ME213            | C     | 2         | 1         | 2            |        |
| ME214            | P     | 1         | 1         | 1            |        |
| ME223            | P     | 1         | 1         | 1            |        |
| ME232            | P     | 1         | 1         | 1            |        |
| ME241            | C     | 2         | 1         | 2            |        |
| ME251            | C     | 2         | 1         | 2            |        |
| ME271            | C     | 2         | 1         | 2            |        |
|                  |       | \( \sum 16 \) |         | \( \sum 24 \) | 1.50   |

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

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

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

Interpretation of the Academic Progress By-Laws

By-Law 5.4.1 (2) leaves it open to each particular faculty to decide what constitutes unsatisfactory progress calling for action under 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 progress, to be acted on under sub-heading (c) of the By-Law. "Approved programme" means the student's programme for the whole period in question, and the fraction one-quarter is to be measured by the "units" defined on page 63.

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

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

Mutually Exclusive Subjects
(See Section 14 of the Requirements)
The Faculty Board has deemed the following subjects or part subjects to be mutually exclusive:—
3. ME482 Engineering Economics, Accounting & Financial Studies.
4. Accounting & Financial Studies & Accounting I.

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

<table>
<thead>
<tr>
<th>B.E. Full-time</th>
<th>B.Met</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 Year</td>
<td>Units Stage</td>
<td>Units Stage</td>
</tr>
<tr>
<td>0-15 — 1</td>
<td>0-17 — 1</td>
<td>0-7 — 1</td>
<td>0-7 — 1</td>
</tr>
<tr>
<td>16-31 — II</td>
<td>18-33 — II</td>
<td>8-16 — 2</td>
<td>8-15 — 2</td>
</tr>
<tr>
<td>32-47 — III</td>
<td>34-49 — III</td>
<td>17-25 — 3</td>
<td>16-23 — 3</td>
</tr>
<tr>
<td>48+ — IV</td>
<td>50+ — IV</td>
<td>26-34 — 4</td>
<td>24-31 — 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35-43 — 5</td>
<td>32-39 — 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>44-52 — 6</td>
<td>40+ — 6</td>
</tr>
<tr>
<td></td>
<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.

Publication of Faculty Board Minutes
A copy of Faculty Board decisions on matters of general interest will be displayed on all Departmental Notice Boards, in the Library, the University Union and the Staff House.
Decisions in relation to individual students, personal staff matters and other items which are of a confidential nature will not be included in the published list.

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

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

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

Special Consideration/Special Examinations
Senate has ruled that a student may apply for special consideration or special examination for mid-year examinations. This will also apply to assignments and term quizzes which are considered in assessing the student's final grading.
Consequently, any student who is prevented by illness or other circumstances from sitting a mid-year examination or quiz or from submitting an assignment should submit a request for special consideration, accompanied by a medical certificate where appropriate, to the Secretary to the University.
Alternative Subjects
(see Section 15 of the Requirements)

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

1. 
   (a) CE212 Mechanics of Solids & ME214 Mechanics of Solids I.
   (b) CE221 Properties of Materials I & ME241 Properties of Materials.
   (c) ChE211 Fluid Statics & Dynamics, CE231 Fluid Mechanics & ME251 Fluid Mechanics.
   (d) ChE212 Heat & ME372 Heat Transfer.
   (e) Met213 Applied Statistics & ME582D Industrial Computations.
   (f) ME122 Process Technology & ME271 Fabrication Metallurgy.

Standing and Exemption Examinations for Holders of Technical College Certificates

A student may apply for standing in any subject. The Head of the appropriate Department will decide whether standing shall be recommended 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 subjects or subject units as follows:

SUBJECT OR SUBJECT UNITS

Mechanical Engineering Certificate

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME111</td>
<td>Graphics</td>
</tr>
<tr>
<td>ME112</td>
<td>Engineering Drawing &amp; Elementary Design</td>
</tr>
<tr>
<td>ME223</td>
<td>Mechanical Technology</td>
</tr>
<tr>
<td>ME151</td>
<td>Microstructure of Materials</td>
</tr>
<tr>
<td>ME122</td>
<td>Process Technology</td>
</tr>
<tr>
<td>Surveying I</td>
<td>If passed appropriate elective in certificate</td>
</tr>
<tr>
<td>Survey Camp I</td>
<td></td>
</tr>
<tr>
<td>Surveying I</td>
<td>If passed appropriate elective in certificate</td>
</tr>
<tr>
<td>Survey Camp I</td>
<td></td>
</tr>
</tbody>
</table>

Survey Certificate

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveying I</td>
<td>If passed appropriate elective in certificate</td>
</tr>
<tr>
<td>Survey Camp I</td>
<td></td>
</tr>
<tr>
<td>Surveying II</td>
<td></td>
</tr>
<tr>
<td>Survey Camp II</td>
<td></td>
</tr>
<tr>
<td>Town Planning A</td>
<td>If passed appropriate elective in certificate</td>
</tr>
<tr>
<td>Property &amp; Survey Law</td>
<td>Course</td>
</tr>
<tr>
<td>Land Valuation</td>
<td>Surveying I</td>
</tr>
<tr>
<td>Survey Camp I</td>
<td></td>
</tr>
<tr>
<td>Surveying II</td>
<td>Survey Camp I</td>
</tr>
</tbody>
</table>

Engineering Survey Certificate

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveying I</td>
<td>If passed appropriate elective in certificate</td>
</tr>
<tr>
<td>Survey Camp I</td>
<td></td>
</tr>
<tr>
<td>Surveying II</td>
<td></td>
</tr>
<tr>
<td>Survey Camp II</td>
<td></td>
</tr>
</tbody>
</table>

Examination exemptions may be granted in the following subjects:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE111</td>
<td>Statics</td>
</tr>
<tr>
<td>EE203</td>
<td>Introduction to Electrical Energy</td>
</tr>
<tr>
<td>EE204</td>
<td>Introduction to Electrical Information</td>
</tr>
<tr>
<td>ME131</td>
<td>Dynamics</td>
</tr>
<tr>
<td>ME212</td>
<td>Engineering Design</td>
</tr>
<tr>
<td>ME213</td>
<td></td>
</tr>
</tbody>
</table>

Industrial Training

This is a general statement covering all aspects of Industrial Training. For a full-time Bachelor of Engineering or Bachelor of Metallurgy degree students are normally required to complete periods of practical experience, totalling at least 20 weeks, acceptable to the Faculty Board.

For a Bachelor of Engineering degree on a part-time basis, students may choose to take Industrial Experience units as part of their elective programme. The University can accept no responsibility for finding suitable employment for students wishing to enrol for Industrial Experience units. To be eligible for an Industrial Experience unit, the student must be in approved employment on the 1st November preceding the year in which the unit is to be taken. 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. Normally no Industrial Experience unit will be allowed in the first year of enrolment.

Students attending on a full-time basis must submit a report for each period of Industrial Training to the appropriate Department by the 31st March following the training period.

Where a student changes from part-time to full-time and has, during his part-time attendance, completed an Industrial Experience elective, the work completed during this elective unit will be considered as satisfying the 20 weeks Industrial Training requirements for full-time students.

A student transferring from part-time to full-time studies and who has not, during his period of part-time attendance, completed an Industrial Experience elective unit, will be required to submit a statement regarding the Industrial Experience gained during his part-time attendance.

Students should consult the appropriate Department to find details regarding the submission of reports.

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

Units

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, the unit involves a total of 42 hours (1 1/2 hours per week) of lectures, laboratories, and tutorials. Where subjects from other faculties form part of an Engineering course, the unit value is assessed on the basis of the work-load required for that subject as part of a normal year's programme. Normally, Part I subjects each count as 4 units while complete Part II and Part III subjects have a higher unit value.
However, the unit value specified for subjects in other faculties is determined from time to time by the Faculty Board.

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

In the Master of Engineering Science Requirements a unit is defined as exactly one-twelfth of a full-time year, and in all postgraduate courses, including the Master of Engineering and Doctor of Philosophy the unit is understood to have the same value. This “postgraduate unit” is also defined as a programme which involves a student in a total of approximately 120 hours’ work. This total includes all formal course work plus assignments and study. If the “unit” is a formal instructional course the 120-hour total includes 42 hours of lectures or the equivalent.

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

New Students

Students enrolling for the first time in an Engineering course should read carefully, before completing their enrolment form, the course schedules contained in the Degree Requirements sections. Your programme will vary slightly according to the Department in which you are enrolling.

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

Subject Name

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

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

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

The first numeral generally indicates the Year of the full-time course in which the subject is normally taken; the second numeral indicates the field of study; the third numeral for undergraduate courses indicates the level, or sequence in the field.

The fields of study are shown at the beginning of each departmental subject entry.

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

Prerequisites and Corequisites

Prerequisites are those subjects which the student must have already passed before enrolling in the subject.

Corequisites are those subjects in which the student must enrol concurrently unless he has already passed them.

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

Hours

All subjects in the Faculty of Engineering are based on units of 42 contact hours each. A full explanation of the unit is given on page 63.

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

Examinations and Assessment

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

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

Content

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

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

Texts

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

DESCRIPTION OF SUBJECT ENTRIES

Chemical Engineering

Indicating Numerals
ChE-0
ChE-1
ChE-2
ChE-3

Field of Study
General
Chemical Engineering Science
Unit Operations
Engineering Practice

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
Part II
(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
Reuben, G. G. & Burstall, M. L. The Chemical Economy (Longman 1973)
Reference

Kent, J. 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.

Texts


Reference


(v) 512205 ChE212 Heat

Content

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

Texts


(vi) 512208 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


(vi) 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 Pti* 1976

SAA Code *Unfired Pressure Vessels AS 1210-1972*
### 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**

<table>
<thead>
<tr>
<th>Part I</th>
<th>ChE301 Computations</th>
<th>ChE311 Thermodynamics</th>
<th>ChE312 Reaction Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
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<td>(ii)</td>
<td>ChE302 Unit Operations Laboratory</td>
<td>ChE313 Transport Principles</td>
<td>ChE321 Continuous Contacting Processes</td>
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<td>(iii)</td>
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<table>
<thead>
<tr>
<th>(ii) 513101 ChE301 Computations</th>
<th>Approx. 21 hours</th>
</tr>
</thead>
</table>

**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.

### 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.

Texts

(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

513200 Chemical Engineering IIB

*Prerequisites* Chemical Engineering I

*Pre- or Corequisite* Chemical Engineering IIA

*Hours* 4½ hours per week

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

*Content*
(i) **513144** ChE314 Process Control
(ii) **513311** ChE331 Process Economics
(iii) **513332** ChE332 Equipment Design — including materials and corrosion

(v) **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**
1. **Process plant costs** — fixed, variable, direct, indirect — review of cost accounting procedures applied to above. Balance sheet and income statements.
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**

**Reference**

(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**

**SAA Code**

SAA Code  *Unfired Pressure Vessels AS1210-1972*

SAA Code  *Steel Structures Code AS 1250-1972*

**Reference**

**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**

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

Trinks, W. & McWhinney  Industrial Furnaces (Wiley)

514100 Chemical Engineering III

Prerequisites  Chemical Engineering IIA and IIB

Hours  7 hours per week

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

Content

ChE402 Seminar
ChE431 Process Engineering

Together with not less than six topics selected from:

ChE411 Advanced Combustion (or ChE431 Fuel Technology I 1 or 2 topics)
ChE412 Radiant Heat Transfer (or ChE432 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:

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<tr>
<th>Units</th>
<th>Content</th>
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<tbody>
<tr>
<td>CE201</td>
<td>Materials and Structures (alternately ME241-1½ units; Materials Science IS 2 units)</td>
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<tr>
<td>EE203</td>
<td>Introduction to Electrical Information &amp; Energy</td>
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<tr>
<td>ChE341</td>
<td>Fuel Technology I</td>
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<tr>
<td>ChE342</td>
<td>Furnace Heat Transfer</td>
</tr>
<tr>
<td>GE471</td>
<td>Energy</td>
</tr>
<tr>
<td>GE472</td>
<td>Advanced Topic (from IIIB, IIA, IIIIB, to not more than 3 units)</td>
</tr>
<tr>
<td>GE475</td>
<td>Faculty General Seminar</td>
</tr>
<tr>
<td>GE476</td>
<td>Energy may be available for students who have completed GE471 Energy or GE472 Energy.</td>
</tr>
</tbody>
</table>

Elective I 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.

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.

Subject to sufficient enrolment the following will be offered:

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<thead>
<tr>
<th>Units</th>
<th>Content</th>
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<tbody>
<tr>
<td>ChE411</td>
<td>Advanced Combustion (alt.ChE341 Fuel Technology I— one unit)</td>
</tr>
<tr>
<td>ChE412</td>
<td>Radiant Heat Transfer (alt. ChE342 Furnace Heat Transfer—one unit)</td>
</tr>
<tr>
<td>ChE416</td>
<td>Advanced Process Control</td>
</tr>
<tr>
<td>ChE421</td>
<td>Multicomponent (vap-lq) Separations</td>
</tr>
<tr>
<td>ChE422</td>
<td>Particle Mechanics (coal washing &amp; ore dressing fundamentals)</td>
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<tr>
<td>ChE432</td>
<td>Environmental control</td>
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<tr>
<td>ChE433</td>
<td>Process evaluation</td>
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<tr>
<td>ChE403</td>
<td>Advanced Computations</td>
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</tbody>
</table>

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 com­
puters. Examples will be taken from statistics, fluid mechanics, stage
operations, reaction engineering, automatic control and optimization.

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

510117 ChE511 Advanced Heat Transfer
510118 ChE512 Advanced Heat Transfer

Hours
ChE512 — 42 hours ChE511 — 42 hours
for course

Content
ChE511
A study of fundamentals of and computational methods for radiative
transfer, particularly for grey lambert surfaces and non-luminous
gases. Methods of representing real gases by grey gas components.
Matrix methods of solving for non-isothermal systems.
ChE512
Studies in heat transfer in packed beds (e.g. blast furnaces, catalytic
reactors) and in unsteady conditions.

Text
ChE511
Hottel, H. C. &
Sarofim, A. C.
 Radiative Transfer (McGraw-Hill 1968)

510122 ChE513 Advanced Combustion

Hours
Approx. 84 hours for course

Content
A detailed study of the nature of industrial flames and their behaviour
in furnace enclosures — the chemical reaction involved, mixing
aerodynamics of jets, flames and combustion systems; prediction of
flame length, shape and radiative properties.

Texts
Beer, J. &
Chigier, N.
Field, M. A. et al.
Aerodynamics of Combustion (Academic
1972)
Combustion of Pulverized Coal (BCURA 1967)

References
Lewis, B. &
Von Elbe, G.
 Thring, M. W.
 Combustion Flames and Explosions in Gases
(Academic 1961)
 Science of Flames and Furnaces (Chapman &
Hall 1962)

510126 ChE514 Furnace Engineering

Prerequisites
Advanced Heat Transfer desirable but not
essential

Hours
Approx. 84 hours for course

Content
The design and operation of furnaces; heat balances, calculation of
losses, insulation, gas recuperation and regeneration; approximate
methods of heat-transfer computation; temperature distribution; re­
fractories; physical construction; control; fuels and firing methods;
economics of fuel selection and waste-heat recovery; effluent pollution
control.

Texts
Thring, M. W.
 Trinck, W. &
 MacWhinney
 Science of Flames and Furnaces
(Chapman & Hall 1962)
Industrial Furnaces (Wiley)

510135 ChE515 Energy Management

Hours
3 hours per week

Content
The cost-price structure of energy supply; factors influencing relative
costs of coal-oil gas-electricity.
Technical possibilities and limitations in change of fuel and energy
sources for existing equipment.
Primary fuel conversion; liquid fuels from coal and gas.
Energy economy in process plant; the thermodynamics of heating
and power generation. Methods of loss assessment and management
of in plant energy use; loss control by furnace insulation, 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 mech­
anical and fluid-flow systems. Efficient and inefficient speed and flow
control systems.
Combined power and process heat systems; the gas turbine in process
plant; reversed cycles; the heat pump for distillation and other process
systems. Energy storage in hot water, as latent heat, in solid storage systems, as chemical energy in cells or in intermediate products.

The international resource situation. Energy resources for the future. (Nuclear, solar direct and vegetable growth, etc.)

Text
Hottel, H. C. & Howard, J. B.  
New Energy Technology (M.I.T. 1971)

References
To be advised

510125 ChE516 Reaction Engineering

Hours
Approx. 84 hours for course

Content
Kinetics of reactions involving mass transfer with chemical reaction and their application to the design of reactors for gas-solid catalytic reactions.

510123 ChE521 Air Pollution Effluent Control

Hours
Approx. 84 hours for course

Content
The general problem; legislative controls; combustion and other processes producing gaseous or gas carried effluents; control methods; practice and fundamental principles of gas washing, settlement filtration, cycloning and electrostatic precipitation. Process modification, by-product recovery, removal of pollutants by reaction, costs and economics.

Text
Strauss,W.  
Industrial Gas Cleaning (Pergamon 1967)

or

Dept of Health Education & Welfare

Air Pollution Engineering Manual  
Publication No. 99 — AP-40

References
Fuchs, N.  
Mechanics of Aerosols (Pergamon 1965)

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

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
The general problem; statutory requirements; practice and fundamental principles. By-product recovery.


Part II: Unit operations in Water and Wastewater Engineering

Content
Theory of treatment processes dealt with as various Unit Operations, together with practical aspects of overall treatment plants and costs of alternatives.

Topic outlines
Introduction—Sources and characteristics of waters to be processed. Unit Operations and Treatment Kinetics.

Aeration and Gas Transfer—Oxygenation or degassing.

Flocculation—Zeta Potential and Coagulation: Precipitation, Neutralization pH Control.

Settling—Sedimentation and Thickening: Settling Tanks—rect. or circular.

Solids removal by filtration—CT machines or Hydrocyclones.

Filter aids.

Introduction to Biological Treatment Methods.

Design of Biological Treatment Systems for Activated Sludge, Trickling Filters, Lagoons, Stabilisation Ponds, to reduce BOD, COD.

Design of Biological Treatment Systems for full nitrification/denitrification tertiary treatment.

Physicochemical Methods for tertiary treatment including Ion exchange and Adsorption processes.

Texts
For Parts I & II

Fair, G. M. et al.  
Water and Waste Water Engineering Vol. 2  
(Wiley 1968)

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

Indicating Numerals
CE-0-
CE-1-
CE-2-
CE-3-
CE-4-
CE-5-
CE-6-
CE-7-
CE-8-
CE-9-

Field of Study
Service Courses
Structures
Materials
Fluid Mechanics
Water Resources
Civil Engineering practice
Surveying—Specialist courses
Surveying and Transportation
Special Topics

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

521104  CE171 Engineering Surveying I†

Prerequisites
Nil

Hours
1¼ lecture hours, ½ tutorial hour, 1 fieldwork hour per week & 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.

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

522107  CE212 Mechanics of Solids

Prerequisites
CE111 and Maths I

Hours
1¼ 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, deflection of beams, torsion, buckling.

Text

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)

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

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

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

522202 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**
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 equations, Euler's equation of motion along a streamline. Bernoulli equation, energy equation. Linear momentum equation. The moment of Momentum equation. Linear and angular momentum applications. Introduction to dimensional analysis. Viscous effects:—fluid resistance, laminar and turbulent flow, flow in pipes and conduits. Fluid measure-
Text

References

522203 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

523333 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

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

Texts

Analysis
B.H.P.—A.I.S.

Design

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

Bresler, B. et al

Design of Steel Structures
Wiley

or

McGuire, W.

Steel Structures
Prentice-Hall

or

Gorenc, B. E. & Tinyou, R.

Steel Designer's Handbook
N.S.W. U.P.

Lay, M. G.

Source Book for the Australian Steel Structures
Code AS1250 (AISC)

Warner, R. F. et al

Reinforced Concrete
Pitman 1976

SAA

Steel Structures Code AS1250 — 1975

SAA

Code for Concrete in Buildings AS1480 — 1973

SAA

Code for Welding in Building AS1554, Pt I
Manual Welding — 1974

SAA

Loading Code AS1170 Pt I Dead and Live
Load—1971 & AS 1170 Pt II Wind
 Loads—1975

References

Analysis

Baker & Heyman, J.

Plastic Design of Frames Vols 1 & 2
Cambridge U.P.

Raz, S. A.

Analytical Methods in Structural Engineering
Wiley 1974

Design

Bennett, E. W.

Structural Concrete Elements
Chapman Hall 1973

Ferguson, P. M.

Reinforced Concrete Fundamentals 3rd edn
Wiley

Gray, C. S.

Steel Designer's Manual
Lockwood

Sachs, P.

Wind Forces in Engineering
Pergamon

Aust. Engineering Drawing Handbook,
Structural Drawing—AS CZ1, Part 2—
1977

AS1100

Metric Drawing Standard

Code for High Strength Bolts — AS1511 —
1973

SAA

Code for Welding in Building AS1554 Pt. II
— 1972 Automatic and Semi-automatic
Welding

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

As for CE313 (Analysis Component)

References

523102 CE324 Soil Mechanics†

Prerequisite

CE212

Pre- or Corequisite

CE332

Hours

2 lecture hours & 1 tutorial hour per week

Examination

One 3-hour paper

Content

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

Text

Claye, C. R.


References

Ambe, T. W.

Soil Testing for Engineers (Wiley)
523001 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
Morris, H. M.
Rouse, H.
Streeter, V.
Valentine, H. R.

523202 GE350 Seminar

Hours
2 seminar hours per week for 21 weeks

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

523107 CE351 Civil Engineering Systems I

Hours
1 lecture hour & ½ tutorial hour per week
524101 CE414 Structural Analysis and Design II
Prerequisites  CE313, Maths IIB
Hours  3½ lecture-hours & 2½ tutorial hours per week
Examination  One 3-hour paper

Content
Matrix displacement method of analysis, stability of frames, dynamic
behaviour of beams and frames, influence lines in indeterminate
structures, non-uniplanar bending and torsion. Advanced reinforced
concrete design — special structures; design of prestressed concrete
structures, plastic design of portal frames. Laboratory tests of pre-
stressed and reinforced concrete beams. Architectural aspects of
structural design.

Text
SAA  Prestressed Concrete Code AS1481 — 1974

References
Bresler, B., Lin, T. Y. & Scalzi, J. B.  Design of Steel Structure 2nd edn (Wiley)
Coates, R. C. et al.  Structural Analysis (Nelson 1972)
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)

524104 CE414B Structural Design II
Prerequisite  CE313
Hours  1½ lecture hours & 1½ tutorial hours per week
Examination  Progressive assessment

Content
Design component of CE414.

Text
SAA  Prestressed Concrete Code AS1481 — 1974

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)

524403 CE425 Earth and Rock Engineering
Prerequisite  CE324
Hours  1 lecture hour & ½ tutorial hour per week
Examination  Progressive assessment

Content
Site investigation, design of spread footings, strip and combined
footings, raft foundations, piled foundations, design of embankments,
hewings, earth and rockfill dams, introductory rock mechanics.

Text

References
Pe, I. K. (ed.)  Soil Mechanics, New Horizons (Butterworths 1974)
524102 CE452 Engineering Construction

Hours 2 lecture hours & 1 tutorial hour per week

Examination One 3-hour paper

Content

Management: Construction company failures and the need for efficient management; principles of management, management functions and techniques; nature and type of organisations structure.

Administration: Costing; estimating; engineering contracts; drawings and specifications; tendering.

Project Planning and Control: Planning; constructing and analysing networks; resource levelling; cost minimization; presentation of information; control.

Construction Plant: Classification, selection and use of plant; plant organization; plant costs, purchase or hire; site establishment and temporary works.

Construction Methods and Equipment: Earthmoving; drilling and blasting; tunnelling; foundation drilling; piling; bridge and building construction.

Texts

Antill, J. M. Civil Engineering Management (Angus & Robertson 1973)

References

Carson, A. B. Foundation Construction (McGraw-Hill)
Peurifoy, R. L. Construction, Planning, Equipment and Methods (McGraw-Hill)

524404 CE453 Project

Prerequisites & Corequisites According to the nature of Topic.

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

Content

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

Electives

In all electives, the subdivision of the course into lectures, tutorials etc; the form of examination and the prescribed and reference texts unless indicated below, will be advised by the lecturer.
524031  CE417 Steel Beams, Columns and Frames
Pre(Co-)prerequisite  CE414
Hours  1 lecture hour & ½ 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(Co-)prerequisite  CE414
Hours  1 lecture hour & ½ tutorial hour per week
Examination  Progressive assessment
Content
The properties and behaviour of brickwork and its components. The design of brickwork structures including recent developments in high rise construction. The properties and behaviour of timber. The design of timber structures.
Text
References
—  Recommended Practice for Engineered Brick Masonry (Structural Clay Products Institute, U.S.A.)
SAA  Brickwork Code AS1640 — 1974
SAA  Timber Engineering Code — AS1720 — 1975

524033  CE419 Engineering Seismology
Prerequisites  Nil
Hours  1½ lecture hours per week
Examination  Progressive assessment
Content
Causes of earthquakes, the theory of plate tectonics; introduction to classical seismology; seismicity, source mechanisms, source parameters, simple source models; wave propagation, propagation of strong ground motion; effects of local geology and topography; design earthquake estimation; statistical characterization of high-frequency ground motion, introduction to random vibration theory; tectonics and seismicity of the South-West Pacific and resulting earthquake engineering problems.
Texts
References  To be advised.

524034  CE426 Advanced Properties of Materials
Prerequisites  CE212, CE221
Hours  1 lecture hour & ½ tutorial hour per week
Examination  One 3-hour paper
Content
Texts
References  To be advised.

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
References  To be advised.

524036  CE428 Soil Mechanics
Prerequisite  CE324
Hours  1 lecture hour & ½ tutorial hour per week
Examination
Progressive assessment

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

Texts
Nil

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

524037 CE429 Foundation Engineering

Prerequisite
CE324

Hours
1 lecture hour & 1 tutorial hour per week

Examination
Progressive assessment.

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

Texts
Nil

References
To be advised.

524038 CE433 Theoretical Hydrodynamics

Prerequisite
CE332

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

Examination
One 3-hour paper

Content

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

References
Leopold, L. B. et al.  *Fluvial Processes in Geomorphology* (Freeman 1964)
Leliavsky, S.  *An Introduction to Fluvial Hydraulics* (Dover 1966)
Wiegel, R. L.  *Oceanographical Engineering* (Prentice-Hall 1964)

524041 CE442 Water Resources Engineering

Prerequisite
CE241
524042 CE443 Water Quality Management

**Prerequisite**
CE241

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

**Examination**
To be advised.

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

**Text**

**Reference**


524043 CE454 Civil Engineering Systems II

**Prerequisite**
CE351

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

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

**Texts**
Nil

**References**


524045 CE473 Engineering Surveying II

**Prerequisite**
CE171

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

**Content**
To be advised.

**Text**
Bruton, M. J. *Introduction to Transportation Planning* (Hutchinson 1970)

524046 CE474 Transportation Planning

**Prerequisite**
CE372

**Hours**
1½ lecture hours per week

**Examination**
One 2-hour paper

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

**Text**
Bruton, M. J. *Introduction to Transportation Planning* (Hutchinson 1970)

524047 CE475 Highway Engineering

**Prerequisite**
CE372

**Hours**
1½ lecture hours per week

**Content**
To be advised.

**Texts**
Nil

524048 CE490 Special Topic

**Prerequisite**
CE372

**Hours**
1½ lecture hours per week

524049 CE491 Special Topic

**Prerequisite**
CE372

**Hours**
1½ lecture hours per week
The following subjects have been approved for inclusion in the M.Eng.Sc. course programme. Those subjects which will not be offered in 1978 are marked '. The other subjects will be offered subject to adequate enrolment.

1 CE515 Elastic Continua 1
1 CE516 Plastic Frame Design 1
CE517 Steel Beams, Columns & Frames 1
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 & Coastal Engineering I 1
CE543 Water Quality Management 1
CE554 Civil Engineering Systems II 1
CE574 Transportation Planning 1
CE617 Prestressed Concrete Design 2
CE626 Theoretical Aspects of Fracture Mechanics 2
CE634 Advanced Fluid Mechanics 1
CE635 River & Coastal Engineering II 1
1 CE636 Water Reticulation & Wastewater Collection 1
CE643 Water Pollution & Water Quality Management 1
CE644 Water & Wastewater Treatment 2
CE645J Microbiology of Water Resources 2
CE646 Public Health Science 1
CE647 Unit Operations in Public Health Engineering 1
CE654 Construction Management 1
CE674 Traffic Engineering 1

520115 CE515 Elastic Continua

Hours 1 lecture hour & ½ tutorial hour per week
Examination One 2-hour paper

Content

References

520116 CE516 Plastic Frame Design

Hours 1 lecture hour & ½ tutorial hour per week
Examination One 2-hour paper

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

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

520117 CE517 Steel Beams, Columns and Frames

Hours 1 lecture hour & ½ 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)

520118 CE519 Engineering Seismology

Hours 1½ hours per week
Examination Progressive assessment

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

Texts To be advised
520131 CE526 Advanced Properties of Materials

Hours 1 lecture hour & ½ tutorial hour per week
Examination One 3-hour paper

Content

Texts Nil
References To be advised

520120 CE527 Concrete Technology

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 Nil
References To be advised

520121 CE528 Soil Mechanics

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

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

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

520122 CE529 Foundation Engineering

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

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

Texts Nil
References To be advised

520123 CE533 Theoretical Hydrodynamics

Hours 1 lecture hour & ½ tutorial hour per week
Examination One 3-hour paper

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

Text Vallentine, H. R. Applied Hydrodynamics (Butterworths)
Reference Milne-Thompson, L. M. Theoretical Hydrodynamics (Macmillan)

520124 CE534 Open Channel Flow

Hours 1 lecture hour & ½ tutorial hour per week
Examination One 3-hour paper

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

Text Henderson, F. M. Open Channel Flow (Collier-Macmillan 1966)
References As for CE 332

520125 CE535 River and Coastal Engineering I

Hours 1 lecture hour & ½ tutorial hour per week
Examination One 3-hour paper
Content

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

References
Ippen, A. T. (ed.)  
*Estuary and Coastline Hydrodynamics* (McGraw-Hill 1966)

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

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

Muir Wood, A. M.  
*Coastal Hydraulics* (Macmillan 1969)

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

520126 CE543 Water Quality Management

Hours  
1 lecture hour & ½ tutorial hour per week

Examination  
One 3-hour paper

Content

Preliminary Reading  
Imhoff, K. et al.  
*Disposal of Sewage and other Waterborne Wastes* 2nd edn (Butterworth 1971)

Text  
Nemerow, N. L.  
*Scientific Water Pollution Analysis* (McGraw-Hill 1974)

Reference  
Knesse, A. V. & Bower, B. T.  

Velz, C. J.  

520133 CE554 Civil Engineering Systems II

Hours  
1 lecture hour & ½ tutorial hour per week

Examination  
One 3-hour paper

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

References
de Neufville, R. & Stafford, J. H.  
*Systems Analysis for Engineers and Managers* (McGraw-Hill 1971)

Stark, R. M. & Nicholls, R. L.  

Wagner, H. M.  

520129 CE574 Transportation Planning

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.

Text  
Bruton, M. J.  
*Introduction to Transportation Planning* (Hutchinson 1970)

520600 CE617 Prestressed Concrete Design

Hours  
2 lecture hours & 1 tutorial hour per week

Examination  
One 3-hour paper

Content
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)

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

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

**Examination**
Progressive assessment

**Content**
Design and analysis of water collection, transmission and distribution systems. Design and analysis of wastewater collection systems.

**Texts**
To be advised

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)
Kneesse, A. & Bower, B. T.  

520605 CE644 Water and Wastewater Treatment

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

Content  

References  
—  
Water Treatment Plant Design (Amer. Water Works Assn 1969)
—  
Fair, G. M. et al.  
Water and Wastewater Engineering Vol. 2 (Wiley 1968)
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

Content  
The theory of treatment processes used in municipal water and wastewater treatment works.

Texts  
To be advised

520609 CE654 Construction Management

Hours  
1½ lecture hours per week
Examination  
Progressive assessment

Content  
The civil engineering construction industry in perspective. Functions of construction management, project evaluation, planning, cost estimating, bidding, construction supervision. Day-labour versus contract organisations. Work study in construction. Labour relations.

Texts  
To be advised

520610 CE674 Traffic Engineering

Hours  
1 lecture hour 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  
Salter, R. J.  
Highway Traffic Analysis and Design (Macmillan 1974)
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, and a detailed report must be 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 1 (Introduction)
Introduction to Electrical Engineering, Model Theory, Units,

Part 2 (Resistive Circuits)
Ohms Law, Kirchhoff's Law, Parallel and Series resistive circuits, Nodal and Mesh Analysis, Thevenin's 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.

532103 EE203 Introduction to Electrical Information*

Prerequisites: Maths I & Physics IA or IB

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

Examination: Progressive assessment & final examination

Content:

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

Fundamental principles of measuring non-electrical quantities by electrical means.

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

References:
Fitzgerald, A. E. et al. Basic Electrical Engineering (McGraw-Hill)
Lockwood, F. B. & Dunstan, R. Electrical Engineering Principles (Heinemann)
McKenzie-Smith, I. et al. Basic Electrical Engineering Science (Longman)

532104 EE204 Introduction to Electrical Energy**

Prerequisite: EE203

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

Examination: Progressive assessment & final examination
Content


Texts
Nil

References
As for EE203

532106 EE211 Energy Conversion**

Prerequisite
EE131

Hours
3 hours of lectures & laboratory work per week

Examination
Progressive assessment & final examination

Content

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)

Reference
Nil

532107 EE221 Semi-conductor Devices*

Prerequisites
EE131 & Physics IA or IB

Hours
3 hours of lectures & laboratory work per week

Examination
Progressive assessment & final examination

Content

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

Reference
Gibbons, J. F. Semi conductor Electronics (McGraw-Hill)

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 Sinusodial 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
Baldwin, C. T., Hayt, W. H. & Kemmerly, J. E. Fundamentals of Electrical Measurements (Harrap)

Reference
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.
The energy system in the steady state: introduction to optimum operational conditions and to load flow techniques.

533106 EE314 Electrical Machines*
Prerequisites EE211
Hours 3 hours of lectures, tutorials & laboratory work per week
Examination Progressive assessment & final examination
Text
O'Kelly, D. & Simmons, S.

Reference
Thaler, G. J. & Wilcox, M. L.

533111 EE315 Power Electronics**
Prerequisites
EE232

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 invertor. AC/DC converters and their application to battery-electric vehicles.

Text
Nil

Reference
Pelly, B. R.

Thyristor Phase Controlled Converters and Cycloconverters (Wiley)

533107 EE323 Linear Electronics*
Prerequisite
EE221

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.

Electronic Circuits (McGraw-Hill)

Millman, J. & Halkias, C. C.

Integrated Electronics (McGraw-Hill)

533108 EE324L Electronics Laboratory**
Prerequisite
EE221, EE323

Hours
3 hours of laboratory work per week

Examination
Progressive assessment

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

Text
As for EE323

References
Kohonen, T.

Digital Circuits and Devices (Prentice-Hall)
Peatman, J. B.  
*The Design of Digital Systems* (McGraw-Hill)

Peatman, J. B.  
*Microprocessor Based Systems* (McGraw-Hill)

533217 EE333 Advanced Circuit Analysis*
Note: People who have passed EE332 Electrical Circuits will not be permitted to enrol in EE333.

**Prerequisite**  
EE232 Electrical Circuits

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

**Examination**  
Progressive assessment & final examination

**Content**
Distributed systems; types of transmission systems; co-axial cables, pairs, strip lines and waveguides. Telegraphers equations: lossy and lossless lines; attenuation and dispersion. Pulse transients on lines, reflections and terminations, A.C. analysis of lines, impedance, standing wave ratio, Smith charts, matching.

Filter approximation; classical filters; constant-k; m-derived; All pass filters. Bandpass, highpass, lowpass transformation. Modern filters; Chebyshev; Butterworth and elliptic filters. Miscellaneous; Notch, twin T, double tuned bandpass filters. R-c active filters; first and second order, bi-quad filters using operational amplifiers.

**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 C, D, E

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

**Examination**  
Progressive assessment & final examination

**Content**

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

**References**
Chen, C. T.  
*Introduction to Linear System Theory* (Holt, Rinehart & Winston)

Desoer, C. A.  
*Notes for a Second Course in Linear Systems* (Van Nostrand Reinhold)

Gupta, S. C. & Hasdorff, L.  
*Fundamentals of Automatic Control* (Wiley)

Melsa, J. L. & Schultz, D. G.  
*Modern Control Engineering* (Prentice-Hall)

Raven, F. H.  
*Automatic Control Engineering* (McGraw-Hill)

533210 EE342 Linear System Theory**

**Prerequisite**  
EE341

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

**Examination**  
Progressive assessment & final examination

**Content**

**Text**
Rosenbrock  
*State-Space and Multivariable Theory* (Nelson 1970)

**References**
As for EE341

533213 EE344 Communications**

**Prerequisites**  
EE331, Maths IIB

**Hours**  
3 hours per week
Examination
Progressive assessment & final examination

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

Text

Reference

533116 EE345 Digital Signal Processing**

Prerequisite
EE341 or ME361

Hours
3 hours of lectures & tutorials per week

Examination
Progressive assessment & final examination

Content

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
Ph 221 & Mathematics IIB

Hours
3 hours of lectures, laboratory & tutorials per week

Examination
To be advised

Content

Text

533219 EE361 Introduction to Logic and Assembly Languages*

Prerequisite
Maths I

Hours
3 hours of lectures & practical work per week

Examination
Progressive assessment & final examination

Content
Number Systems: Representation and Arithmetic
Boolean Algebra: Combinational logic, Karnaugh Maps, flip flops, sequential logic, counters.
Hardware components, processor structure, addressing modes. Assembly Language. Instruction sets, pseudo ops, Machine Language programming, Subroutines, Co-routines, use of stacks, interrupts, macros, recursion, re-entry, linkers and loaders.

Texts
Friedman, A. D.  

**Logical Design of Digital Systems** (Computer Science Press)

Stone, H. S.

**Introduction to Computer Organization and Data Structures** (McGraw-Hill)

533212 EE362 Switching Theory and Logical Design**

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

**References**

Hill, F. J. & Peterson, G. R.  
**Introduction to Switching Theory and Logical Design** (Wiley)

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

Mano, M. M. & Prather, R. E.  
**Computer Logic Design** (Prentice-Hall)

**Introduction to Switching Theory: A Mathematical Approach** (Allyn & Bacon)

533208 EE380 Project/Directed Reading

**Prerequisite**  
Consent of Head of Dept

**Hours**  
By arrangement

**Examination**  
To be advised

**Content**  
Private work of laboratory, literature search or theoretical nature requiring the preparation of a report. Taken under the direction of a supervisor with whom the topic should be negotiated.

534107 EE415 Power Systems**

**Prerequisites**  
EE313

**References**

O'Kelly, D. & Simmons, S.  
**Introduction to Generalized Machine Analysis** (McGraw-Hill)

Say, M. G.  
**Design of Alternating Current Machines**  
3rd edn (Pitmans)

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

534144 EE416 Advanced Electrical Machine Theory**

**Prerequisite**  
EE314

**Hours**  
3 hours of lectures per week

**Examination**  
Progressive assessment & final examination

**Content**  

Single phase commutator motors. Linear induction machines. More advanced techniques used in winding design.

The imbricated pole generator, the self cascadled alternator, and the homopolar machine.

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

**References**

Say, M. G.  
**Design of Alternating Current Machines**  
3rd edn (Pitmans)

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

**References**
Grebene, A. B.  *Analogue Integrated Circuit Design* (Van Nostrand)
Hamilton, D. & Howard, W.  *Basic Integrated Circuit Engineering* (McGraw-Hill)

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534110 EE422 Electronic Design B**

**Note**
People who have passed EE423L Electronics Laboratory and EE425 Digital Electronics will not be permitted to enrol in EE422.

**Prerequisite**
EE323

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

**Examination**
Progressive assessment & final examination

**Content**

**Text**
Nil

**Reference**
As for EE421
RCA  *Solid State Power Circuits* (1971)

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534132 EE443 Optimization Techniques*

**Prerequisites**
Maths II Topics C, D, E.

**Hours**
3 hours per week

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

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

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

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534141 EE446 Linear Optimal Control**

**Prerequisite**
EE342

**Hours**
3 hours of lectures & tutorials per week

**Examination**
Progressive assessment & final examination

**Content**

**Text**
Rosenbrock  *State-space and Multivariable Theory* (Nelson 1970)

**References**

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534134 EE447 Digital Communications*

**Prerequisite**
Consent of Instructor
**534102 EE480 Project/Directed Reading**

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

**534101 EE491 Seminar**

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

The following subjects have been approved for inclusion in the M.Eng.Sc. course programme. Those subjects which will not be offered in 1978 are marked †. The other subjects will be offered subject to adequate enrolment.

**All subjects are 1 unit (42 hours) unless otherwise noted.**

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<td>EE592</td>
<td>Seminar ***</td>
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</tbody>
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**References**

- Donovan, J. J. *Systems Programming* (McGraw-Hill)

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**References**

- Shaw, A. C. *The Logical Design of Operating Systems* (Prentice-Hall)
- Hansen, P. B. & Madnick, S. E. *Operating Systems Principles* (Prentice Hall)
- Shaw, A. C. *The Logical Design of Operating Systems* (Prentice-Hall)
- Hansen, P. B. *Operating Systems Principles* (Prentice Hall)

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- Shaw, A. C. *The Logical Design of Operating Systems* (Prentice-Hall)
- Hansen, P. B. *Operating Systems Principles* (Prentice Hall)
530110 EE580 Thesis/Project

Content
Multiples of 1 unit. Topics to be arranged.

530111 EE590 Seminar**
530137 EE591 Seminar**
530138 EE592 Seminar**
530139 EE593 Seminar**

530120 EE543 Optimization Techniques**

Prerequisites
Maths II Topics C, D, E.

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

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

Reference
Aoki, M. Introduction to Optimization Techniques (Macmillan)

Luenberger, D. G. Optimization via Vector Space Methods (Wiley 1969)

530123 EE545 Communication Systems * (not offered in 1978)
530128 EE546 Modern Control (Linear Optimal Control Theory)
See EE446

530129 EE547 Digital Communication** See EE447
530130 EE552 Advanced Topics in Communications Systems**
(not offered in 1978)
530117 EE563 Computer Operating Systems* See EE463
530132 EE562 Advanced Switching Theory and Logic Design *
(Not offered in 1977)
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*
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

504102 GE472 Energy

**Prerequisites**

Physics IA or IB, Maths IIB

**Hours**

3 hours per week for 2nd year

**Examinations**

Progressive assessment

**Content**

Energy conversion technology:—

Conversion efficiencies and technical and economic constraints.

Current technology—steam plants, combustion engines and turbines, nuclear reactors, hydro-electric plants etc.

Possible future technology—solar power, m.h.d., fusion, fuel cells, the hydrogen economy, total energy etc.

Energy management:—

Planning of systems, increase in efficiency of usage, choice of energy sources and energy conservation.

**Texts**

To be advised

500100 GE501G Air Pollution Studies I

**Hours**

42

**Mechanical Engineering**

**Indicating Numerals**

ME-0-
ME-1-
ME-2-
ME-3-
ME-4-
ME-5-
ME-6-
ME-7-
ME-8-
ME-9-

General courses
Analysis and Design
Mechanical Engineering Practice
Machines
Materials
Fluid Mechanics
Automatic Control
Thermodynamics
Industrial Engineering
Project & Seminar

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

541307 ME097 Industrial Experience Units
541308 ME098 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 ME092-096 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).

541101 ME111 Graphics

**Prerequisites**

Nil

**Hours**

42

**Examination**

One 2 hour paper & one 3½ hour paper

**Content**

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

**Text**

To be advised

**References**

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

541102 ME112 Engineering Drawing and Elementary Design

**Prerequisites**

Nil
**Hours**

42

**Examination**

One 3 hour paper

**Content**

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

**Text**

*Australian Standard Engineering Drawing Practice* CZI 1976 (Inst. of Engineers, Aust.)

**References**

Levens, A. S. *Graphics* (Wiley)

Luzadder, W. J. *Basic Graphics* (Prentice-Hall)

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**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**

*Trade Technology Notes*

**References**

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


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

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**54122 ME122 Process Technology**

**Prerequisite**

Nil

**Hours**

42

**Examination**

Progressive assessment

**Content**


**Text**

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


**References**

Campbell, J. S. *Processes and Materials in Manufacturing* (McGraw-Hill)

Datsko, I. *Materials, Properties and Manufacturing Processes* (Wiley)

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**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**


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**542201 ME201 Laboratory Measurements**

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

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

542302 ME212 Engineering Design*

Prerequisites
ME121, ME111/2, ME214 or CE212

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

References
Faires, V. M. Design of Machine Elements (Macmillan)
Kent, W. Mechanical Engineers’ Handbook Design and Production (Wiley)
Phelan, R. M. Fundamentals of Mechanical Design (McGraw-Hill)
Shigley, J. E. Mechanical Engineering Design (McGraw-Hill)
— Machine Cut Gears Helical and Straight Spur A.S.B. 61 — 1941

542303 ME213 Engineering Design**

Prerequisite
ME212

Hours
42

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

Text
Stephenson, J. & Callander, R. A. Engineering Design (Wiley)

References
Faires, V. M. Design of Machine Elements (Macmillan)
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)

5421056 ME214 Mechanics of Solids*
Prerequisites Maths I, ME111/112, ME131, CE111
Hours 42
Examination Progressive assessment and examination

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

Text

References
Popov, E. P. Introduction to Mechanics of Solids (Prentice-Hall 1968)

542304 ME223 Mechanical Technology**
Prerequisite ME121
Hours 42
Examination Progressive assessment

Content

Texts
Campbell, J. S. Processes and Materials in Manufacturing (Wiley)
DeGarmo, E. P. Materials Processes in Manufacturing (Macmillan)
Reference Doyle, L. E. et al. Manufacturing Processes and Materials for Engineers (Prentice-Hall)

542301 ME232 Dynamics of Machines**
Prerequisites Maths I, ME131, ME111/2, CE111
Hours 42
Examination One 3-hour paper

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

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

References
Hirschhorn, J. Kinematics and Dynamics of Plane Mechanisms (McGraw-Hill)
Hirschhorn, J. Dynamics of Machinery (Nelson)
Holowenko, A. R. C. Kinematics and Dynamics of Plane Mechanisms (Wiley)
**542102 ME241 Properties of Materials**

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

**Hours**
42

**Examination**
To be advised

**Content**

**Text**
Nil

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

**542202 ME251 Fluid Mechanics**

**Prerequisites**
Maths I, ME131

**Hours**
42

**Examination**
Progressive assessment and examination

**Content**

**Text**

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

**542203 ME271 Thermodynamics**

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

**Hours**
42

**Examination**
Progressive assessment

**Content**
Fundamental thermodynamic concepts, first and second laws and corollaries. Reversible and irreversible processes. Properties of perfect gases, liquids and vapours. Calculation of property changes and energy flows for non-flow, steady flow and unsteady flow processes using various working substances. Examination of various energy conversion systems as examples of the above calculations — Carnot cycle, Rankine cycle, reheat cycle, regenerative feed heating, Otto cycle, Diesel and mixed cycles, Stirling and Ericsson cycles, gas turbine cycles, refrigeration cycles. Introduction to combustion processes.

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

**References**
Cole, E. H. *Engineering Thermodynamics* (Edward Arnold 1973)

**543101 ME301 Engineering Computations**

**Prerequisite**
Maths I

**Hours**
42

**Examination**
Progressive assessment

**Content**
Numerical solution of ordinary differential equations, initial value, boundary value and characteristics value problems. Solution of partial differential equations by finite difference methods.

Introduction to linear programming, with engineering applications.

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

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

543302 ME313 Engineering Design*

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

**Hours**  42

**Examination**  Progressive assessment and examination

**Content**
The design of power unit cylinders, reciprocating power elements, cylinder closures, dynamic struts and dynamic levers using work or indicator diagrams as developed from thermodynamics, fluid mechanics or machine tool theory as the basis of horsepower, load and stress calculation. Effects of inertia, dead weight and centrifugal force on piston loads. Inertia bending of struts and bending induced by bearing friction. Stress summation and factor of safety criteria. Special reference to reciprocating engine, compressor and power press units. Manufacturing techniques and material compatibility. Introduction to optimisation techniques and formalised decision making in design.

Text

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

543301 ME333 Dynamics of Machines**

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

**Hours**  42

**Examination**  Progressive assessment and examination

**Content**
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)
Church, A. H.  *Mechanical Vibrations* (Wiley)
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)

543302 ME342 Properties of Materials*

**Prerequisite**  ME241

**Hours**  42

**Examination**  Progressive assessment and examination

**Content**
Elasticity of a network of long chain molecules — general stress — strain relations for rubber-like materials — Mooney's theory for large deformations — Rivlin — Sanders and Carmichael — Holderway applications to natural rubbers.
Basic course in fracture mechanics — temperature approach and the stress analysis approach — stress intensity factor; thickness, temperature and fatigue effects — fracture toughness. Applications to design — testing methods — C.O.D. (crack opening displacement) testing — relation of various tests to fracture toughness.

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

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

543103 ME343 Mechanics of Solids**
Prerequisites
CE212 or ME214

Examination
Progressive assessment and examination

Content

Texts
An Introduction to the Mechanics of Solids
(McGraw-Hill)
Mechanics of Metals (Addison-Wesley)
Stress, Strain and Strength (McGraw-Hill)
Mechanics of Solids and Fluids (Prentice-Hall)
Mechanical Behaviour of Materials (Addison-Wesley)
Mechanics of Materials (McGraw-Hill)
Advanced Mechanics of Materials (Wiley)

543201 ME352 Fluid Mechanics**
Prerequisite
ME251

Examination
Progressive assessment and examination

Content
Basic equations for interactions between fluids and moving vanes. Applications to radial flow pumps and fans, and the development of similarity relationships and descriptions of performance. Similar applications to axial flow pumps and fans, turbo-compressors, water turbines, steam turbines, and gas turbines. Study of cavitation as it affects machines handling liquids.

Texts
E. Cscancady, Theory of Turbomachines (McGraw-Hill)
Kovats, A. & Desmur, G., Pumps, Fans and Compressors (Blackie)

543204 ME361 Automatic Control*
Prerequisite
Maths IIB

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
42

Hours

Progressive assessment and examination

Content


Text


References

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

543505 ME373 Thermodynamics**

Prerequisite

ME271

Hours

42

Examination

Progressive assessment

Content

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

Text

Wood, B. D. Applications of Thermodynamics (Addison-Wesley 1969)
543503 ME384 Design for Production**

Prerequisites ME213, ME223, ME122

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
Gladman, C. A. Geometric Analysis of Engineering Designs (Australian Trade Publications 1972)
Kempster, M. H. A. Principles of Jig and Tool Design (English U.P.)
McCormick, E. J. Human Factors Engineering (McGraw-Hill 1964)

416105 ME385 Accounting and Financial Studies

Content
For subject entry see page 210.

544451 ME401 Systems Analysis*

Prerequisites Maths IIB, ME361

Hours 42

Examination Progressive assessment and examination

Content
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

544452 ME402 Systems Planning, Organization and Control**

Prerequisites Maths IIB, ME361

Hours 42

Examination Progressive assessment and examination

Content

Texts Nil

References
Ackoff, R. L. A Concept of Corporate Planning (Wiley 1970)
Battersby, A. Network Analysis for Planning Scheduling (MacMillan 1970)
Citron, S. J. Elements of Optimal Control (Holt Rinehart & Winston 1969)
544407 ME417 Design of Worm and Special Purpose Gear Reduction Units (not offered in 1978)

544409 ME419 Design of Conveyors and Materials Handling Equipment

Prerequisites ME313, ME232

Content

Text
Nil

References
Brook, N. Mechanics of Bulk Materials Handling (Butterworths 1971)
Hawk, M. C. Bulk Materials Handling (Uni. of Pittsburgh, School of Engineering Vols. I (3) 1971 & II (8) 1973)
Jenike, A. W. Storage and Flow of Solids (Bul. 123, Utah Engineering Experiment Station 1964)
Hudson, E. G. Conveyors (John Wiley—Chapman & Hall)
Rudenko, N. Materials Handling Equipment (Peace Publishers, Moscow)
Spivakovsky & Dyackkov Conveyors and Related Equipment (Peace Publishers, Moscow)
Stocker, H. E. Materials Handling (Prentice-Hall)

544417 ME434 Advanced Kinematics and Dynamics of Machines (not offered in 1978)

544401 ME444 Properties of Materials (not offered in 1978)

544402 ME445 Mechanics of Solids (not offered in 1978)

544416 ME448 An Introduction to Photomechanics (not offered in 1978)

544418 ME449 Reliability Analysis for Mechanical Systems (not offered in 1978)
544411 ME453 Fluid Mechanics (not offered in 1978)
544461 ME454 Turbomachinery (not offered in 1978)
544412 ME473 Thermodynamics (not offered in 1978)
544413 ME474 Heat Transfer (not offered in 1978)
544423 ME476 Development in the Use of Solar Energy (not offered 1978)

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

5444102 ME482 Engineering Economics
Prerequisite Maths I
Hours 42
Examination To be advised
Content
The time value of money, economic criteria for decision making, purchase and replacement economics, cost benefit analysis, evaluation of accounting data for decision making.
Introduction to demand, supply, price and the policy of the firm in various operating environments.
Decision making under risk and uncertainty.
Texts
Fabrycky, W. J. & Thuesen, G. J. *Economic Decision Analysis* (Prentice-Hall 1974) or

References

544463 ME483 Production Engineering (not offered in 1978)

544441 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
References

544482 ME488 Operations Research — Probabilistic Models**
Prerequisite Maths IIB
Hours 42
Examination Progressive assessment
Content
Statistical decision theory; Forecasting, methods moving average exponentially smoothed average. Inventory control theory. Fixed order quantity; fixed order cycle systems; Production—inventory systems. Queueing theory; simple queue Multi-server queues. Queues in series. Transients in queues; simulation of systems. Applications.

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

References
Brown, R. G.  
*Smoothing, Forecasting and Prediction of Time Series* (Prentice-Hall)

Dychman, T. R. et al.  
*Management Decision Making under Uncertainty* (Macmillan)

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

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

544843 ME489 Operations Research — Applications in Industry

Prerequisite  
Maths IIB

Hours  
42

Examination  
To be advised

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

Texts  
Nil

References
Dooley, A. R. et al.  
*Casebooks in Production Management* (Wiley 1968)

Duckworth, E.  
*A Guide to Operation Research* (Methuen 1965)

Eilon, S. et al.  
*Exercises in Industrial Management* (Macmillan 1966)

McKenny, J. L. & Rosenbloom, R. S.  
*Cases in Operations Management*

Rivett, B.H.P., & Ackoff, R. L.  
*A Manager's Guide to Operational Research* (Wiley 1963)

Schnelle, K. E.  
*Case Analysis and Business Problem Solving* (McGraw-Hill 1967)

544203 ME496 Project/Seminar

Hours  
126

Examination  
Progressive assessment

The following subjects have been approved for inclusion in M.Eng.Sc. programmes. The offering of any subject is dependent on adequate enrolments in that subject. Subjects marked † are unlikely to be offered in 1978.

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540115 ME502G Operations Research and Decision Theory (Refer also ME487/488)

Hours  
3 hours of lectures, seminars & tutorials per week

Examination  
Progressive assessment and examination

Content

Texts  
As for ME487 & ME488

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

Wagner, H. M.  
*Principles of Operations Research* (Prentice-Hall)
540101 ME503G Design of Experiments for Engineering Research

Prerequisites Nil

Hours 3 hours of lectures, seminars & tutorials per week

Examination Progressive assessment

Content
A systematic approach to the analysis and design of experiments and the interpretation of experimental results. The course has been divided into three approximately equal parts as follows:—
(1) Statistical methods for the design and evaluation of experiments.
(2) Model analysis, use of true and distorted models as well as analogues. Use of dimensional analysis.
(3) Methods of measurement, mechanical, optical, electrical and electronic instrumentation. Recording techniques and data processing. Use of computers. Planning of computer and laboratory operations.

Texts
Nil

References
Bright-Wilson, Introduction to Scientific Research (McGraw-Hill)
Cook & Rabinowicz, Physical Measurements and Analysis (Addison-Wesley)
Ezekiel & Fox, Methods of Correlation Analysis and Regression Analysis (Wiley)
Korn & Korn, Mathematics Handbook for Scientists and Engineers (McGraw-Hill)
—, Experimental Statistics Handbook 91 (U.S. Nat. Bur. of Standards)

540107 ME511G Experimental and Theoretical Stress Analysis

Prerequisites Nil

Hours 3 hours of lectures & tutorials per week

Examination Progressive assessment

Content
An introduction to the experimental and theoretical analysis of complex components with emphasis on the use of computer techniques. Theoretical and experimental applications of the use of strain gauge,
photoelastic and modelling methods will be covered. Certain aspects of simulation techniques will also be given.

**540107 ME515G Advanced Design Concepts in Mechanical Engineering**

**Hours** 3 hours per week

**Examination** Progressive assessment

**Content**
The application of system analysis principles to the solution of problems associated with the design of mechanisms. Formalising of the design process. Fundamental concepts of reliability. Reliability analysis. Methods of improving the reliability of Systems. Computer programming for mechanical design applications. The optimum design of typical mechanical components.

**Texts**
Nil

**References**

- Dalley, J. W. & Riley, W. F.
- Durelli, A. J. et al.
- Durelli, A. J. & Riley, W. F.
- McMillan, C.
- Southwell, R. V.
- Zienkiewicz, O. C.

540113 ME517G Materials Handling and Transportation Systems

**Hours** 3 hours per week

**Examination** Progressive assessment

**Content**
Principles of granular mechanics and flow patterns and properties. Measurement of strength and flow properties in relation to hopper design. Stress analysis of bulk solids. Design of hoppers, feeding and handling equipment. Analysis and optimization of materials handling and transportation systems. Examination of the technical characteristics and unit cost data for various types of transport systems. Examples considered will be selected from various types of conveyor systems, pipeline systems (pneumatic and hydraulic) road and rail systems and sea transport systems such as Lash, Splash, Ro Ro, Container etc. Other studies may include stockpiling, packaging and cargo systems.

**Texts**
Nil

**References**

- Brown, R. L. & Richards, J. C.
- Hawk, M. C.
- Jenike, A. W.

540102 ME535G Vibration and Noise Problems in Industry

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

**Examination** Progressive assessment

**Content**
A systematic study of both noise and vibration problems which are of common occurrence in industrial plants and structures. It is divided into:


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

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

540108 ME536G Advanced Dynamics of Machines

**Hours**
1½ hours of lectures per week

**Examination**
Progressive assessment

**Content**
Dynamic motion analysis: the energy distribution method, equivalent mass-and-force method, the rate-of-change-of-energy method. Advanced kinematics of the Plane Motion: the inflection circle, Euler-Savary equation, Bobilliers construction, Hartmann's construction. Introduction to synthesis; graphical methods, analytical methods.

**Text**
Hirschhorn, J.

**References**
Hall, A. S.
Holowenko, A. R.

540109 ME546G Elasticity, Plasticity and Applications

**Hours**
3 hours of lectures & tutorials per week

**Examination**
Progressive assessment

**Content**
Development of theories of elasticity and plasticity; application of these theories to elastic, elasto-plastic and plastic problems: use of approximate methods of solution; application of slip-line field solutions to certain plasticity problems; use of experimental methods.

**References**
Csanady, G. T.

540114 ME554G Fluid Mechanics

**Hours**
1½ hours of lectures per week

**Examination**
To be advised

**Content**
A selection of the following topics.
Two phase flow particularly related to transport of solids in pipelines; Fractional analysis and its application; Pump and compressor design; Application of hydrodynamics; Computer applications in fluid mechanics.

**Text**
Nil

**References**
Kovats, A.
Streeter, V. L.
Vallentine, H. R.

540118 ME575G Heat Transfer

**Hours**
1½ hours of lectures & laboratory per week

**Examination**
Progressive assessment

**References**
Csanady, G. T.
Content
A selection of the following topics.
Heat transfer in laminar and turbulent flow; Heat transfer with boiling; Condensation heat transfer; Heat exchangers; Radiant heat transfer and furnace applications; Applications of dimensional analysis; Applications of computer techniques in heat and mass transfer.

Reference
To be advised

540119 ME581G Mathematical Programming

Hours
3 hours of lectures & tutorials per week

Examination
To be advised

Content
A survey of methods for the solution of statics, deterministic optimisation problems.
Linear programming; the simplex algorithm and its revised form duality theory; sensitivity analysis; decomposition algorithms transportation and assignment problems.
Linear programming in integers; cutting plane algorithms branch-and-bound methods; implicit enumeration; algorithms for binary integer programmes.
Network, scheduling and other combinatorial problems.
Introduction to the theory of convex nonlinear programmes; the Kuhn-Tucker theorem applications to quadratic programming and geometric programming.
Dynamic programming methods.

Texts
Geoffrion, A. M. (ed.) Perspectives on Optimisation (Addison-Wesley 1972)
Nemhauser, G. L. Introduction to Dynamic Programming (Wiley 1966)

References
Hadley, G. Linear Programming World Student Series Addison-Wesley 1969)
Künzi, H. P. et al. Nonlinear Programming (Blaisdell 1966)
Luenberger, D. G. Introduction to Linear and Nonlinear Programming (Addison-Wesley 1973)
Taha, H. A. Operations Research (Macmillan 1971)

540120 ME582G Probabilistic Models in Operations Research

Hours
3 hours of lectures, tutorials & seminars per week

Examination
Progressive assessment

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

Texts
Nil

References
Taha, H. A. Operations Research (Macmillan)
Wagner, H. M. Principles of Operations Research (Prentice-Hall)

540121 ME583G Modelling of Management Problems

Hours
1½ lecture hours per week

Examination
Progressive assessment

Content
Principles of model building; classification of models; cause-effect structures; organizational objectives; problem formulation; management problems in industry and government; models for marketing, manpower, production, inventory, distribution, and investment; case studies of management problems.

Reference
Rivett, B. H. P. Principles of Model Building (Wiley)

540122 ME584G Simulation

Hours
1½ lecture hours per week

Examination
Progressive assessment

Content
The basic methodology of simulation and its relationship to operations research and the scientific method; analogue, digital and hybrid simulation; the representation of uncertainty in simulation models, sampling methods; simple example of simulation of a queue to illustrate the problems and methods involved in the construction of different models to answer different questions;
the general discrete event network and its limitations;
general solutions to the modelling of such networks;
the classical 3 phase model;
programming languages for simulation;
design of simulation experiments;
simulation project.

**Texts**

**References**


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

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**433260 ME681G Industrial Law**

For subject description see Faculty handbook Economics & Commerce

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**540123 ME685G Advanced Operations Research**

**Prerequisite**

ME502G or ME487/488

**Hours**

3 hours of lectures, tutorials & seminars per week

**Examination**

Progressive assessment

**Content**

The application of the Operational Research Method and techniques to tactical and strategic industrial problems. Analysis and simulation of production — inventory control systems, queueing systems, investment and replacement, quality control and reliability.

**Reference**

Wagner, H. M. *Principles of Operations Research* (Prentice-Hall)

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**540152 ME582D Industrial Computations**

**Prerequisites**

Nil

**Hours**

42

**Examination**

Progressive assessment and examination

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**433240 ME681D Industrial Law**

For subject entry see Faculty handbook Economics & Commerce

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**540173 ME684D Project**

**Hours**

84

**Examination**

Progressive assessment

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**540174 ME685D Industrial Process Control**

**540175 ME686D Industrial Psychology**

(not offered in 1978)

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**Metallurgy**

**Indicating Numerals**

Met-0- General
Met-1- Computations
Met-2- Physical Chemistry
Met-3- Transport
Met-4- Mechanical
Met-5- Physical Metallurgy & Metallography
Met-6- Extraction
Met-7- Fabrication & Materials
Met-8- Structure & Metal Physics
Met-9- Laboratory

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**111122 Met121 Chemical Metallurgy**

**Prerequisite**

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

Examination
One 1½ hour paper

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

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

Reference
Guy, A. G. *Introduction to Materials Science*

111141 Met141 Mechanical Properties of Materials 1 unit

Prerequisites
Nil

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

Examination
One 1½ hour paper

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

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

Fracture. Types of fracture under static loading, ductile, brittle. Creep dynamic loading fatigue. Ductile-Brittle transition in mild steel, the effects of variables, Mn/C ratio. Creep Test, shape of curve, microstructural aspects, creep rupture, Fatigue Test, S-N curve, effect of variables.

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. Modifi- cation of eutectics, normalizing and annealing. Non-equilibrium microstructures, quenching, martensite and bainite, TTT diagrams, age hardening and tempering.

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

References
Rhines, F. N. *Phase Diagrams in Metallurgy* (McGraw-Hill)
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

Text

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 1½ hour paper

Content

Text

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 1½ hour paper

Content

Text
As for ME582D

References
To be advised

112221 Met221 Metallurgical Thermodynamics 1 unit
Prerequisite Met121
Corequisite Met261
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1½ hour paper

Content

**Text**
Oates, W. A.

**Reference**
Gaskell, D.

112231 Met231 Rate Processes

**Prerequisite**
Met121

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

**Examination**
One 1½ hour paper

**Content**

**Text**
To be advised

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

112241 Met241 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 cleavage, 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 Met251 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)
Cottrell, A. H. *Theoretical Structural Metallurgy* (Arnold)
Kehl, G. H. *Quantitative Microscopy* (McGraw-Hill)
Samuels, L. H. *Metallographic Laboratory Practice* (McGraw-Hill)

112261 Met261 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.

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

112271 Met271 Fabrication Metallurgy
1 unit

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.

References
Flinn, R. A.
Rowe, G. W.

113301 Met301 Communication Skills
¼ unit

Prerequisites
Nil

Hours
About 21 lecture hours & a student seminar

Examination
Progressive assessment

Content
Preparation of written and oral reports.

Text
Pauley, S.

Technical Report Writing Today (Houghton Mifflin)

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
Ray, W. H. & Szekely, J.
Process Optimisation with application in Metallurgy and Chemical Engineering (Wiley)

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.
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.
Levin, E. M. & Hall, F. D.

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

Content

References
Denaro, A. R.
Fontana, M. G. & Greene, N. D.
Potter, E. C.
Uhlig, H. H.
West, J. M.

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

Text
To be advised

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
To be advised

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

Texts

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

113352 Met352 Physical Metallurgy

**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.

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Texts
- Smallman, R. E. 
- Ashbee, K. H. G. *Elements of X-ray Diffraction* (Addison Wesley)

References
- Brandon, D. G. *Modern Techniques in Metallography* (Butterworths)
- Thomas, G. *Transmission Electron Microscopy of Metals* (Wiley)

113353 Met353 Solidification Processes

**Prerequisites**
Met151, Met181

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

**Examination**
One 1½ hour paper

**Content**

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)

113354 Met354 X-ray and Electron Metallography

**Prerequisites**
Met241, Met252

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

**Examination**
One 1½ hour paper
Content

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

References
Hirsch, P. et al. Electron microscopy of thin crystals (Butterworths)
Thomas, G. & Washburn, J. eds.) Electron microscopy and the strength of crystals (Interscience)

113365 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.)
Pehlke, R. D. (ed.) B.O.F. Steelmaking (A.I.M.E.)

113362 Met362 Hydro- and Electro- Extraction Metallurgy 1 unit
Prerequisite Met261
Hours About 21 lecture hours & 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 Nil

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

References
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 Nil
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 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)

References
Chesters, J. H. Refractories: Production and Properties
Grimshaw, R. W. Refractories in Iron & Steelmaking (Iron & Steel Inst.)
The Chemistry and Physics of Clays (Benn)

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. The course will be completed by considering such topics as: Stability of metallic phases, electrical properties of materials. Magnetism. Magnetic properties of materials. Semiconductors.
Text To be advised
References
Altmann, S. L.  Bland theory of metals (Pergamon)
Elliott, R. J. &  An introduction to Solid State Physics and its
Gibson, A. E.  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  
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.
Texts  
References  To be advised

114405  Met401 Directed Reading  2 units
Prerequisites  Nil
Hours  About 42 hours
Examination  By written report and seminar
Content
Topics to be arranged.
Texts  
References  Nil

114406  Met402 Metallurgy Seminar  1 unit
Prerequisites  Nil

114434  Met411 Metallurgy Computations  1 unit
Prerequisites  Nil
Hours  About 42 hours
Examination  By written report and seminar
Content
Topics to be arranged.
Texts  
References  Nil

114435  Met421 Heterogeneous Equilibria  1 unit
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 sytems. Application to alloy
steels, aluminium alloys, tungsten carbide and refractories. Gas/
condensed phase equilibria in multicomponent systems. Applications
to extraction metallurgy.
References
Levin, E.M. &  Phase Diagrams for Ceramists (Amer.
Hall, F. D.  Ceramic Soc. 1956-69 3 Vols)
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  1 unit
Prerequisite  Met331
Texts
To be advised

114432 Met432 Fluid Mechanics

Prerequisite
Met332

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
To be advised

References
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
The solidifying interface with various morphologies. The impinging jet geometry in gas-liquid metal contacting in pyrometallurgy. Melting packed beds.

Text
To be advised

References
To be advised

114451 Met451 Electron Metallurgy

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
Hawkes, P. W.
Electron optics and electron microscopy (Taylor & Francis)

Heidenreich, R. D.
Fundamentals of transmission electron microscopy (Wiley)

114452 Met452 Physical Metallurgy

Prerequisites
Met351, Met352, Met353

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

Examination
One 1½ hour paper

Content
Topics on the relation between mechanical properties and microstructure. Strengthening mechanisms. Internal friction in metals.

Text
To be advised
References
Cahn, R. W.  
Kelly, A.  
Kelly, A. & Nicholson, K. B.  
Nowick, A. S. & Berry, B. S.

Physical Metallurgy (Elsevier)
Strong Solids (Oxford U.P.)
Strengthening Mechanisms in Crystals (Elsevier)
Anelastic Relaxation in Crystalline Solids (Academic)

114453 Met453 Metallography 1 unit
Prerequisites Met351, Met352, Met353
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1½ hour paper
Content Metallography of phase transformations in metals. Recrystallization, grain boundaries and interfaces.
Text To be advised
References Christian, J. W.  
A.S.M.
The Theory of Phase Transformations in Metals and Alloys (Pergamon)
Phase Transformations (Manchester Conference “The Mechanism of Phase Transformations in Crystalline Solids”)

114453 Met453 Metallography 1 unit
Prerequisites Met351, Met352, Met353
Hours About 21 lecture hours & 21 hours of tutorial, demonstration & practical classes
Examination One 1½ hour paper
Content Metallography of phase transformations in metals. Recrystallization, grain boundaries and interfaces.
Text To be advised
References Christian, J. W.  
A.S.M.
The Theory of Phase Transformations in Metals and Alloys (Pergamon)
Phase Transformations (Manchester Conference “The Mechanism of Phase Transformations in Crystalline Solids”)

114461 Met461 Extraction Metallurgy 1 unit
Prerequisites Met361, Met362
Hours About 21 lecture hours & 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.
Text To be advised
References

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.
Text To be advised
References
A.S.M. Metals Handbook Vol. 1, 8th edn
Kennedy, G. A. Welding Technology (Sams)

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.
Text To be advised
References
A.S.M. Metals Handbook Vol. 6, 8th edn
Kennedy, G. A. Welding Technology (Sams)
114481 Met481 Dislocation Theory 1 unit

Prerequisites Met352, Met241

Hours About 21 lecture hours & 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.

Texts To be advised

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

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.

Texts To be advised

References 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.

111102-111106 Met092-6 Industrial Experience 1 unit each

Prerequisites Nil

Examination By arrangement

Content These subject units are designed to formalise the period of Industrial Experience which may be studied in lieu of elective units by part-time students. Each of the Industrial Experience units is equivalent to one elective unit of 42 hours. Students who wish to study the Industrial Experience units Met092-096 will normally 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. 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 industrial experience.

The following subjects have been approved for inclusion in M.Eng.Sc. programmes. The offering of any subject is dependent on adequate enrolments in that subject.

| Units | Met521 Metallurgical Thermodynamics 1
| 115521 | Met 521 Metallurgical Thermodynamics |
| 115531 | Met 531 Heat Transfer |
| 115532 | Met 532 Fluid Mechanics |
| 115533 | Met 533 Metallurgical Rate Processes |
| 115541 | Met 541 Fracture Mechanics |
| 115551 | Met 551 Electron Metallurgy |
| 115552 | Met 552 Physical Metallurgy |
| 115553 | Met 553 Metallography |
| 115561 | Met 561 Extraction Metallurgy |
| 115562 | Met 562 Reactor Analysis |
| 115571 | Met 571 Materials Selection |
| 115572 | Met 572 Welding & Non-Destructive Testing |
| 115581 | Met 581 Dislocation Theory |
| 115582 | Met 582 Metal Physics |

115521 Met521 Metallurgical Thermodynamics

Prerequisite Met321

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

Examination To be advised

**Texts**
To be advised

**References**
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.

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.

115533 Met533 Metallurgical Rate Processes

**Prerequisite**  
Met231

**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.

**References**  
To be advised

1193
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**  
To be advised

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.

**Texts**  
To be advised

**References**  
To be advised

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

**Prerequisites**  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

**References**
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)

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Naval Architecture

NA-0
NA-1
NA-2
NA-3
NA-4
NA-5
NA-6
NA-7
NA-8
NA-9

General courses
Analysis and Design
Shipbuilding practice
Machines
Applications
Resistance & Propulsion

Industrial Engineering
Project & Seminar

544602 NA402 Special Purpose Ships

**Prerequisites**  NA311, NA351

**Hours**  42

**Examination**  One 3-hour paper

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

**Text**
Brahtz, J. F. (ed.)  Ocean Engineering (Wiley)

544604 NA431 Ship's Machinery

**Prerequisites**  NA311, NA351

**Hours**  42

**Examination**  One 3-hour paper

**Content**
Propulsion machinery, auxiliary machinery, deck machinery, rigging, navigational aids.

**Text**
Harrington, R. L. (ed.)  Marine Engineering (Soc. of Naval Architects)

544601 NA452 Theoretical Naval Architecture

**Prerequisites**  NA311, NA351
544801 NA481 Shipyard Production and Management

Prerequisites Nil

Hours 42

Examination One 3-hour paper

Content Pre-fabrication techniques, standardisation, yard lay-out, production planning, contract law, launching arrangements.

Texts

References
Robb, A. M. — Theory of Naval Architecture (Griffin)
— Principles of Naval Architecture (Soc. of Naval Architects & Marine Engineers)

544504 NA496 Project/Seminar

Hours 126

Examination Progressive assessment

Surveying

SV-0- Servicing course
SV-1- General Surveying
SV-2- Survey Camps
SV-3- Survey Computations
SV-4- Astronomy
SV-5- Geodesy
SV-6- Photogrammetry
SV-7- Land Studies
SV-8- Project and Seminars
SV-9- Special courses

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, ½ tutorial hour & 2½ fieldwork hours per week
Part B: 1 lecture hour & ½ tutorial hour per week

Examination Two 3-hour papers
Content

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

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

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

References
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)
Smith, J. R. Optical Distance Measurement (Crosby Lockwood 1970)

522406 SV231 Survey Computations I
Prerequisite
SV111 Surveying I
Examination
Progressive assessment
Content
Use of tables — plane trigonometrical formulae — calculation of triangles, areas, roadways, subdivisions. Use of calculating machines. Traverse computations including offsets and missing data problems. Areas from co-ordinates — transformations — resections and intersections, mathematical and semi-graphic. Spherical trigonometry and applications to survey problems. Elementary computer programming.

Texts
The University of Newcastle Computing Centre Handbook (Univ. of Newcastle 1975)
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. Regional Economics (Weidenfeld & Nicolson 1969)

References
Dean, et al. Spatial Economic Theory (Free Press 1970)
**432300 SV291 Introduction to Legal Studies**

**Prerequisite**
Nil

**Hours**
2 lecture hours & 1 tutorial hour per week for 1st ½ year

**Examination**
One 3-hour paper

**Content**
The Australian constitution and legal system—legal research and writing—areas of law—legal concepts and terminology—statute law—case law.

**Text**
To be advised

**References**

**52330 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 Computations I
Hours
Average 2 lecture hours & 1 fieldwork hour per week
Examination
One 3-hour paper
Content
The celestial sphere and astronomic triangle — definitions, conventions and time — latitude by circum-meridian methods; longitude by ex-meridian methods; best position, balancing — azimuth by circum-elongation, circumpolar and sun observations — optimum position, balancing — position line methods.

Text
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 Computations 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)
— The Manual of the N.S.W. Integrated Survey Grid (N.S.W. Govt Printer)
— Integrated Survey Grid Tables (N.S.W. Govt Printer 1972)
Reference
Bomford, G. Geodesy 3rd edn (Oxford 1971)

523329 SV361 Photogrammetry I
Prerequisite
Nil
Hours
Average 1½ lecture hours & 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—deals 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.

Texts
Hallman, F. 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
To be advised
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 ½ tutorial hour per week

Examination  One 3-hour paper

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

Text  To be advised.

References

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

Text  To be advised.

References

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

524130 SV462 Photogrammetry II

Prerequisite
SV361 Photogrammetry I

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

Hours
Average ½ lecture hour & ½ laboratory hour per week

Examination
One 3-hour paper

Content

Text
References

524135 SV472 Land Valuation

Prerequisite
Nil

Hours
1½ lecture hours per week

Examination
One 3-hour paper

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

Text
References

524136 SV473 Town Planning (not offered in 1978)

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.

Subjects Offered by Non-Engineering Departments

The subjects included in this section are those offered by Departments in other Faculties which are compulsory subjects in one or more Engineering courses. A few subjects which are popular as Electives are also included. For details of other subjects, it will be necessary to refer to the appropriate Faculty Handbook.
The subjects names are arranged in alphabetical order.
416104  Accounting and Financial Studies

Note  Enrolment in this subject is restricted to students who have not previously passed any accounting examinations at tertiary level.

Prerequisites  Nil

Hours  2 lecture hours per week

Examination  An examination each half-year

Content
The use of accounting information for business decisions. Analysis of balance sheets. Income appropriation and flow of funds statements; basic accounting procedures; the concept of cost; types and uses of internal accounting systems; cost allocation; the concept of income; inventory valuation; measurement and accounting; accounting for inflation; preparation of financial statements; analysis and interpretation of financial statements. Basic cost accounting; management control processes; budget as a planning device; budget as a control device; budgeting and employee behaviour; responsibility accounting; performance evaluation; cost analysis for management decisions including capital acquisitions and optimal investment behaviour; transfer pricing; capacity utilization and control; statistical techniques for operational cost control.

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

References
Barton, A. D.
Buckley, J. W. & Lightner, K. M.
Burns, T. J. & Hendrickson, H. S.
Carey, J. L.
Cerepak, J. R.
Chambers, R. J.
Colditz, B. T. & Gibbins, R. W.
Davidson, S. et al.
Gibson, G. J. & Gillard, R. A.
Gole, V. L.

Gordon, M. J. & Shillinglaw, G.

411100  Accounting I

Prerequisites  Nil

Hours  2 lecture hours & 2 tutorial hours per week

Examination  Two 3-hour papers

Content
<table>
<thead>
<tr>
<th>Course</th>
<th>Prerequisites</th>
<th>Hours</th>
<th>Examination</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>721900 Chemistry I</td>
<td>Nil</td>
<td>About 3 lecture hours &amp; 3 hours of tutorial &amp; laboratory classes per week.</td>
<td>Three 3-hour papers, one in mid-year.</td>
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<td>Inorganic Chemistry (30 lectures) Revision of basic concepts; periodic properties of the elements and their compounds; Bonding and Structure.</td>
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<td>Physical Chemistry (30 lectures) Chemical equilibria and energetics; chemical kinetics.</td>
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<tr>
<td>722200 Chemistry IIA</td>
<td>Chemistry I</td>
<td>About 3 lecture hours &amp; 6 hours of tutorial &amp; laboratory classes per week.</td>
<td>A student may satisfy the examiners: either by achieving an overall satisfactory performance in the two progressive examinations (Papers 1 &amp; 2). or by achieving an overall satisfactory performance in the two final papers scheduled for the November examination period (Papers 3 &amp; 4). Students who attempt both sets of examinations will be credited with the higher of the two results.</td>
<td></td>
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</tbody>
</table>
All papers are of 3-hours duration. The average laboratory mark counts 20% towards the final grading.

**Content**

**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; applications to ideal and non-ideal systems.

**Texts**

- Geissman, T. A. *Principles of Organic Chemistry* 3rd edn (Freeman 1968)
- Pickering, W. F. *Modern Analytical Chemistry* (Dekker 1971)

421100 Economics I

**Prerequisites**
Nil

**Hours**
3 lecture hours & 1 tutorial hour per week

**Examination**
One 3-hour paper plus progressive assessment

**Content**
Introduces the basic economic problem (the problem of scarcity) and reviews the relevance of the main areas of economic study to this problem. Theories and aspects of such topics as employment, economic allocation, the distribution of income, and growth and development are broadly reviewed in the beginning to provide a background for later studies. While elementary macroeconomic concepts and theories are introduced at various points in this course, the course principally concentrates on microeconomics but in a way which integrates it with other areas of economics.

Following the introductory review, the course concentrates on the theory of individual and market demand. There is also some discussion of macroeconomic concepts of demand. Concepts of supply and of market equilibrium are introduced, and the macroeconomic Keynesian analogue to Marshallian market equilibrium is discussed. After an analysis of the production function and costs of production, the course examines various types of market competition and their economic implications. Perfect competition, monopoly, oligopoly and other types of imperfect competition are considered. Attention is paid to the results of both theoretical and empirical studies. A section then follows analysing the pricing and employment of productive services and some macroeconomic extensions of distribution theory are considered. A concluding section of the course deals with various aspects of economic welfare.

Throughout the course special attention will be given to the institutional context in which economic decisions are made.

**Background Reading**

- Heyne, P. *The Economic Way of Thinking* (Science Research Associates)
- Lipsey, R. *Positive Economics* 4th edn (Weidenfeld & Nicolson)
- — *Workbook to Accompany the Economics of Markets* (Wiley 1975)

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

**References**
To be advised

Economics I

Prerequisites

Hours

Examination

Content

The elementary macroeconomic concepts introduced in Economics I are developed into a comprehensive examination of the determinants of aggregate economic activity. The microeconomic foundation of macroeconomic analysis is examined and the concept of general equilibrium is introduced. Conventional static models of economic activity, including both product and monetary markets, are examined from the Keynesian and Monetarist points of view. Dynamic implications are introduced and extended into a preliminary discussion of the nature and causes of economic fluctuations and growth. Emphasis is given to the welfare implications of macroeconomic analysis, particularly in relation to policy goals associated with levels of employment, price stability and economic growth. Reference is made to externalities associated with macroeconomic policy measures, particularly as they affect the non-economic welfare of society. Special attention is given to the institutional context in which macroeconomic decisions are made and the role of the government and international sectors.

Texts

Nevile, J. W. 
Fiscal Policy in Australia—Theory and Practice (Cheshire 1970)

Wonnacott, P. 
Macroeconomics (Irwin 1974)

References

Barrett, N. S. 
The Theory of Macroeconomic Policy (Prentice-Hall 1972)

Bowers, D. A. & Baird, R. N. 
Elementary Mathematical Macroeconomics (Prentice-Hall 1971)

Keiser, N. F. (ed.) 
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.  
Yeomans, K. A.  
James, D. E. & Throsby, C. D.  
Hamburg, M.  
Newton, B. L.  
Kazmier, G. A. et al.  
Whitmore, G. A. et al.  
Yamane, T.  
Pollard, A. H.  
Shao, S. P.  
Neter, J. ea al.  
Lindgren, K. E.

Texts

Facts from Figures (Penguin)  
Introduction to Quantitative Methods in Economics (Wiley 1973)  
Statistics for Business (S.R.A. 1973)  
Fundamental Statistics for Business and Economics 4th edn (Allyn & Bacon 1973)  
An Introduction to the Mathematics of Finance (Pergamon 1968)  
Statistics for Business and Economics (Merrill)  
Self-Correcting Problems in Statistics (Allyn & Bacon 1970)  
Statistics—An Introductory Analysis (Harper)

Suggested Preliminary Reading

Netheme, G. & Chisholm, R.  
Sawer, G.  
Enright, C.  
Shtein, B. J. L. & Lindgren, K. E.

Further References

Derham, D. P. et al.  
Sawer, G.  
Sawer, G.

References

From time to time during the year students will be given assignments, tests, etc. The student’s performance in this work will be taken into account in the following manner.

(a) For the implementation of By-law 5.4.1-1, which deals with unsatisfactory progress. A copy of this By-law appears in the General Supplement to the Faculty Handbooks.
Where a student's performance during the year has been better than his performance in the final examination, then the former will be taken into account in determining his final result. On the other hand, when a student's performance during the year has been worse than his performance in the final examination, then his performance during the year will be ignored in determining his final result.

### Part I Subject

661100 Mathematics I

**Prerequisites** Nil

**Hours** 4 lecture hours & 2 tutorial hours per week

**Examination** Two 3-hour papers

**Content**

- **Topics**
  - AL — Algebra
  - AN — Real Analysis
  - CA — Calculus
  - SC — Statistics and compiling

### Part I Topics

**Algebra (topic AL)** — R. B. Eggleton

**Prerequisites** Nil

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

**Content**


**Text**

Lipschutz, S. *Linear Algebra* (Schaum 1968)

**References**

- Brisley, W. *A Basis for Linear Algebra* (Wiley 1973)
- Kolman, B. *Elementary Linear Algebra* (Macmillan 1977)
- Liebeck, H. *Algebra for Scientists and Engineers* (Wiley 1971)
- Tropper, M. A. *Linear Algebra* (Nelson 1973)

**Real Analysis (topic AN)** — M. J. Hayes

**Prerequisites** Nil

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

**Content**


**Text** Nil

**References**

- Apostol, T. *Calculus Vol. I* 2nd edn (Blaisdell 1967)
- Spivak, M. *Calculus* (Benjamin 1967)

**Calculus (topic CA)** — R. F. Berghout

**Prerequisites** Nil

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

**Content**


**Text**

Ayres, F. *Calculus* (Schaum 1974)

**References**

- Hille, E. & Salas, S. *First Year Calculus* Internat. Textbook Series (Blaisdell 1968)
- Spivak, H. *Calculus* (Benjamin 1967)

**Statistics and Computing (topic SC)** — A. J. Dobson

**Prerequisites** Nil

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

A requirement is the writing of successful computer programmes to solve problems in statistical and numerical analysis.

**Text**

Blatt, J. M. *Basic Fortran IV Programming; Version MIDITRAN* (Computer Systems of Aust. 1969)


**References**


Hoel, P. G. *Introduction to Mathematical Statistics* (Wiley 1971)


Spiegel, M. R. *Statistics* (Schaum 1968)

Wilkes, M. V. *A Short Introduction to Numerical Analysis* (Cambridge U.P. 1971)

**Part II Subjects**

The Department offers three Part II subjects. Students whose course restricts them to one such subject must study Mathematics IIA or Mathematics IIB. The subject Mathematics IIA is a pre- or corequisite for Mathematics IIC, and IIA and IIC together a prerequisite for any Part III subject, so students wishing to take two Part II subjects would normally choose Mathematics IIA and IIC. Students taking all three of the Part II subjects would study all 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.

**List of Topics for Part II Mathematics**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Corequisite or Prerequisite Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mathematical Models</td>
</tr>
<tr>
<td>B</td>
<td>Complex Analysis</td>
</tr>
<tr>
<td>CO</td>
<td>Vector Calculus &amp; Differential Equations</td>
</tr>
<tr>
<td>D</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>F</td>
<td>Numerical Analysis &amp; Computing</td>
</tr>
<tr>
<td>G</td>
<td>Finite Mathematics</td>
</tr>
<tr>
<td>H</td>
<td>Probability &amp; Statistics</td>
</tr>
</tbody>
</table>

I Topic in Statistics  
J Topic in Applied Mathematics  
K Topic in Pure Mathematics  
L Real Analysis

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

**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.

**662200 Mathematics IIB**

**Prerequisite** Mathematics I

**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.

For students in the departments of:

- Chemical Engineering—Topics CO, D, F
- Civil Engineering—Topics CO, D, H (Topics CO, D & H for Surveying)
- Electrical Engineering—Topics CO, B, D
- Mechanical Engineering—Topics CO, D, H

**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

Topics K, L and one of the pairs of topics G and J, H and I or G and H. Subject to the consent of the Head of Department one topic from A to J may be substituted for one of the topics I or J.

Notes

1. Mathematics IIB is no longer offered in two parts in the Faculty of Science. Students who passed Mathematics IIB part I before 1971 should consult Note 1 on page 93 of the 1971 handbook.
2. In order to pass both Mathematics IIA and Mathematics IIB a student must study all the topics A to H above and offer them for examination.
3. Mathematics IIA is a prerequisite or prerequisite for Mathematics IIC.
4. In order to pass in all three Part II subjects a student must study all eleven topics and offer them for examination.
5. Students whose courses include Physics IIA are advised to include topics CO, H and one of B, D or F in their Part II Mathematics subjects. This may require the use of the substitution rules.
6. Students who passed a Part II Mathematics subject prior to 1974 and who wish to take further Part II Mathematics subjects should note that the topic coded "L" in 1974-1976 corresponds to the topic coded "A" in previous years. Such students may require special permission for their selection of Part II topics, and should consult with the Head of Department.
7. Topics C and E existing before 1977 are no longer offered as separate topics.

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
Kreyszig, E. Advanced Engineering Mathematics 2nd edn or both
and

662104 Topic D—Linear Algebra
Lipschutz, S. Linear Algebra (Schaum 1974)

662202 Topic F—Numerical Analysis and Computing
Conte, S. D. & Elementary Numerical Analysis (McGraw-Hill deBoor, C. 1972)

662203 Topic G—Finite Mathematics
Nil

662204 Topic H—Probability and Statistics
Freund, J. E. Mathematical Statistics 2nd edn or
Mendenhall, W. & Schaeffer, R. L. Mathematical Statistics with Applications (Duxbury 1973)

662301 Topic I—Topic in Statistics
eg. Applications of Statistics
Nil

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
Nil

Part III Subjects

The Mathematics Department offers two Part III subjects, each comprising four topics chosen from the list below.

Students wishing to proceed to Honours in Mathematics are required to take both these subjects. They will also be required to study additional topics as prescribed by the Heads of Departments concerned.

Passes in both Mathematics IIA and IIC are prerequisite for entry to Mathematics IIIA, and Mathematics IIIA is pre- or corequisite for Mathematics IIIB. It will be assumed that students taking a third-year subject in 1978 have already studied topics C, D, E, K, and L in their Part II subjects.

Summaries of the Part III topics together with extended booklists will appear in the handbook of the Faculty of Mathematics and will also be available from the Department.

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
662305 EM2I Topic in Statistics, e.g. Applications of Statistics
List of Topics for Part III Mathematics

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM</td>
<td>K, L</td>
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<tr>
<td>*M</td>
<td>C</td>
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<tr>
<td>N</td>
<td>C, E</td>
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<tr>
<td>O</td>
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<td>P</td>
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<td>PD</td>
<td>B, C, E</td>
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<td>Y</td>
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<td>Z</td>
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</tbody>
</table>

The selection rules and definitions of the Part III subjects follow.

*This topic will not be offered in 1978.

### Notes
1. In order to take both Mathematics IIIA and Mathematics IIIB, 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 those eight topics.
2. Students whose course includes a subject from Schedule B must 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

#### 663100 Mathematics IIIA

**Prerequisites**
Mathematics IIA & IIC

**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.

### Texts for Part III Topics

- **663101 Topic M—General Tensors**
  - Not offered in 1978

- **663102 Topic N—Variational Methods**
  - Nil

- **663103 Topic O—Mathematical Logic**

- **663104 Topic P—Ordinary Differential Equations**

- **663108 Topic S—Geometry**
  - Not offered in 1978

- **663210 Topic FM—Foundations of Mathematics**
  - Nil

- **663211 Topic PL—Programming Languages and Advanced Applications in Computing**
  - Nil

- **663215 Topic Q—Fluid Dynamics**
  - Nil

- **663216 Topic R—Theory of Statistics**
  - Nil

- **663209 Topic TC—Theory of Computing**
  - Nil

- **663202 Topic U—Operations Research**
  - Nil

- **663203 Topic V—Measure Theory and Integration**
  - Nil

- **663204 Topic W—Analysis of Normed Linear Spaces**
Elective Units in Mathematics
Subject to meeting any pre-or corequisite requirements, students may take Part III topics as elective units.

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. Readings in Managerial Psychology 2nd edn (Chicago U.P.)
Luthans, F. Organisational Behaviour (McGraw-Hill)
References
Gellerman, S. W. The Management of Human Relations (Holt, Rinehart & Winston)
Leavitt, H. J. Managerial Psychology (Chicago U.P.)
Miner, J. B. Management Theory (Macmillan)
Pugh, D. S. Writers on Organisations (Penguin)
Schein, E. H. Organisational Psychology (Prentice-Hall)
Sutermeister, R. People and Productivity (McGraw-Hill)
Tannenbaum, A. S. Social Psychology of the Work Organisation (Wadsworth)

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.

Content
Section 1: Introduction to Philosophy
Section 2: Logic and Options
Section 3: Seminars

Section 1: 381101 Introduction to Philosophy (Mr Sparkes, Dr Dockrill, Dr Robinson)
Hours 1 hour per week
Examination One 3-hour paper at end of year
Content (i) Plato's theory of political activity, morality, the nature of the soul and its immortality, and universals.
(ii) Descartes' quest for infallible knowledge, his theory of innate ideas, and his attempt to prove the existence of God and the immaterial character of the soul.

Texts
Descartes, R. Philosophical Writings (Anscombe & Geach eds) (Nelson)
Plato The Last Days of Socrates (Tredennick ed) (Penguin)
References
Burnet, J. Greek Philosophy (Macmillan)
Flew, A. Thinking about Thinking (Fontana)
Guthrie, W. K. C. The Greek Philosophers (Methuen)
Socrates (C.U.P.)
Kenny, A. Descartes (Random House)
Taylor, A. E. Plato: the Man and his Work (Methuen)

Section 2: 381103 Logic and Options
Hours 2 hours per week throughout the year
Content
First half year. Introduction to Logic (Assoc. Professor Dominela)
Assumes no prior acquaintance with logic and introduces students to a formal study of validity of arguments as encountered in philosophy and elsewhere.

Texts
Lecture notes with further references will be issued

Examination An examination in Term II. For those dissatisfied with their result, a further examination in November
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) Bertrand Russell's *The Problems of Philosophy*

Details of options will be provided during the first half-year, and choice should be discussed with members of the Department.

Section 3: 381104 Seminars (Mr Sparkes, Dr Dockrill, Dr Lee)

Hours Each Seminar & group will have nine one hour meetings in the first half year

Content
Seminars are conducted in small groups, and the programme is related to the material of Section 1. Members of groups are expected to prepare papers, and to develop acquaintance with problems and ways of discussing them.

As with essays, marks awarded for papers will be included in the mark for the year's work. Credit is also given for performance as a group member.

741200 Physics IA

Prerequisite 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 & practice period per week

Examination One 2-hour paper after the end of each term

Content
For students who in general do not intend to proceed with further studies in Physics. (A credit pass or better in Physics IB will normally be required for entry to Physics II). The treatment will require a minimum of mathematics and will involve an experimental approach throughout. The coverage of the subject will be somewhat broader than in Physics IA.

Texts

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

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
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 CO & 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 three 3-hour papers

Content
The areas of classical and quantum physics essential to the understanding of both advanced pure physics and also the many applications of physics. Some electronics is also included.

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
Texts will be listed on the Physics Dept notice board. Students should retain their Physics II texts

743200 Physics IIIB
This subject will not be offered in any one year unless there are three or more enrolments.

Prerequisite
Physics II
COMBINED DEGREE COURSES

A student may enrol in the combined courses leading to the Bachelor of Arts/Bachelor of Engineering, Bachelor of Commerce/Bachelor of Engineering, Bachelor of Economics/Bachelor of Engineering, Bachelor of Science/Bachelor of Engineering, Bachelor of Metallurgy/Bachelor of Mathematics degrees on the successful completion of his first year course. Students wishing to transfer to a combined degree course will be expected to be above average quality and the minimum standard looked for will be credit level. Only in exceptional circumstances will a student be allowed to transfer to a combined degree course during his second year or later.

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

BACHELOR OF ARTS/BACHELOR OF ENGINEERING

A combined course approved by the Faculty Boards of Arts and Engineering leading to admission to the degrees of Bachelor of Arts and Bachelor of Engineering, shall include, in addition to the requirements for admission to the degree of Bachelor of Engineering, five subjects which must include not less than one Part III and one Part II subject and at least four of which shall be selected from Group I of the Schedule of Subjects to the Requirements for the degree of Bachelor of Arts.

Recommended programmes, approved by the Faculty Boards of Arts and Engineering, appear below:

BACHELOR OF ARTS/BACHELOR OF ENGINEERING

IN CHEMICAL ENGINEERING

Subject

Year I

Chemistry I
CE111 Statics
ME111 Graphics
ME112 Engineering Drawing & Elementary Design
ChE101 Industrial process principles
Physics IA or IB
Mathematics I
ME121 Workshop Practice

Year II

Mathematics IIB Part I
Chemistry IIA
Chemical Engineering I
Arts Subject Part I

Year III

Mathematics IIB Part II
Chemical Engineering IIA Part I
Elective I
Arts Subject Part II
Arts Subject Part I or II
Industrial Experience

Year IV

Chemical Engineering IIA Part II
Chemical Engineering IIB
Arts Subject Part III

Year V

Chemical Engineering III
Arts Subject Part I, II or III
Projects II

Units

4
5
8
17

Note

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

BACHELOR OF ARTS/BACHELOR OF ENGINEERING

IN CIVIL ENGINEERING

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

Year V

Arts Subject Part I 4
Arts Subject Part II 5
Arts Subject Part III 8

BACHELOR OF ARTS/BACHELOR OF ENGINEERING

IN ELECTRICAL ENGINEERING

In addition to the requirements for the B.E. with the relevant elective requirements selections as shown in Appendix A, the combined degree student is required to undertake one year in the relevant non-engineering faculty. This year may be taken after completion of the third or the fourth year of a B.E. programme. For some, there may be advantages for taking this year after completing the four year B.E. requirements but before taking out a B.E. degree.

BACHELOR OF ARTS/BACHELOR OF ENGINEERING

IN MECHANICAL ENGINEERING

Year I

CE111 Statics 1
ME111 Graphics 1
ME112 Engineering Drawing & Elementary Design 1
ME131 Dynamics 1
### Subject  
#### Mathematics I  
#### Physics IA  
#### Chemistry IS  
#### MEI21 Workshop Practice  
#### MEI22 Process Technology  
#### Met151 Microstructure of Materials  

With approval of Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, and Met151 and MEI21.

#### Year II  
<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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</thead>
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<tr>
<td>ME201 Laboratory Measurements</td>
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<tr>
<td>ME202 Dynamics of Engineering Systems</td>
<td>1</td>
</tr>
<tr>
<td>ME214 Mechanics of Solids I</td>
<td>1</td>
</tr>
<tr>
<td>ME223 **Mechanical Technology</td>
<td>1</td>
</tr>
<tr>
<td>ME232 **Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME241 **Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME251 **Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME271 **Thermodynamics</td>
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</tr>
<tr>
<td>Mathematics IIB</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

**Arts subject Part I**  
- Laboratory Measurements  
- Dynamics of Engineering Systems  
- Mechanics of Solids I  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Fluid Mechanics**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part II**  
- Introduction to Electrical Information  
- Introduction to Electrical Energy  
- Engineering Design  
- Engineering Computations  
- **Properties of Materials**  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part III**  
- Laboratory Measurements  
- Dynamics of Engineering Systems  
- Mechanics of Solids I  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part IV**  
- Laboratory Measurements  
- Dynamics of Engineering Systems  
- Mechanics of Solids I  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part V**  
- Structural Design  
- Engineering Design  
- Dynamics of Machines  
- Engineering Administration  
- Engineering Economics  
- Project/ Seminar  
- **Methods Engineering**  
- Quality Engineering  
- Design of Crankshafts, Flywheels and other Rotating Members  
- Design of Hydraulic & Pneumatic Power Systems  
- Design of Conveyors & Materials Handling Equipment  
- Reliability Analysis of Mechanical Systems  
- Operations Research—Deterministic Models  
- Electives  

**Total** | **14**

---

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

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

#### Subject  
#### Units  

<table>
<thead>
<tr>
<th>Year</th>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>I</td>
<td>CE111 Statics</td>
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<tr>
<td></td>
<td>ME111 Graphics</td>
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<tr>
<td></td>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
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<td></td>
<td>ME131 Dynamics</td>
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<td></td>
<td>Mathematics I</td>
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<td>Physics IA</td>
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<td></td>
<td>Chemistry IS</td>
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<tr>
<td></td>
<td>MEI21 Workshop Practice</td>
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<tr>
<td></td>
<td>MEI22 Process Technology</td>
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</tr>
<tr>
<td></td>
<td>Met151 Microstructure of Materials</td>
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</table>

With approval of Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and MEI22.

<table>
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<tr>
<th>Year</th>
<th>Subject</th>
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<tr>
<td>II</td>
<td>ME201 Laboratory Measurements</td>
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<td>ME202 Dynamics of Engineering Systems</td>
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<tr>
<td></td>
<td>ME214 Mechanics of Solids I</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME223 **Mechanical Technology</td>
<td>1</td>
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<tr>
<td></td>
<td>ME232 **Dynamics of Machines</td>
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<tr>
<td></td>
<td>ME241 **Properties of Materials</td>
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</tr>
<tr>
<td></td>
<td>ME251 **Fluid Mechanics</td>
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<td>Mathematics IIB</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
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</table>

**Arts subject Part I**  
- Laboratory Measurements  
- Dynamics of Engineering Systems  
- Mechanics of Solids I  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part II**  
- Introduction to Electrical Information  
- Introduction to Electrical Energy  
- Engineering Design  
- Engineering Computations  
- **Properties of Materials**  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part III**  
- Laboratory Measurements  
- Dynamics of Engineering Systems  
- Mechanics of Solids I  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part IV**  
- Laboratory Measurements  
- Dynamics of Engineering Systems  
- Mechanics of Solids I  
- **Mechanical Technology**  
- **Dynamics of Machines**  
- **Properties of Materials**  
- **Thermodynamics**  
- Mathematics IIB  

**Arts subject Part V**  
- Structural Design  
- Engineering Design  
- Dynamics of Machines  
- Engineering Administration  
- Engineering Economics  
- Project/ Seminar  
- **Methods Engineering**  
- Quality Engineering  
- Design of Crankshafts, Flywheels and other Rotating Members  
- Design of Hydraulic & Pneumatic Power Systems  
- Design of Conveyors & Materials Handling Equipment  
- Reliability Analysis of Mechanical Systems  
- Operations Research—Deterministic Models  
- Electives  

**Total** | **17**

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1. First half year  
2. Second half year
### Bachelor of Commerce/Bachelor of Engineering

#### Bachelor of Economics/Bachelor of Engineering

The following recommended programmes have been approved by the Faculty Boards of Economics & Commerce, and Engineering:

### Bachelor of Commerce/Bachelor of Engineering

#### In Chemical Engineering

<table>
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<tr>
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<th>Units</th>
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<tr>
<td>Year I</td>
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<tr>
<td>ME111 Statics</td>
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<tr>
<td>ME111 Mathematics I</td>
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<tr>
<td>ME111 Graphics</td>
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</tr>
<tr>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
<td>1</td>
</tr>
<tr>
<td>Che101 Industrial process principles</td>
<td>1</td>
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<tr>
<td>ME121 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td>Year II</td>
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<tr>
<td>Chemical Engineering I</td>
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<tr>
<td>Chemistry II</td>
<td>5</td>
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<tr>
<td>Mathematics IIB Part I</td>
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<tr>
<td>One Economics &amp; Commerce subject Group A</td>
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<tr>
<td>Year III</td>
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<td>Chemical Engineering IIA</td>
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<tr>
<td>Mathematics IIB Part 2</td>
<td>2</td>
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<tr>
<td>One Economics &amp; Commerce subject Group A</td>
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<td>One Economics &amp; Commerce subject Group A or B</td>
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<tr>
<td>Year IV</td>
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<td>Chemical Engineering IIB</td>
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<tr>
<td>Three Economics &amp; Commerce subjects</td>
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<td>Elective II</td>
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<td>Year V</td>
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<td>Chemical Engineering III</td>
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<td>Project II</td>
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<tr>
<td>Two Economics &amp; Commerce subjects</td>
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#### In Civil Engineering

<table>
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<th>Units</th>
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<tbody>
<tr>
<td>Year I</td>
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<td>CE111 Statics</td>
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<tr>
<td>ME111 Graphics</td>
<td>1</td>
</tr>
<tr>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
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<tr>
<td>ME131 Dynamics</td>
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<td>Mathematics I</td>
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<tr>
<td>Physics IA</td>
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<td>Chemistry I</td>
<td>2</td>
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<td>CE171 Engineering Surveying</td>
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* First half year

** Second half year

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

---

*Approximate unit values. Refer to Arts Faculty Handbook for subject details.

**See Elective Requirements — Appendix A.

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Mathematics IIB may be taken in two parts each of three terms duration.
## BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING

### IN ELECTRICAL ENGINEERING

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* First half year
** Second half year

1 The subjects which count towards the B.Com. degree are those marked * plus six Engineering units chosen from subjects normally taken in 3rd or 4th year of the full-time Engineering programme which may be counted as one Group C subject.

2 The four elective units must be taken in the Faculty of Engineering.

## BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING

### IN MECHANICAL ENGINEERING

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* First half year
** Second half year

1 The subjects which count towards the B.Com. degree are those marked * plus six Engineering units chosen from subjects normally taken in 3rd or 4th year of the full-time Engineering programme which may be counted as one Group C subject.

2 The four elective units must be taken in the Faculty of Engineering.
Subject | Year V | Units
---|---|---
CE303 | Structural Design | 2
ME381 | *Methods Engineering | 1
ME383 | **Quality Engineering | 2
ME413 | Design of Crankshafts, Flywheels & other Rotary M | 1
ME414 | Design of Hydraulic & Pneumatic Power Systems | 1
ME419 | *Design of Conveyors & Materials Handling Systems | 1
ME419 | Reliability Analysis of Mechanical Systems | 1
ME487 | *Operations Research—Deterministic Models | 1
ME496 | Project/Seminar | 1
Electives | 5
One Economics & Commerce subject Group C | 2
14

1. 3 electives must be chosen from the list of Departmental Electives.
2. The subjects which count towards the B.Com. degree are those marked * plus six Engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject.

BACHELOR OF COMMERCE/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

Year I
CE111 | Statics | 1
ME111 | Graphics | 1
ME112 | Engineering Drawing & Elementary Design | 1
ME131 | Dynamics | 1
ME132 | Mathematics I | 4
ME133 | Physics I | 2
ME134 | Chemistry I | 1
ME135 | Workshop Practice | 1
ME136 | Process Technology | 1
ME137 | Microstructure of Materials | 1

Year II
*Introduction to Electrical Information | 1
EE204 | Dynamics of Engineering Systems | 1
ME214 | *Mechanics of Solids | 1
ME223 | **Mechanical Technology | 1
ME241 | **Properties of Materials | 1
ME242 | Mathematics II| 4
ME243 | Accounting I | 4
ME244 | Economics I | 4

Year III
ME201 | Laboratory Measurements | 1
ME212 | *Engineering Design | 1
ME213 | **Engineering Design | 1
ME214 | **Dynamics of Machines | 1
ME215 | *Fluid Mechanics | 1
ME216 | **Thermodynamics | 1
§ Introductory Quantitative Methods | 1
Two Bachelor of Commerce subjects | 8

* First half year
** Second half year

Notes:
* First half year
** Second half year
1 These elective units must be chosen from the list of Departmental Electives.
2 The subjects which count towards the B.Com. degree are those marked * plus six Engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject.
§ Introductory Quantitative Methods is not a compulsory subject for students who have successfully completed Part II Mathematics Topic H and who proceed directly to and pass one of Economic Statistics II, Statistical Analysis, Quantitative Business Analysis II or Commercial Electronic Data Processing.

BACHELOR OF ECONOMICS/BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

Year I
*Chemistry I | 4
ME111 | Statics | 4
CE111 | Mathematics I | 1
ME111 | Graphics | 1
ME112 | Engineering Drawing & Elementary Design | 1
ChE101 | Industrial Process Principles | 1
Physics IA/IB | 4
ME121 | Workshop Practice | 1

Year II
Chemical Engineering I | 6
Chemistry IIA | 5
ME113 | Mathematics IIB Part I | 2
ME112 | Economics I | 4

Year III
Chemical Engineering IIA | 7
ME113 | Mathematics IIB Part 2 | 2
ME112 | One Bachelor of Economics Subject | 4
§ Introductory Quantitative Methods | 4
### Bachelor of Economics/Bachelor of Engineering in Civil Engineering

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* First half year
** Second half year

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### Bachelor of Economics/Bachelor of Engineering in Electrical Engineering

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* First half year
** Second half year
### BACHELOR OF ECONOMICS/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

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### BACHELOR OF ECONOMICS/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

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<td>ME122 Process Technology</td>
<td>1</td>
</tr>
<tr>
<td>Met151 Microstructure of Materials</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>17</td>
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<tr>
<td><strong>Year IV</strong></td>
<td></td>
</tr>
<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
</tr>
<tr>
<td>ME313 Engineering Design</td>
<td>1</td>
</tr>
<tr>
<td>ME333 Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME342 Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME343 Mechanics of Solids</td>
<td>1</td>
</tr>
<tr>
<td>ME352 Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME361 Automatic Control</td>
<td>1</td>
</tr>
<tr>
<td>ME372 Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ME373 Thermodynamics</td>
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</tr>
<tr>
<td>Two Bachelor of Economics subjects</td>
<td>8</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>1 Three electives must be chosen from the list of Departmental Electives.</td>
<td></td>
</tr>
<tr>
<td>2 The subjects which count towards the B.Ec. degree are those marked * plus six Engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject.</td>
<td></td>
</tr>
<tr>
<td>§ Introductory Quantitative Methods is not a compulsory subject for students who have successfully completed Part II Mathematics Topic H and who proceed directly to and pass one of Economic Statistics II, Statistical Analysis, Quantitative Business Analysis II or Commercial Electronic Data Processing.</td>
<td></td>
</tr>
</tbody>
</table>

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* First half year

** Second half year
**BACHELOR OF MATHEMATICS/BACHELOR OF ENGINEERING**

A combined course leading to admission to the degrees of Bachelor of Engineering and Bachelor of Mathematics as approved by the Faculty Boards of Mathematics and Engineering shall include, Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA, Mathematics IIIB or a Part III subject chosen from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Engineering (Mechanical), Bachelor of Engineering (Industrial), Bachelor of Engineering (Electrical), Bachelor of Engineering (Chemical) or Bachelor of Engineering (Civil).

The following recommended programmes have been approved by the Faculty Boards of Mathematics & Engineering.

---

### Subject | Units
---|---
ME223 **Mechanical Technology** | 1
ME241 **Properties of Materials** | 1
2Mathematics IIB | 4
2Economics I | 4
2One Bachelor of Economics subject | 4
---|---
**Year III**
ME201 *Laboratory Measurements* | 1
ME212 *Engineering Design* | 1
ME213 **Engineering Design** | 1
ME251 **Dynamics of Machines** | 1
ME251 *Fluid Mechanics* | 1
ME271 **Thermodynamics** | 1
2Introductory Quantitative Methods | 4
2Economics II | 4
2One Bachelor of Economics subject | 4
---|---
**Year IV**
ME301 Engineering Computations | 1
ME313 *Engineering Design* | 1
ME333 **Dynamics of Machines** | 1
ME342 *Properties of Materials* | 1
ME343 **Mechanics of Solids** | 1
ME361 *Automatic Control* | 1
ME381 *Methods Engineering* | 1
ME383 **Quality Engineering** | 1
ME384 **Design for Production** | 1
ME487 *Operations Research—Deterministic Models* | 1
ME488 *Operations Research—Probabilistic Models* | 1
2One Bachelor of Economics subject | 4
---|---
**Year V**
ME496 Project/Seminar | 4
1Electives | 3
2Two Bachelor of Economics subjects | 8
---|---
---|---
**Notes**
* First half year
** Second half year
1 These elective units must be chosen from the list of Departmental Electives.
2 The subjects which count towards the B.Ec. degree are those marked a plus six Engineering units chosen from subjects normally taken in Year III or Year IV of the full-time Engineering programme which may be counted as one Group C subject.
3 Introductory Quantitative Methods is not a compulsory subject for students who have successfully completed Part II Mathematics Topic H and who proceed directly to and pass one of Economic Statistics II, Statistical Analysis, Quantitative Business Analysis II or Commercial Electronic Data Processing.

---

### BACHELOR OF MATHEMATICS/BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

| Subject | Units |
---|---|
Year I | 
CE111 Chemistry I | 4
ME111 Statics | 1
ME111 Graphics I | 1
ME112 Engineering Drawing & Elementary Design | 1
ChE101 Industrial Process Principles | 1
Mathematics I | 4
Physics IA or IB | 4
ME121 Workshop Practice | 1
---|---
Year II | 
Mathematics IIA | 4
Mathematics IIC | 4
Chemistry IIA | 5
Chemical Engineering I Part 1 | 1
---|---
Year III | 
Mathematics IIIA | 8
Chemical Engineering I Part 2 | 5
Chemical Engineering IIA Part 1 | 2
---|---
Year IV | 
Mathematics IIIB or Part III Schedule B subject | 8
Chemical Engineering IIA Part 2 | 5
Chemical Engineering IIB | 3
---|---
Year V | 
Chemical Engineering III | 5
Projects II | 6
Elective I | 5
---|---

---

### BACHELOR OF MATHEMATICS/BACHELOR OF ENGINEERING IN CIVIL ENGINEERING

| Subject | Units |
---|---|
Year I | 
CE111 Statics | 1
ME111 Graphics | 1
ME112 Engineering Drawing & Elementary Design | 1
ME131 Dynamics | 1
Mathematics I | 4
---|---
<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry IS</td>
<td>2</td>
</tr>
<tr>
<td>CE171 Engineering Surveying I</td>
<td>2</td>
</tr>
</tbody>
</table>

**Year II**

| Mathematics IIA                             | 4     |
| 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     |
| EE203 *Introduction to Electrical Information| 1   |
| EE204 **Introduction to Electrical Energy   | 1     |
| ME121 Workshop Practice                     | 1     |
| ME271 **Thermodynamics                      | 1     |

**Year III**

| Mathematics IIC                             | 4     |
| Structural Analysis & Design                | 4     |
| CE324 Soil Mechanics                        | 2     |
| CE332 Fluid Mechanics II                    | 2     |
| CE351 Civil Engineering Systems I           | 1     |
| CE372 Transportation Engineering           | 1     |
| ME301 Engineering Computations              | 1     |
| GE350 Seminar                               | 1     |

**Year IV**

| Mathematics IIIA                            | 8     |
| Structural Analysis & Design II             | 4     |
| CE425 Earth & Rock Engineering             | 1     |
| CE452 Engineering Construction             | 1     |
| ME482 Engineering Economics                | 1     |

**Year V**

| Mathematics IIIB                            | 8     |
| Project                                     | 2     |
| Electives                                   | 4     |

**Total Units**

| 78 |

---

**BACHELOR OF MATHEMATICS/BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING**

**Year I**

| Mathematics I                               | 4     |
| EE131 Circuit Fundamentals                  | 1     |
| CE111 Statics                               | 1     |
| ME111 Graphics                              | 1     |
| ME112 Engineering Drawing & Elementary Design| 1   |
| Physics IA                                  | 4     |
| Chemistry IS                                | 2     |
| Met181 Electronic Structure of Materials    | 1     |
| ME131 Dynamics                              | 1     |
| ME121 Workshop Practice                     | 1     |

* First half year
** Second half year

---

**Year II**

| Mathematics IIA                              | 4     |
| EE211 **Energy Conversion                    | 1     |
| EE221 *Semiconductor Devices                 | 1     |
| EE222 Electrical Circuits                    | 1     |
| Ph221 *Electromagnetics & Quantum Mechanics  | 2     |
| Mathematics IIA                              | 4     |
| Mathematics IIC                              | 4     |

**Year III**

| Maths IIIA                                   | 8     |
| Maths III B or Schedule B                    | 8     |

**Year IV**

| **Power Systems**                            | 1     |
| EE314 *Electrical Machines                   | 1     |
| EE315 **Power Electronics                    | 1     |
| EE323 *Linear Electronics                    | 1     |
| EE325 **Introduction to Digital Technology   | 1     |
| EE333 *Advanced Circuit Analysis             | 1     |
| EE341 *Automatic Control                     | 1     |
| EE344 **Communications                       | 1     |
| EE361 *Introduction to Logic & Assembly Language| 1   |
| GE350 Seminar                                | 1     |

2 from EE300, 400 Electives

**Year V**

| EE480 Project                                | 3     |
| EE491 Seminar                                | 1     |

9 from EE300, 400 or 500 Electives

---

**BACHELOR OF MATHEMATICS/BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING**

**Year I**

| Statics                                      | 1     |
| ME111 Graphics                              | 1     |
| ME112 Engineering Drawing & Elementary Design| 1   |
| ME131 Dynamics                              | 1     |
| Physics IA                                  | 4     |
| Chemistry IS                                | 2     |
| ME121 Workshop Practice                     | 1     |
| ME122 Process Technology                    | 1     |
| Met151 Microstructure of Materials          | 1     |

| 17 |

**Year II**

| Mathematics IIA                              | 4     |
| ME201 *Laboratory Measurements               | 4     |
| ME202 **Dynamics of Engineering Systems      | 1     |
| ME214 *Mechanics of Solids                   | 1     |

* First half year
** Second half year
### BACHELOR OF MATHEMATICS/BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

**Year I**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE111 Statics</td>
<td>1</td>
</tr>
<tr>
<td>ME111 Graphics</td>
<td>1</td>
</tr>
<tr>
<td>ME112 Engineering Drawing &amp; Elementary Design</td>
<td>1</td>
</tr>
<tr>
<td>ME131 Dynamics</td>
<td>1</td>
</tr>
<tr>
<td>ME132 Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>ME133 Chemistry IA</td>
<td>4</td>
</tr>
<tr>
<td>ME134 Physics IA</td>
<td>2</td>
</tr>
<tr>
<td>ME135 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td>ME136 Process Technology</td>
<td>1</td>
</tr>
<tr>
<td>ME137 Met151 Microstructure of Materials</td>
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</tr>
</tbody>
</table>

**Year II**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Mathematics IIA</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics IIC</td>
<td>4</td>
</tr>
<tr>
<td>ME201 Laboratory Measurements</td>
<td>1</td>
</tr>
<tr>
<td>ME202 Dynamics of Engineering Systems</td>
<td>1</td>
</tr>
<tr>
<td>ME214 Mechanics of Solids</td>
<td>1</td>
</tr>
<tr>
<td>ME223 Mechanical Technology</td>
<td>1</td>
</tr>
<tr>
<td>ME232 Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME241 Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME271 Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME271 Thermodynamics</td>
<td>1</td>
</tr>
</tbody>
</table>

**Year III**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Mathematics IIIA</td>
<td>8</td>
</tr>
<tr>
<td>ME212 Engineering Design</td>
<td>1</td>
</tr>
<tr>
<td>ME213 **Engineering Design</td>
<td>1</td>
</tr>
<tr>
<td>EE203 *Intro. to Elect. Info.</td>
<td>1</td>
</tr>
<tr>
<td>EE204 **Intro. to Elect. Energy</td>
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</tr>
<tr>
<td>ME301 Engineering Computations</td>
<td>1</td>
</tr>
<tr>
<td>ME302 Properties of Materials</td>
<td>1</td>
</tr>
<tr>
<td>ME342 Mechanics of Solids</td>
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</tr>
<tr>
<td>ME351 Automatic Control</td>
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</tr>
</tbody>
</table>

**Year IV**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics IIIB or Part III Schedule B Subject</td>
<td>8</td>
</tr>
<tr>
<td>ME313 Engineering Design</td>
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</tr>
<tr>
<td>ME333 **Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME352 Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME372 Heat Transfer</td>
<td>1</td>
</tr>
<tr>
<td>ME373 Thermodynamics</td>
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</tr>
<tr>
<td>GE350 Seminar</td>
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<tr>
<td>CE303 Structural Design</td>
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</table>

**Year V**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME481 Engineering Administration</td>
<td>1</td>
</tr>
<tr>
<td>ME482 **Engineering Economics</td>
<td>1</td>
</tr>
<tr>
<td>ME496 Project/Seminar</td>
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</tr>
<tr>
<td>ME381 Methods Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME383 **Quality Engineering</td>
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<tr>
<td>ME384 Design for Production</td>
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<tr>
<td>ME487 O.R.—Deterministic Models</td>
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<tr>
<td>ME488 O.R.—Probabilistic Models</td>
<td>1</td>
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<tr>
<td>GE350 Seminar</td>
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</tr>
</tbody>
</table>

**Electives**

**Total Units**: 13

---

*A combined course leading to admission to the degree of Bachelor of Metallurgy and Bachelor of Mathematics as approved by the Faculty Boards of Mathematics and Engineering shall include Mathematics I, Mathematics IIA, Mathematics IIC, Mathematics IIIA and either Mathematics IIIB or a Part III subject chosen from Schedule B of the Schedule of Subjects approved for the degree of Bachelor of Mathematics and other subjects to a minimum of 50 units taken from the schedule of subjects approved for the degree of Bachelor of Metallurgy.*
**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING**

The candidate shall complete all requirements for the Bachelor of Engineering in Chemical Engineering and comply with the requirements of the Faculty of Science for the degree of Bachelor of Science with the provision that Engineering I is recognised as a Science part I subject and Chemical Engineering I as a Science part II subject (Clause 12b of the Science degree requirements) and that a subject taken for the Science degree may be accepted as Elective II for the Engineering degree. Normally the requirements for the Bachelor of Science degree shall be completed before the candidate enrols for the final year of the Engineering degree.

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

**Subject**

<table>
<thead>
<tr>
<th>Year</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
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</tr>
<tr>
<td>Physics IA</td>
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</tr>
<tr>
<td>Met141</td>
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</tr>
<tr>
<td>Microstructure of Materials</td>
<td></td>
</tr>
<tr>
<td>Met151</td>
<td>1</td>
</tr>
<tr>
<td>Atom Structure of Materials</td>
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<tr>
<td>Met182</td>
<td>1</td>
</tr>
<tr>
<td>Electronic Structure of Materials</td>
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</tr>
<tr>
<td>Met121</td>
<td>1</td>
</tr>
<tr>
<td>Chemical Metallurgy</td>
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<tr>
<td>ME11</td>
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<tr>
<td>Graphics</td>
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<td>ME112</td>
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</tr>
<tr>
<td>Engineering Drawing &amp; Elementary Design</td>
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<tr>
<td>ChE101</td>
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<td>Industrial Process Principle</td>
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<td>ME121</td>
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<td>Workshop Practice</td>
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<td></td>
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<tr>
<td><strong>II</strong></td>
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</tr>
<tr>
<td>Mathematics IIA</td>
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<td>Mathematics IIC</td>
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<td>Met221</td>
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<td>Metallurgical Thermodynamics</td>
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<td>Met212</td>
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<td>Metallurgical Stoichiometry</td>
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<td>Applied Statistics</td>
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<td>Rate Processes</td>
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<tr>
<td>Extration Metallurgy</td>
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<tr>
<td>Met252</td>
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<td>Metallography</td>
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<tr>
<td>Microplasticity</td>
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<td>Met271</td>
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<tr>
<td>Fabrication Metallurgy</td>
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<td></td>
</tr>
<tr>
<td><strong>III</strong></td>
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<td>Met301</td>
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<td>Communication Skills</td>
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<td>ChE331</td>
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<td>Met391</td>
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<tr>
<td>Metallurgy Laboratory</td>
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<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>Met.392</td>
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<tr>
<td>Elective Units (see note below)</td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>16</td>
</tr>
<tr>
<td>Mathematics IIB</td>
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</tr>
<tr>
<td>6 Met300 subjects</td>
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</tr>
<tr>
<td>Elective units (see note below)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td><strong>V</strong></td>
<td>16</td>
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<td>Metallurgy 400 units</td>
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<td>Met401</td>
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<tr>
<td>Directed Reading</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total units</strong></td>
<td>78</td>
</tr>
</tbody>
</table>

* First half year
** Second half year
1 To include Topics A, C, D and E
2 To include Topics F, G, K and L
3 or a Schedule B elective

**Electives**

Of the elective units in the combined degree course, no more than four may be taken from the list for Elective I in the Bachelor of Metallurgy degree schedule. Mathematics II Topic B (EM2B) should be included as an elective.

The elective list covering subjects which may be taken in lieu of Mathematics IIB is given in Schedule B of the degree of Bachelor of Mathematics.

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

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

**Year V**

| Science Subject Part I | 4 |
| Science Subject Part II | 5 |
| Science Subject Part III | 8 |

**Note**

Students wishing to major in Mathematics should ensure that Mathematics IIB in the B.E. programme is replaced by Mathematics IIA as necessary co- and pre-requisites to Mathematics IIC and Mathematics IIIA respectively.
**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING**

**In Electrical Engineering**

In addition to the requirements for the B.E. with the relevant elective requirements selections as shown in Appendix A, the combined degree student is required to undertake one year in the relevant non-engineering faculty. This year may be taken after completion of the third or the fourth year of a B.E. programme. For some, there may be advantages for taking this year after completing the four year B.E. requirements but before taking out a B.E. degree.

**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING**

**In Mechanical Engineering**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td></td>
</tr>
<tr>
<td>Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry IS</td>
<td>2</td>
</tr>
<tr>
<td>ME121 Workshop Practice</td>
<td>1</td>
</tr>
<tr>
<td>ME122 Process Technology</td>
<td>1</td>
</tr>
<tr>
<td>Met151 Microstructure of Materials</td>
<td>1</td>
</tr>
<tr>
<td>With approval of Head of Department, Chemistry I (4 units) may be taken in lieu of Chemistry IS, Met151 and ME122.</td>
<td>17</td>
</tr>
<tr>
<td>Year II</td>
<td></td>
</tr>
<tr>
<td>Mathematics IIA</td>
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</tr>
<tr>
<td>Mathematics IIC</td>
<td>4</td>
</tr>
<tr>
<td>Physics II</td>
<td>4</td>
</tr>
<tr>
<td>ME201 *Laboratory Measurements</td>
<td>1</td>
</tr>
<tr>
<td>ME202 *Dynamics of Engineering Systems</td>
<td>1</td>
</tr>
<tr>
<td>ME251 *Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME271 **Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td>Year III</td>
<td></td>
</tr>
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1. First half year
2. Second half year

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**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING**

**In Industrial Engineering**

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1. See Elective Requirements — Appendix A.

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**BACHELOR OF SCIENCE/BACHELOR OF ENGINEERING**

**In Industrial Engineering**

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### Subject
- **ME213** Engineering Design
- **ME342** Properties of Materials
- **ME343** Mechanics of Solids
- **ME381** Methods Engineering
- **ME383** Quality Engineering
- **ME384** Design for Production
- **ME487** Operations Research — Deterministic Models
- **ME488** Operations Research — Probabilistic Models

**Year V**
- **ME313** Engineering Design
- **ME333** Dynamics of Machines
- **ME361** Automatic Control
- **ME385** Accounting & Financial Studies
- **ME496** Project/Seminar

### Units
- **ME313** 1
- **ME333** 1
- **ME361** 2
- **ME385** 4
- **ME496** 1

### 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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**Chemical Engineering**

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**Elective**

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514100 | Chemical Engineering III | 514111 CBE402 Seminar 514112 CBE411 Process Engineering plus at least 6 of 514113 CBE414 Advanced Reaction Engineering II 514114 CBE415 Advanced Transport Theory 514115 CBE416 Advanced Process Control 514116 CBE421 Multicomponent Separations 514120 CBE422 Particle Mechanics 514121 CBE423 Environmental Control 514112 CBE424 Radiant Heat Transfer

514110 | ChE421 Multicomponent Separations 514120 | CBE422 Particle Mechanics 514121 | CBE423 Environmental Control 514114 | CBE424 Radiant Heat Transfer

514200 | Projects II | 509200 | Elective II 514220 | Process Engineering 514240 | Design Project

**B.E. and B.Sc. (Eng.) in Civil Engineering**

521101 | CE111 Statics 541101 | ME111 Graphics 541102 | ME112 Engineering Drawing & Elementary Design 541103 | ME113 Dynamics 661100 | Mathematics I 741200 | Physics IA 721900 | Chemistry IS 521104 | CE171 Engineering Surveying I 662200 | Mathematics II B 662109 | Topic C0 662104 | Topic D 662204 | Topic H


**Electives**


**B.E. in Computer Engineering**

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List 1

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| 533116          | EE345 Digital Signal    |                 | Processing                          |
| 534139          | EE441 Sample Data Control Systems | |                                           |
| 534140          | EE442 Nonlinear Control |                 |                                     |
| 534132          | EE443 Optimization      |                 | Techniques                          |
| 534141          | EE446 Linear Optimal    |                 | Control                             |
| 534145          | EE462 Topics in Switching Theory |         |                                     |
| 544451          | ME401 Systems Analysis  |                 |                                     |
| 544452          | ME402 Systems Planning, Organization & Control | |                                           |
| 544417          | ME404 Mathematical      |                 | Programming                         |
| 544462          | ME405 Advanced Engineering |                | Computations                        |
| 544841          | ME487 Operations        |                 | Research: Deterministic Models      |
| 544842          | ME488 Operations        |                 | Research: Probabilistic Models      |
| 544843          | ME489 Operations        |                 | Research: Applications in Industry  |
| 410103          | Commercial Programming  |                 |                                     |
| 410104          | Systems Analysis & Design |                 |                                     |
| 663114          | EM3U Operations         |                 |                                     |
| 663117          | EM30 Mathematical Logic  |                 |                                     |
| 663112          | EM3Z Mathematical        |                 | Principles of Numerical Analysis    |

Not offered in 1978

B.E. and B.Sc. (Eng.) in Electrical Engineering

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Other 300-400 Level Subjects

If counted as subjects place on the left hand side of the enrolment form, if elective units place on the right hand side level with or below 509400 Electives.

| 533111          | EE315 Power Electronics  | |                                           |
| 533108          | EE324L Electronics       | |                                           |
| 533110          | EE342 Linear System Theory | |                                           |
| 533116          | EE345 Digital Signal     | |                                           |
| 533218          | EE351 Electromagnetic Propagation & Antennas | |                                           |
| 533220          | EE362 Switching Theory & Logical Design | |                                           |
| 533208          | EE380 Project/Directed Reading | |                                           |
| 534107          | EE415 Power Systems      | |                                           |
Other 300-400 Level subjects (cont.)
534144 EE416 Advanced Electrical Machine Theory
534109 EE421 Electronic Design A
534110 EE422 Electronic Design B
534139 EE441 Sample Data Control Systems
534140 EE442 Nonlinear Optimal Control
534132 EE443 Optimization Techniques
534141 EE446 Linear Optimal Control
534114 EE447 Digital Communications
534142 EE448 High Frequency Circuits & Devices
534145 EE462 Topics in Switching Theory
534140 EE463 Computer Operating Systems
534145 EE464 Compiler Construction
534124 EE481 Industrial Experience Units

Industrial Experience Units

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B.E. & B.Sc. (Eng.) in Mechanical & Industrial Engineering

Years I & II

721900 Chemistry I
661100 Mathematics I
741200 Physics I
521101 CE111 Statics
541101 ME111 Graphics
541102 ME112 Engineering Drawing & Elementary Design
541201 ME121 Workshop Practice
541202 ME122 Process Technology
541303 ME131 Dynamics
111151 Met151 Microstructure of Materials

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Departmental Technical Electives

If the following are to be counted as subjects they should be written on the left hand side of the enrolment form but if they are to be elective units they should be written as follows:

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<td>544406 ME416 Design of Pressure Vessels etc.</td>
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Elective components
1 unit selected from

Elective components
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### B.E. in Industrial Engineering
#### Years III & IV

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