THE DEAN'S FOREWORD

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

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

The role of universities in modern society is a changed one. Not only is it necessary to preserve the ideals of learning and associated fundamental research, it has become equally important for universities to become increasingly involved in the advancement of science and technology necessary for modern industrial and economic development. In this respect the role of the University Engineering Faculty in applied and industrially orientated research is an important one. The Faculty of Engineering through its research and associated projects undertaken on behalf of Australian industry, has already made a significant contribution.

In the light of the foregoing comments, the Faculty of Engineering has continued to update course material to meet the current and future standards of the professions and the needs of society. To ensure that this is done effectively, it is essential to maintain a stimulating learning environment, teaching and assessment methods. While the various courses provide the essential depth of study in the principal technical fields, we believe it to be of importance that students gain some breadth in their educational experience. In the various degree programmes the opportunity exists for students to take some subjects in other Faculties. The rationale for this is obvious; while the role of the professional Engineer or Surveyor may be seen as providing technical solutions to technical problems, he or she must also be acutely aware of the social implications of the decisions being made. The inter-relation of the professions and society is one of growing importance.

The opportunity to obtain a well-rounded tertiary educational experience is embodied in the very concept of the University system. The University environment, with its excellent campus and facilities, together with the many extra-curricular activities, creates an opportunity for obtaining a total experience, indeed a unique experience, in one's lifetime. For this reason I would encourage you to take full advantage of the opportunities available to you and, where time permits, take an active interest in the various facets of University life.

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

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

A.W. Roberts, Dean, Faculty of Engineering.
ADVICE AND INFORMATION

This Handbook is intended to provide you with all the information you need about the Faculty of Engineering and the courses which are offered within it. Students are assumed to be familiar with the information it contains which relates to their own course of study and to general University and Faculty requirements.

As course requirements and other aspects of the University do not remain static, students are advised to purchase a copy of the Handbook annually in order to become aware of changes and to retain it so as to provide a record of their course content.

Further advice and information about the Faculty of Engineering can be obtained from a number of people.

General Information
Enquiries regarding general matters such as University Regulations and procedures, Faculty rules and policies, admission, enrolment and re-enrolment, and studies within the Faculty generally, may be directed to:

THE FACULTY SECRETARY  Mr. G.D. Gordon
THE SUB-DEAN OF THE FACULTY  Dr. W.G. Field
THE DEAN OF THE FACULTY  Professor A.W. Roberts

Academic Advice
Academic advice and general enquiries regarding the content of particular courses may be obtained from the following members of academic staff.

CHEMICAL ENGINEERING  Mr. J. Roberts or Professor G.J. Jameson
CIVIL ENGINEERING  Dr. W.G. Field or Professor R.E. Melchers
COMPUTER ENGINEERING  Professor A. Cantoni or Associate Professor R.J. Evans
ELECTRICAL ENGINEERING  Dr. R.E. Betz or Associate Professor R.J. Evans
INDUSTRIAL ENGINEERING  Mr. G.D. Butler or Professor A.W. Roberts
MECHANICAL ENGINEERING  Mr. G.D. Butler or Professor A.W. Roberts
METALLURGY  Professor E.O. Hall or Dr. J.D. Browne

Personal Counselling
Students may wish to discuss matters relating to course difficulties or options with the Faculty Secretary (room EA209) or any of the persons listed above.

Members of the University Counselling Service are also available for entirely confidential consultation on any matter. The Counselling Service is situated on the lower ground floor of the McMullin Building. An appointment is usually required.

Faculty Staff

About This Section
This section contains the list of the academic, professional and office staff of the Faculty of Engineering, in departmental divisions, at the date of publication of the Handbook.
FACULTY OF ENGINEERING

Dean
Professor A.W. Roberts, BE, PhD(New South Wales), ASTC, FIEAust, MI MechE, MAIE

Deputy Dean
Professor G.J. Jameson, BSc(New South Wales), PhD(Cambridge), ASTC, CEng, MI ChemE

Sub-Dean
W.G. Field, BE(New South Wales), PhD, ASTC

Faculty Secretary
G.D. Gordon, BA

Faculty Administrative Assistant
Dianne Oughton, BA, MLitt(New England)

Professor of Engineering
D.W. George, AO, BSc, BE, PhD(Sydney), FTS, FIEE, FIMechE, FIEAust, FAIP (Vice-Chancellor and Principal) (Personal Chair)

Department of Chemical and Materials Engineering

Professors
E.O. Hall, MSc(New Zealand), PhD(Cambridge), MAusIMM, (Professor of Metallurgy)
G.J. Jameson, BSc(New South Wales), PhD(Cambridge), ASTC, CEng, FIChemE, FIEAust, FRACI (Professor of Chemical Engineering), (Head of Department)

Associate Professors
W.A. Oates, BSc(London), MSc, CEng, FIM(London)
T.F. Wall, PhD, FRMITChemEng), CEng, MIEAust, FInstF, MCombI, MChemE, FAIE

Senior Lecturers
J.D. Browne, BSc(London), MSc(New South Wales), PhD(Monash), MAIP
K. Lynne-Smith, BE(Sydney), MSc(New South Wales), PhD
N.A. Molloy, BE(Queensland)
G.E. Murch, BSc, PhD, DSc(Adelaide), FRACJ, MACs, MASM
J. Roberts, BSc(New South Wales), ME, ASTC, ARACI, MAWWA

Lecturer
G.E. Evans, BE, GradM.IChemE

Senior Research Fellows
J.S. Truskova, BSc, PhD(Sydney), FInstF, MCombI
L.J. Wibenberly, BSc, PhD, MIEAust, AIE, MCombI

Research Fellow
D. Phong-Anant, BE, PhD, MIEAust, AIE, MCombI

Post Doctoral Research Fellow
P. Glaws, BSc(Lafayette College), ME, PhD(Carnegie Mellon, USA)

Professional Officers
J.A. Grahame, ASTC
D.D. Todd, MSc(New South Wales), PhD, ASTC, ARACI, DipOen(ORI Surrey)
J.B. Wauders, BE, MEngSc, ARACI

Departmental Office Staff
Gillian B. Hensman
Elizabeth M. Viner

Honorary Professors
G.R. Belton, BSc, PhD(London), DCE(London)
I. McC Stewart, AM, MEE(Queensland), SM(Massachusetts Institute of Technology), CEng, MIEAustE, FInstF, MAusIMM, MCombI, FIEAust

Department of Civil Engineering and Surveying

Professor
R.E. Melchers, BE, MEngSc(Monash), PhD(Cantab), DipEd(Monash), MICE, MIEAust, (Professor of Civil Engineering), (Head of Department)

Associate Professor
J.G. Fryer, BSurv, PhD(New South Wales), MIAust, (Director of Surveying Studies)

Senior Lecturers
F.L. Clarke, BSurv(New South Wales), PhD, LS, FISAust
M.H. Effie, DipSurvSc(Sydney), DipT&CP(Sydney), LS, MISAust
W.G. Field, BE(New South Wales), PhD, ASTC
B.S. Heaton, BE(New South Wales), ME, ASTC, MIEAust
P.W. Kleeman, BE(Adelaide), FSASM
A.W. Page, BE(New South Wales), PhD, ASTC, MIEAust

Lecturers
G.A. Kuczera, BE, MEngSc(Melbourne), PhD(Stanford), MIAust
H.L. Mitchell, BSurv, PhD(New South Wales), MIAust
I.D. Moore, BE, PhD(Sydney)
S. Panangaden, BS(University of Toronto), MS, PhD(Hebrew), MIAust, MiranSSE
R.C. Patterson, BSurv, BSc, MScSurvSc, MStat NST(Western Australia), MIAust
S.W. Sloan, BE, MEngSc(Monash), MPhil, PhD(Cambridge)
B.J. Williams, BE(Adelaide), MEngSc(New South Wales), PhD(Stanford)

Professional Officers
R.G. Hanson, BE(Canterbury), DipBusStud, MIAust, GradPenZ
R.J. Mayne, BE, GradIEAust

Senior Technical Officer
J.B. Leis

Technical Officers
M.W. Dann
H.C. Gennette

Laboratory Assistant
P.A. Bowe

Senior Laboratory Craftsmen
T.H. Fryer
L.L. McLardy

Departmental Office Staff
Cherie E. Hook
Anne Robotham

Computer Programmer
J.D. Hendricks, BSc

Department of Electrical and Computer Engineering

Professors
A. Cantoni, BE, PhD(Western Australia), SMIEE(Professor of Computer Engineering)
G.C. Goodwin, BSc, BE, PhD(New South Wales), FIEEE, MIAust(Professor of Electrical Engineering)
Associate Professor
R.J. Evans, BE(Melbourne), ME, PhD, MIEEE, (Head of Department)

Senior Lecturers
D.J. Hill, BE, BSc(Queensland), PhD, MIEEE, MSIAM
P.J. Moylan, BE(Melbourne), ME, PhD, MIEEE, AMACS

Lecturers
R.F. Betz, ME, PhD, MIEEE
S.W. Chan, BE, PhD
B.J. Cook HND(Elect)(Plymouth Polytechnic), PhD(Bristol), MIEEE, CEng
C.E. De Souza, BE(Pernambuco, Brazil), Dr-Ing(Paris 6), MIEEE
R.H. Middleton, BE, BSc, PhD

Professional Officer
R.W. Goodhew, BE(New South Wales), ASTC, MIEEE, AMIEE

Departmental Office Staff
Marcia Conn
Greta Davies
Roslyn Thrift, BSc

Department of Mechanical Engineering

Professors
R.A. Antonia, BE, MEngSC, PhD(Sydney), FIEAust, FRMS(Professor of Mechanical Engineering)
A.W. Roberts, BE, PhD(New South Wales), ASTC, FIEAust, MIMechE,
MAIE (Professor of Industrial Engineering) (Head of Department)

Associate Professor
E. Betz, ME, PhD(New South Wales), ASTC, FIEAust, MASME

Senior Lecturers
L.W.B. Browne, BE(Sydney), PhD
G.D. Butler, BE(New South Wales), MSc(Cranfield), ASTC, MIEEE
A.J. Chambers, BE(New South Wales), ME, PhD(Stanford), MIEEE
J.W. Hayes, BE, MEngSc(Sydney), MIEEE, MAIE, AMORSA, MASOR
K.L. Hitz, BE(New South Wales), PhD
R.D. Parnbery, BSc, ME, PhD, MIEEE
H.A. Willens, BE(New South Wales), ME, DipNavalArch, MTS(Dordrecht), ASTC,
MRINA
D.H. Wood, BE, MEngSc(Sydney), PhD(London), DIC

Lecturers
B.J. Hill, BSc(Eng), MEngSc, PhD, GradIEAust
D.C. Rye, BE(Adelaide), GradIEAust, MAHS
D.H. Wood, BE, MEngSc(Sydney), PhD(London), DIC
O.J. Scott, ME

Professional Officers
J.A. Lewis, BSc(New South Wales), ME, PhD, ASTC, MIEEE, AMIEE, AMAM
M. Ooms, BE
R.J. Scobie, ASTC

Departmental Office Staff
Marcia M. Couper
Pamela Falkiner
Isabel Sherwood
Lyn Thomas

General Information about the Faculty

About This Section
This section contains general information about the Faculty of Engineering and the degree programmes which are offered within it.
Degree Regulations and Undergraduate Course Programmes are given in separate sections of this Handbook.
THE FACULTY

The Faculty of Engineering is constituted by the Council of the University under By-law 2.4.1 and is comprised of the Department of Chemical and Materials Engineering, the Department of Civil Engineering and Surveying, the Department of Electrical and Computer Engineering and the Department of Mechanical Engineering.

The Faculty Board, Faculty of Engineering, is charged with conducting the affairs of the Faculty and includes the Vice-Chancellor (ex officio), the Dean of the Faculty, the members of the full-time academic staff of the Faculty, representatives of other faculties and departments of the University, and four student members. The Dean is Chairman and executive officer of the Faculty Board.

The responsibilities of Faculty Boards are set out in By-law 2.4.4 and other By-laws and Regulations of the University.

DEGREES AND DIPLOMAS

The awards which may be made by the University to persons presented by the Faculty of Engineering are listed below.

Undergraduate Degrees

Bachelor of Engineering (BE) which is awarded in the specialities of:
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Industrial Engineering
- Mechanical Engineering
- Bachelor of Metallurgy (BMet)
- Bachelor of Surveying (BSurv)
- Bachelor of Science (Engineering)(BSc(Eng))
- Bachelor of Science (Metallurgy)(BSc(Met))

Postgraduate Diplomas

Diploma in Industrial Engineering (DipIndEng)
Diploma in Surveying (DipSurv)

Postgraduate Degrees

Master of Engineering Science (MEngSc)
Master of Engineering (ME)
Master of Science (MSc)
Doctor of Engineering (DEng)
Doctor of Philosophy (PhD)
Doctor of Science (DSc)

UNDERGRADUATE DEGREE COURSES

ENGINEERING

Bachelor of Engineering (BE) degree courses are offered in the following specialities:
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Industrial Engineering
- Mechanical Engineering

In addition, a structured process metallurgy option is available within the Chemical Engineering programme.

Each engineering degree programme may be completed by four years full-time or equivalent part-time study. A minimum of seven years study is required to complete a course entirely on a part-time basis, however, students may choose to combine years of full-time study with years of part-time study as their commitments permit. It is also possible to follow a ‘thick sandwich’ pattern of attendance by which full-time study and part-time industrial experience are alternately undertaken on an annual basis. It is recommended that at least the final year of study be taken on a full-time basis.

Engineering courses are highly structured and, although each follows a similar pattern, the content of the courses naturally differ according to the needs of the speciality concerned.

In Year I students study mathematics and the basic sciences as well as commencing studies in the engineering sciences. Year II programmes continue studies in mathematics and, where applicable, basic sciences. The scope of engineering studies is also widened. Year III consists of major engineering subjects and is generally regarded as the core of the programme. In the final year these studies may be extended by the inclusion of specialist topics which may enable the student to concentrate on one or two particular subjects areas or to gain a wide range of specialist knowledge. Engineering programmes also make provision for non-engineering elective subjects to be included in the degree programme. The final year project, in which students may undertake extensive studies in an area of special interests, is a particular feature of engineering programmes at Newcastle.

Engineering programmes are regularly reviewed in order to incorporate the latest developments relevant to each specialisation. The currently Approved Programme for each course is set out in Section 5 of this Handbook.

In addition to the full degree programmes offered in the Faculty, students may commence studies in Mining Engineering and Naval Architecture by completing the first two years of the full time programmes in Civil Engineering or Mechanical Engineering respectively. Students choosing to follow these programmes may complete their studies at the University of New South Wales.

Honours

Honours are awarded on the basis of performance during the entire course programme (see Faculty Policies section).

Accreditation

Each engineering programme is recognised as meeting the full academic requirements for corporate membership of the Institution of Engineers, Australia (IEAust) and recognised by a number of overseas professional bodies.
The Computer Engineering programme is also accredited by the Australian Computer Society as satisfying that organisation's highest level of academic requirements.

The Chemical Engineering programme also meets requirements for membership of the Institution of Chemical Engineers (Great Britain) and is recognised by the Royal Australian Chemical Institute and the Australian Institute of Energy.

Combined Degree Programmes
Each of the BE programmes may form part of a combined degree programme leading to the award of a second degree by a total of five year's full-time study. Programmes have been approved which lead to the award of the BE degree in any speciality together with Bachelors degrees in Arts (BA), Commerce (BCom), Economics (BEC), Mathematics (BMath) or Science (BSc). Combined degree programmes are normally entered after completion of the first year of an engineering programme with an average of credit or WAM of 70.

SURVEYING
The Bachelor of Surveying (BSurv) programme is offered as a four year full-time or equivalent part-time course on a similar basis to that of engineering programmes. In addition to Mathematics and Physics, the course also deals with Economics and Law as well as the technical aspects of cadastral surveying, engineering surveying, topographical surveying, geodetic surveying and hydrographic surveying. The currently approved programme is set out in Section 5 of this Handbook.

The course meets the academic prerequisites for an application for registration under the Surveyors Act, 1929 (as amended). In order to become a Registered Surveyor in NSW it is necessary for a graduate to serve a period under articles and meet other requirements of the Board of Surveyors of NSW. Enquiries on this aspect should be directed to the Registrar of the Board of Surveyors of NSW.

METALLURGY
The Council of the University has resolved that no new students will be enrolled in the Bachelor of Metallurgy (BMet) Programme. It is, however, expected that the degree will continue to be awarded to students already enrolled in the programme for some years to come.

POSTGRADUATE DIPLOMA COURSES

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

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

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

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

DIPLOMA IN SURVEYING
The Department of Civil Engineering and Surveying is responsible for the teaching of subjects which form the core of the Diploma in Surveying.

The Diploma in Surveying is a postgraduate course designed to broaden and further the education of the practising surveyor. Recent technological changes have significantly altered the role and operational techniques of surveyors. Many items of equipment and computational methods now in use were unknown ten to fifteen years ago. The course has a twofold objective. Primarily, it has been designed as a bridging course for surveyors with the professional qualification of the Reciprocating Surveyors Boards of Australia and New Zealand. University Degree Courses in Surveying were not available when these surveyors passed the examinations set by those Boards. As a consequence, the variety and depth of the modern curriculum was not available to these people. The Diploma in Surveying is seen as broadening and updating their professional training with a choice of subjects designed to complement their current knowledge. For those surveyors who already have had, in their undergraduate programme, a comprehensive training in the modern developments in surveying, 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 important applications in some fields of surveying.

The Diploma programme consists of ten units of 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 basis.

The regulations for the Diploma in Surveying, and the Schedule of Subjects available is set out in Section 3 of this Handbook.
POSTGRADUATE DEGREE PROGRAMMES

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

A number of the Departments of the Faculty of Engineering offer subjects which comprise the major part of the Master of Engineering Science degree programme.

The Master of Engineering Science degree course is offered on both a part-time and full-time basis in order to give graduate engineers the opportunity to update themselves in technological areas of interest. This degree course is flexible in that candidates for the degree may select from a large number of subject combinations which may span one or more engineering Departments. Some undergraduate or postgraduate material may be taken from inside or outside the Faculty of Engineering as credit for the degree, provided that such material is relevant to the programme as a whole.

The Regulations for the Master of Engineering Science degree and the list of approved subjects are set out in Section 3 of this Handbook.

This degree programme is currently under review within the Faculty.

MASTER OF ENGINEERING
The Master of Engineering degree has the primary aim of introducing the student to postgraduate research. Course work may be included in the programme. The quality and standard of work required in the thesis will be at a substantially higher level than that expected of an Honours Bachelor of Engineering graduate.

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

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

The Regulations for the Master of Science degree are set out in Section 3 of this Handbook.

MASTER OF SURVEYING
The Master of Surveying 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 not normally be included in the programme, and the quality and standard of work required in the thesis will be at a substantially higher level than that expected of an Honours Bachelor of Surveying graduate.

The Regulations for the Master of Surveying degree are set out in Section 3 of this Handbook.

DOCTOR OF PHILOSOPHY
In addition to the above degrees it is possible to register for candidature for the degree of Doctor of Philosophy in each Department in the Faculty. Persons wishing to obtain information on the requirements for the degree should address enquiries to: The Secretary, University of Newcastle, New South Wales 2308.
Section 3

Degree Regulations

About This Section
This section contains the University Regulations regarding the Bachelor's Degrees and Postgraduate coursework Degrees and Diplomas offered in the Faculty of Engineering.
REGULATIONS GOVERNING BACHELOR DEGREES

General
1. These Regulations are made in accordance with the powers vested in the Council under By-law 5.2.1 and prescribe the conditions and requirements relating to the degrees of Bachelor of Engineering, Bachelor of Metallurgy, Bachelor of Surveying, Bachelor of Science (Engineering) and Bachelor of Science (Metallurgy).

Definitions
2. (1) In these Regulations, unless the context or subject matter otherwise indicates or requires:
   "course" means the total requirements as prescribed in the schedule to qualify a candidate for the award of the degree;
   "Dean" means the Dean of the Faculty of Engineering;
   "degree" means the degree of Bachelor of Engineering, Bachelor of Metallurgy, Bachelor of Surveying, Bachelor of Science (Engineering) or Bachelor of Science (Metallurgy) as the case may be;
   "Department" means the department or departments offering a particular subject and includes any other body doing so;
   "Faculty Board" means the Faculty Board, Faculty of Engineering;
   "responsible department" means the department designated as such in the schedule;
   "Schedule" means the Schedule to these Regulations relevant to the degree in which a person is enrolled or proposing to enrol;
   "subject" means any part of the course for which a result may be recorded.

(2) The unit value of a subject for the purposes of these Regulations shall:
(a) in the case of subjects offered by Departments of the Faculty of Engineering, be calculated on the basis that approximately 42 hours of lectures, tutorials and laboratory work equals one unit;
(b) in the case of any subject offered only in the second half of the academic year, the last Monday of second term;
(c) in the case of any other subject, the last Monday of first term.

Enrolment
3. In any year a candidate shall enrol only in those subjects approved by the Dean or his nominee.

Standing
4. The Faculty Board may grant to a candidate standing in specified and unspecified subjects not exceeding the unit value specified in the Schedule in recognition of work completed in this University or another institution, subject to the following:
(a) Standing in a specified subject shall be granted only on the recommendation of the Head of Department.
(b) Standing in an unspecified subject shall be granted only on the recommendation of the Head of the responsible department.
(c) Where standing has been granted in unspecified subjects the Faculty Board on the recommendation of the Head of the responsible department:
   (i) shall prescribe the course (not consistent with that specified in the Schedule) which the candidate is required to undertake; and
   (ii) may specify the area of study for which the standing is granted for the purposes of the core programme prescribed by the Senate as required in the Schedule.

Prerequisites and Corequisites
5. (1) The Faculty Board on the recommendation of the Head of Department may prescribe prerequisites and/or corequisites for a subject.
(2) Except with the approval of the Dean, a candidate may not enrol in a subject unless he or she has passed any subjects prescribed as its prerequisites and has already passed or concurrently enrols in or is already enrolled in any subjects prescribed as its corequisites.

Withdrawal
6. (1) A candidate may withdraw from enrolment in a subject or the degree only by informing the Secretary to the University in writing and the withdrawal shall take effect from the date of receipt of such notification.
(2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty. The relevant date shall be:
(a) in the case of any subject offered only in the first half of the academic year, the last Monday of first term;
(b) in the case of any subject offered only in the second half of the academic year, the fourth Monday of third term;
(c) in the case of any other subject, the last Monday of second term.

Subject Requirements
7. (1) To complete a subject, a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written or other work as the Department shall require.
(2) To pass a subject a candidate shall complete it and pass such examinations as the Faculty Board shall require.

Grading of Degrees
8. (1) The degree shall be conferred as an ordinary degree except that in cases where a candidate's performance in the course has reached a standard determined by the Faculty Board the degree may be conferred either with merit or with honours as provided in the Schedule.
(2) A degree with honours † shall be conferred in one of the following grades:
   (a) Class I;
   (b) Class II, Division 1; or
   (c) Class II, Division 2.

Admission to Degree
9. To qualify for admission to the degree a candidate shall satisfy the requirements prescribed in the Schedule. †

† Refer also to Faculty Policies on Undergraduate Performance and Progress.
Combined Degree Courses

10. (1) A candidate may complete the requirements for the degree in conjunction with another Bachelor degree by completing a combined course approved by the Faculty Board and also the Faculty Board of the Faculty offering that other Bachelor degree.

(2) Admission to a combined degree course —
(a) shall be subject to the approval of the Deans of the two Faculties;
(b) shall, except in exceptional circumstances, be at the end of the candidate's first year of enrolment in a degree; and
(c) shall be restricted to candidates who in their first year of enrolment have achieved a standard of performance deemed satisfactory for the purposes of admission to a combined degree course by the Faculty Board.

(3) The work undertaken by a candidate in a combined degree course shall be no less in quantity and quality than if the two courses were taken separately as shall be certified by the Deans of the two Faculties concerned.

(4) To qualify for admission to the two degrees a candidate shall satisfy the requirements for both degrees.

Exceptional Circumstances

11. In order to provide for exceptional circumstances arising in a particular case, the Senate on the recommendation of the Faculty Board may relax any provision of these Regulations.

Schedule 1 — Bachelor of Engineering

1. The degree may be conferred in the following areas of specialisation:
   Chemical Engineering
   Civil Engineering
   Computer Engineering
   Electrical Engineering
   Industrial Engineering
   Mechanical Engineering

2. For the purposes of these Regulations the responsible department with respect to each area of specialisation shall be:
   Department of Chemical and Materials Engineering — Chemical Engineering
   Department of Civil Engineering and Surveying — Civil Engineering
   Department of Electrical and Computer Engineering
   Department of Mechanical Engineering — Mechanical Engineering

3. (a) To qualify for admission to the degree in any area of specialisation a candidate shall:
   (i) pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than 60 units; and

Schedule 2 — Bachelor of Metallurgy

1. For the purposes of these Regulations the responsible department for the degree shall be the Department of Chemical and Materials Engineering.

2. (a) To qualify for admission to the degree a candidate shall:
   (i) pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than 60 units; and
   (ii) satisfy the industrial experience requirements prescribed by the Faculty Board.

(b) The programme referred to in section 2(a)(i) of this Schedule shall include the core programme prescribed from time to time by the Senate.

3. A candidate may be granted standing in a maximum of 32 units under the provisions of Regulation 4 of these Regulations.

4. The degree may be conferred as a degree with honours.

Schedule 3 — Bachelor of Surveying

1. For the purposes of these Regulations the responsible department for the degree shall be the Department of Civil Engineering and Surveying.

2. (a) To qualify for admission to the degree a candidate shall:
   (i) pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than 60 units; and
   (ii) satisfy the industrial experience requirements prescribed by the Faculty Board.

(b) The programme referred to in section 2(a)(i) of this Schedule shall include the core programme prescribed from time to time by the Senate.

3. A candidate may be granted standing in a maximum of 32 units under the provisions of Regulation 4 of these Regulations.

4. The degree may be conferred as a degree with honours.
Schedule 4 — Bachelor of Science (Engineering)

1. The degree of Bachelor of Science (Engineering) shall be conferred only on a candidate specialising in the area of Chemical Engineering.

2. For the purposes of these Regulations the responsible department for the degree shall be the Department of Chemical and Materials Engineering.

3. No candidate shall be permitted to enrol or re-enrol for the degree unless the candidate was enrolled for the degree prior to 1980.

4. (a) To qualify for admission to the degree a candidate shall, before March, 1987:
   (i) pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than 48 units; and
   (ii) satisfy the industrial experience requirements prescribed by the Faculty Board.

   (b) The programme referred to in section 4(a)(i) of this Schedule shall include the core programme prescribed from time to time by the Senate.

5. A candidate may be granted standing in a maximum of 25 units under the provisions of Regulation 4 of these Regulations.

6. The degree may be conferred as a degree with merit.

Schedule 5 — Bachelor of Science (Metallurgy)

1. For the purposes of these Regulations the responsible department for the degree shall be the Department of Chemical and Materials Engineering.

2. No candidate shall be permitted to enrol or re-enrol for the degree unless that candidate was enrolled prior to 1983.

3. (a) To qualify for admission to the degree a candidate who was enrolled for either the degree of Bachelor of Metallurgy or Bachelor of Science (Metallurgy) prior to 1983 shall:
   (i) pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than 48 units; and
   (ii) satisfy the industrial experience requirements prescribed by the Faculty Board.

(b) To qualify for admission to the degree a candidate who enrols for the degree of Bachelor of Metallurgy after 1982 shall:
   (i) pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than 45 units; and
   (ii) satisfy the industrial experience requirements prescribed by the Faculty Board.

(c) The programmes referred to in section 3(a)(i) and 3(b)(i) of this Schedule shall include the core programme prescribed from time to time by the Senate.

4. A candidate may be granted standing in a maximum of 25 units under the provisions of Regulation 4 of these Regulations.

5. The degree may be conferred as a degree with merit.

CORE PROGRAMMES

The following core programmes have been approved by the Senate.

I. BACHELOR OF ENGINEERING

Bachelor of Engineering in Chemical Engineering
Mathematics 6 units
Science 4 units
Engineering 100 level 4 units
Engineering 200 level 8 units
Engineering 300 level 8 units
Engineering 400 level 8 units

Bachelor of Engineering in Civil Engineering
Mathematics 6 units
Science 4 units
Engineering 100 level 4 units
Engineering 200 level 8 units
Engineering 300 level 8 units
Engineering 400 level 8 units

Bachelor of Engineering in Computer Engineering
Mathematics 6 units
Science 4 units
Computer Science 4 units
Engineering 100 level 4 units
Engineering 200 level 8 units
Engineering 300 level 8 units
Engineering 400 level 8 units

Bachelor of Engineering in Electrical Engineering
Mathematics 6 units
Science 4 units
Engineering 100 level 4 units
Engineering 200 level 8 units
Engineering 300 level 8 units
Engineering 400 level 8 units

Bachelor of Engineering in Industrial Engineering
Mathematics 6 units
Science 4 units
Engineering 100 level 4 units
Engineering 200 level 8 units
Engineering 300 level 8 units
Engineering 400 level 8 units

Bachelor of Engineering in Mechanical Engineering
Mathematics 6 units
Science 4 units
Engineering 100 level 4 units
Engineering 200 level 8 units
Engineering 300 level 8 units
Engineering 400 level 8 units
2. BACHELOR OF METALLURGY
Mathematics 6 units
Physics 4 units
Chemistry 4 units
Engineering 100 level 5 units
Metallurgy 200 level 8 units
Metallurgy 300 level 11 units
Metallurgy 400 level 10 units

3. BACHELOR OF SURVEYING
Mathematics 6 units
Physics 4 units
Surveying 100 level 4 units
Surveying 200 level 8 units
Surveying 300 level 9 units
Surveying 400 level 9 units

4. BACHELOR OF SCIENCE (ENGINEERING)
Mathematics 6 units
Physics 4 units
Chemistry 8 units
Engineering 100 level 1 unit
Chemical Engineering 100 level 1 unit
Chemical Engineering 200 level 5 units
Chemical Engineering 300 level 8 units
Chemical Engineering 400 level 1 unit

5. BACHELOR OF SCIENCE (METALLURGY)
Mathematics 6 units
Physics 4 units
Chemistry 4 units
Engineering 100 level 5 units
Metallurgy 200 level 8 units
Metallurgy 300 level 11 units

REGULATIONS GOVERNING DIPLOMAS

General
1. These Regulations are made in accordance with the powers vested in the Council under By-law 5.2.1 and prescribe the conditions and requirements relating to the Diploma in Industrial Engineering and the Diploma in Surveying.

Definitions
2. (1) In these Regulations and the Schedules thereto, unless the context or subject matter otherwise indicates or requires:
   - "course" means the total requirements as prescribed in the schedule to qualify a candidate for the award of the Diploma;
   - "Dean" means the Dean of the Faculty of Engineering;
   - "Department" means the department or departments offering a particular subject and includes any other body doing so;
   - "Diploma" means the Diploma in Industrial Engineering or the Diploma in Surveying as the case may be;
   - "Faculty Board" means the Faculty Board, Faculty of Engineering;
   - "responsible department" means the department designated as such in the Schedule;
   - "Schedule" means the Schedule to these Regulations relevant to the diploma in which a person is enrolled or proposing to enrol;
   - "subject" means any part of the course for which a result may be recorded.
   (2) The unit value of a subject for the purposes of these Regulations shall be determined by the Faculty Board.

Admission and Enrolment
3. (1) To be eligible for admission to candidature an applicant shall have satisfied the requirements for admission specified in the Schedule.
   (2) Application for admission to candidature shall be considered by the Faculty Board which may approve or reject any application.

4. (1) In any year a candidate shall enrol only in those subjects approved by the Dean or his nominee.
   (2) A candidate will not be permitted to enrol in any subject which is deemed by the Faculty Board to be substantially equivalent to one which he has previously counted towards a degree or diploma.

Standing
5. (1) The Faculty Board, on the recommendation of the Head of the responsible department, may grant a candidate standing in the course in recognition of work completed in this University or elsewhere on such conditions as the Faculty Board may determine.
   (2) The standing granted under this regulation shall not exceed the unit value specified in the Schedule.
Prerequisites and Corequisites

6. (1) The Faculty Board, on the recommendation of the Head of Department, may prescribe prerequisites and/or corequisites for a subject.

(2) Except with the approval of the Dean, a candidate may not enrol in a subject unless he or she has passed any subject prescribed as its prerequisite and has already passed or concurrently enrols in or is already enrolled in any subject prescribed as its corequisite.

Withdrawal

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

(2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty. The relevant date shall be:

(a) in the case of any subject offered only in the first half of the academic year, the last Monday of first term;

(b) in the case of any subject offered only in the second half of the academic year, the fourth Monday of third term;

(c) in the case of any other subject, the last Monday of second term.

Subject Requirements

8. (1) To complete a subject, a candidate shall attend such lectures, tutorials, seminars, laboratory classes and field work and submit such written or other work as the Department shall require.

(2) To pass a subject a candidate shall complete it and pass such examinations as the Faculty Board shall require.

Grading of Diploma

9. The Diploma shall be awarded in one grade only.

Award of Diploma

10. To qualify for the award of the Diploma, a candidate shall enrol and satisfy the requirements prescribed in the Schedule.

Exceptional Circumstances

11. In order to provide for exceptional circumstances arising in a particular case, the Senate on the recommendation of the Faculty Board may relax any provision of these Regulations.

Schedule 1 — Diploma in Industrial Engineering

1. For the purposes of these Regulations the responsible department for the Diploma shall be the Department of Mechanical Engineering.

2. (1) To be eligible for admission to candidacy an applicant shall:

(a) have satisfied the requirements for admission to a degree in the University of Newcastle; or

(b) have satisfied the requirements for admission to a degree in another university recognised for this purpose by the Faculty Board; or

(c) hold such other qualifications approved by the Faculty Board for the purpose of admission to candidacy.

(2) Notwithstanding the provisions of sub-section (1), the Faculty Board may require an applicant to complete such prerequisite and/or corequisite studies as it may prescribe.

3. (1) To qualify for the award of the Diploma, a candidate shall pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than twelve units.

(2) The programme referred to in sub-section (1) shall contain two units of study comprising the investigation of and report on a project specified by the Head of the responsible department.

4. Standing granted to a candidate under Regulation 5 of these Regulations shall not exceed six units, except that a candidate who has transferred from the Master of Engineering Science degree course may be granted standing in subjects equivalent to the unit value of those subjects completed while the candidate was enrolled in the degree course.

5. Except with the permission of the Faculty Board, the course shall not be completed in less than two years of part-time study.

Schedule 2 — Diploma in Surveying

1. For the purposes of these Regulations the responsible department for the Diploma shall be the Department of Civil Engineering and Surveying.

2. (1) To be eligible for admission to candidacy an applicant shall:

(a) have satisfied the requirements for admission to a degree in the University of Newcastle; or

(b) have satisfied the requirements for admission to a degree in another university recognised for this purpose by the Faculty Board; or

(c) have Registration as a Land Surveyor, or hold the issue of a Certificate of Competency, by any of the Boards of Surveyors of Australia or New Zealand; or

(d) hold such other qualifications approved by the Faculty Board for the purpose of admission to candidacy.

(2) Notwithstanding the provisions of sub-section (1) the Faculty Board may require an applicant to complete such prerequisite and/or corequisite studies as it may prescribe.

3. To qualify for the award of the Diploma, a candidate shall pass a programme of subjects approved by the Faculty Board on the recommendation of the Head of the responsible department totalling not less than twelve units.

4. Standing granted to a candidate under Regulation 5 of these Regulations shall not exceed four units.

5. Except with the permission of the Faculty Board, the course shall not be completed in less than two years of part-time study.
Approved Subjects
DIPLOMA IN INDUSTRIAL ENGINEERING

Students enrolling in the Diploma in Industrial Engineering may select their programme from the following list of subjects:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME381 Methods Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME383 Quality Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME481 Engineering Administration</td>
<td>1</td>
</tr>
<tr>
<td>ME482 Engineering Economics I</td>
<td>1</td>
</tr>
<tr>
<td>ME483 Production Scheduling</td>
<td>1</td>
</tr>
<tr>
<td>ME484 Engineering Economics II</td>
<td>1</td>
</tr>
<tr>
<td>ME485 Numerical Control and Computer Aided Manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>ME487 Operations Research - Fundamental Techniques</td>
<td>1</td>
</tr>
<tr>
<td>ME488 Operations Research - Planning, Inventory Control and Management</td>
<td>1</td>
</tr>
<tr>
<td>ME582 Industrial Computations</td>
<td>1</td>
</tr>
<tr>
<td>ME681 Industrial Law</td>
<td>4</td>
</tr>
<tr>
<td>ME684 Project</td>
<td>2</td>
</tr>
</tbody>
</table>

The above list of subjects is for use simply as a guide in the selection of a programme. The list is not exhaustive. Students may, if they wish, select other ME400/500 level subjects or subjects offered by departments other than the Department of Mechanical Engineering. Please note that the programme selected must be approved by the Faculty Board on the recommendation of the Head of the Department of Mechanical Engineering.

DIPLOMA IN SURVEYING

The Faculty Board has approved the subjects listed below for inclusion in the Diploma programme.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE351 Civil Engineering Systems I</td>
<td>1</td>
</tr>
<tr>
<td>CE372 Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE474 Transportation Planning</td>
<td>1</td>
</tr>
<tr>
<td>SV271 Basic Regional and Urban Economics</td>
<td>2</td>
</tr>
<tr>
<td>SV313 Surveying III</td>
<td>2</td>
</tr>
<tr>
<td>SV314 Hydrographic Surveying</td>
<td>1</td>
</tr>
<tr>
<td>SV334 Survey Computations III</td>
<td>1</td>
</tr>
<tr>
<td>SV351 Geodesy I</td>
<td>2</td>
</tr>
<tr>
<td>SV361 Photogrammetry I</td>
<td>2</td>
</tr>
<tr>
<td>SV393 Land Boundary Definitions</td>
<td>1</td>
</tr>
<tr>
<td>SV416 Surveying IV</td>
<td>2</td>
</tr>
<tr>
<td>SV441 Astronomy</td>
<td>2</td>
</tr>
<tr>
<td>SV452 Geodesy II</td>
<td>1</td>
</tr>
<tr>
<td>SV462 Photogrammetry II</td>
<td>1</td>
</tr>
<tr>
<td>SV465 Advanced Cartography</td>
<td>1</td>
</tr>
<tr>
<td>SV472 Land Valuation</td>
<td>1</td>
</tr>
<tr>
<td>SV473 Town Planning</td>
<td>2</td>
</tr>
<tr>
<td>SV475 Survey Management and Planning</td>
<td>1</td>
</tr>
<tr>
<td>SV582 Project</td>
<td>2</td>
</tr>
<tr>
<td>Geography II B</td>
<td>4</td>
</tr>
<tr>
<td>Economics I</td>
<td>4</td>
</tr>
</tbody>
</table>

Note:
1. A ten day live-in Survey Camp is included as part of SV313.

REGULATIONS GOVERNING MASTER DEGREES

Part I — General

1. (1) These Regulations, including the Schedules thereto, prescribe the conditions and requirements relating to the degrees of Master of Architecture, Master of Arts, Master of Commerce, Master of Education, Master of Educational Studies, Master of Engineering, Master of Engineering Science, Master of Mathematics, Master of Psychology (Clinical), Master of Psychology (Educational), Master of Science, Master of Medical Science, Master of Scientific Studies, Master of Special Education and Master of Surveying.

2. In these Regulations and the Schedules thereto, unless the context or subject matter otherwise indicates or requires:
   "Faculty Board" means the Faculty Board of the Faculty responsible for the course in which a person is enrolled or is proposing to enrol;
   "programme" means the programme of research and study prescribed in the Schedule.
   "Schedule" means the Schedule of these Regulations pertaining to the course in which a person is enrolled or is proposing to enrol; and
   "thesis" means any thesis or dissertation submitted by a candidate.

3. These Regulations shall not apply to degrees conferred "honoris causa.

4. A degree of Master shall be conferred in one grade only.

2. An application for admission to candidature for a degree of Master shall be made on the prescribed form and lodged with the Secretary to the University by the prescribed date.

3. (1) To be eligible for admission to candidature an applicant shall:
   (a) (i) have satisfied the requirements for admission to a degree of Bachelor in the University of Newcastle as specified in the Schedule; or
      (ii) have satisfied the requirements for admission to a degree or equivalent qualification, approved for the purpose by the Faculty Board, in another tertiary institution; or
      (iii) have such other qualifications and experience as may be approved by the Senate on the recommendation of the Faculty Board or otherwise as may be specified in the Schedule; and
   (b) have satisfied such other requirements as may be specified in the Schedule.

(2) Unless otherwise specified in the Schedule, applications for admission to candidature shall be considered by the Faculty Board which may approve or reject any application.

3. (3) An applicant shall not be admitted to candidature unless adequate supervision and facilities are available. Whether these are available shall be determined by the Faculty Board unless the Schedule otherwise provides.

4. To qualify for admission to a degree of Master a candidate shall enrol and satisfy the requirements of these Regulations including the Schedule.

5. The programme shall be carried out:
   (a) under the guidance of a supervisor or supervisors either appointed by the Faculty Board or as otherwise prescribed in the Schedule; or
   (b) as the Faculty Board may otherwise determine.
6. Upon request by a candidate the Faculty Board may grant leave of absence from the course. Such leave shall not be taken into account in calculating the period for the programme prescribed in the Schedule.

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

(2) A candidate who withdraws from any subject after the relevant date shall be deemed to have failed in that subject unless granted permission by the Dean to withdraw without penalty. The relevant date shall be:
(a) in the case of a subject offered in the first half of the academic year — the last Monday in first term;
(b) in the case of a subject offered in the second half of the academic year — the fourth Monday in third term;
(c) in the case of any other subject — the last Monday in second term.

8. (1) If the Faculty Board is of the opinion that the candidate is not making satisfactory progress towards the degree then it may terminate the candidature or place such conditions on its continuation as it deems fit.

(2) For the purpose of assessing a candidate's progress, the Faculty Board may require any candidate to submit a report or reports on his progress.

(3) A candidate against whom a decision of the Faculty Board has been made under Regulation 8(1) of these Regulations may request that the Faculty Board cause his case to be reviewed. Such request shall be made to the Dean of the Faculty within seven days from the date of posting to the candidate the advice of the Faculty Board's decision or such further period as the Dean may accept.

(4) A candidate may appeal to the Vice-Chancellor against any decision made following the review under Regulation 8(3) of these Regulations.

9. In exceptional circumstances arising in a particular case, the Senate, on the recommendation of the Faculty Board, may relax any provision of these Regulations.

Part II — Examination and Results

10. The Examination Regulations approved from time to time by the Council shall apply to all examinations with respect to a degree of Master with the exception of the examination of a thesis which shall be conducted in accordance with the provisions of Regulations 12 to 16 inclusive of these Regulations.

11. The Faculty Board shall consider the results in subjects, the reports of examiners and any other recommendations prescribed in the Schedule and shall decide:
(a) to recommend to the Council that the candidate be admitted to the degree; or
(b) in a case where a thesis has been submitted, to permit the candidate to resubmit an amended thesis within twelve months of the date on which the candidate is advised of the result of the first examination or within such longer period of time as the Faculty Board may prescribe; or
(c) to require the candidate to undertake such further oral, written or practical examinations as the Faculty Board may prescribe; or
(d) not to recommend that the candidate be admitted to the degree, in which case the candidature shall be terminated.

Part III — Provisions Relating to Theses

12. (1) The subject of a thesis shall be approved by the Faculty Board on the recommendation of the Head of the Department in which the candidate is carrying out his research.

(2) The thesis shall not contain as its main content any work or material which has previously been submitted by the candidate for a degree in any tertiary institution unless the Faculty Board otherwise permits.

13. The candidate shall give to the Secretary to the University three months' written notice of the date he expects to submit a thesis, and such notice shall be accompanied by any prescribed fee.1

1. At present there is no fee payable.

14. (1) The candidate shall comply with the following provisions concerning the presentation of a thesis:
(a) the thesis shall contain an abstract of approximately 200 words describing the content;
(b) the thesis shall be typed and bound in a manner prescribed by the University;
(c) three copies of the thesis shall be submitted together with:
(i) a certificate signed by the candidate that the main content of the thesis has not been submitted by the candidate for a degree of any other tertiary institution; and
(ii) a certificate signed by the supervisor indicating whether the candidate has completed the programme and whether the thesis is of sufficient academic merit to warrant examination; and
(iii) if the candidate so desires, any documents or published work of the candidate whether bearing on the subject of the thesis or not.

(2) The Faculty Board shall determine the course of action to be taken should the certificate of the supervisor indicate that in the opinion of the supervisor the thesis is not of sufficient academic merit to warrant examination.

15. The University shall be entitled to retain the submitted copies of the thesis, accompanying documents and published work. The University shall be free to allow the thesis to be consulted or borrowed, and, subject to the provisions of the Copyright Act, 1968 (Com.), may issue it in whole or any part in photocopy or microfilm or other copying medium.

16. (1) For each candidate two examiners, at least one of whom shall be an external examiner (being a person who is not a member of the staff of the University) shall be appointed either by the Faculty Board or otherwise as prescribed in the Schedule.

(2) If the examiner's reports are such that the Faculty Board is unable to make any decision pursuant to Regulation 11 of these Regulations, a third examiner shall be appointed either by the Faculty Board or otherwise as prescribed in the Schedule.

Schedule 6 — Master of Engineering

1. The Faculty of Engineering shall be responsible for the course leading to the degree of Master of Engineering.

2. To be eligible for admission to candidature an applicant shall:
(a) have satisfied the requirements for admission to a degree with honours in the University of Newcastle or other university approved for this purpose by the Faculty Board in the area in which he proposes to carry out his research; OR
(b) have satisfied the requirements for admission to a degree in the University of Newcastle or other university approved for this purpose by the Faculty Board and have completed to the satisfaction of the Faculty Board such work and such examinations as determined by the Faculty Board; OR
(c) in exceptional cases produce evidence of possessing such other qualifications as may be approved by the Faculty Board on the recommendation of the Head of the Department in which the candidate proposes to carry out his programme.

3. To qualify for admission to the degree a candidate shall complete to the satisfaction of the Faculty Board a programme consisting of:
(a) such work and examinations as may be prescribed by the Faculty Board; and
(b) a thesis embodying the results of an original investigation or design.

4. The Programme shall be completed:
(a) in not less than two academic years except that, in the case of a candidate who has completed the requirements for a degree of Bachelor with honours or a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, the Faculty Board may reduce this period to not less than one academic year; and
(b) except with the permission of the Faculty Board, not more than 5 years.

5. Except with the permission of the Faculty Board a candidate shall take part in research seminars within the Department in which he is carrying out his research.

Schedule 7 — Master of Engineering Science
1. The Faculty of Engineering shall be responsible for the course leading to the degree of Master of Engineering Science.

2. To be eligible for admission to candidature an applicant shall:
(a) have satisfied the requirements for admission to a four year full-time or equivalent part-time Bachelor’s degree in Engineering or Metallurgy from the University of Newcastle or any other approved university; OR
(b) have satisfied the requirements for admission to a three year full-time or equivalent part-time Bachelor’s degree of the University of Newcastle or any other approved university and have completed the requirements for admission to the degree of Bachelor such work and examinations as determined by the Faculty Board; OR
(c) in exceptional cases produce evidence of possessing such other qualifications as may be approved by the Faculty Board on the recommendation of the Head of Department in which the candidate proposes to carry out his programme.

3. (1) A candidate shall nominate the Department in which he proposes to pursue his programme.
(2) The Head of such Department shall make recommendations to Faculty Board as to:
(a) the candidate’s suitability for admission to candidature;
(b) the adequacy of facilities for supervision of the proposed programme;
(c) the supervisor or supervisors who should be appointed to supervise the candidate’s programme.

4. To qualify for admission to the degree a candidate shall complete a programme of study comprising subjects totalling 12 units 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 supervisor or supervisors concerned.

5. A candidate may be granted standing by the Faculty Board on such conditions as the Faculty Board may determine in up to six units in recognition of work completed in this University or elsewhere.

6. (1) The programme shall be completed in not less than one academic year in the case of a full-time candidate or not less than two academic years in the case of a part-time candidate.
(2) Except with the permission of the Faculty Board, the programme shall be completed in not more than two years in the case of a full-time candidate and not more than three years in the case of a part-time candidate.

1. For list of approved M.Eng.Sc. subjects see page 37 of this Handbook.

Schedule 11 — Master of Science
1. A candidate for the degree of Master of Science may be enrolled in either the Faculty of Engineering or the Faculty of Science. The Faculty in which the candidate is enrolled shall be responsible for the programme.

2. (1) To be eligible for admission to candidature in the Faculty of Science an applicant shall:
(a) have satisfied all the requirements for admission to the degree of Bachelor of Science with honours Class I or Class II of the University of Newcastle or to a degree, approved for this purpose by the Faculty Board, of this or any other university; OR
(b) have satisfied all the requirements for admission to the degree of Bachelor of Science of the University of Newcastle or other approved university and have completed such work and passed such examinations as the Faculty Board may have determined and have achieved a standard at least equivalent to that required for admission to a degree of bachelor with second class honours in an appropriate subject; OR
(c) in exceptional cases produce evidence of possessing such other qualifications as may be approved by the Faculty Board on the recommendation of the Head of the Department in which the applicant proposes to carry out the programme.

(2) To be eligible for admission to candidature in the Faculty of Engineering an applicant shall:
(a) have satisfied the requirements for admission to a degree with honours in the University of Newcastle or other university approved for this purpose by the Faculty Board in the area in which he proposes to carry out his research; OR
(b) have satisfied the requirements for admission to a degree in the University of Newcastle or other university approved for this purpose by the Faculty Board and have completed to the satisfaction of the Faculty Board such work and examinations as determined by the Faculty Board; OR
(c) in exceptional cases produce evidence of possessing such other qualifications as may be approved by the Faculty Board on the recommendation of the Head of the Department in which the candidate proposes to carry out his programme.

3. To qualify for admission to the degree a candidate shall complete to the satisfaction of the Faculty Board a programme consisting of:
(a) such work and examinations as may be prescribed by the Faculty Board; and
(b) a thesis embodying the results of an original investigation or design.
4. The programme shall be completed —
(a) in not less than two academic years except that, in the case of a candidate who has completed the requirements for a degree of Bachelor with honours or a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, the Faculty Board may reduce this period to not less than one academic year; and
(b) except with the permission of the Faculty Board, in not more than 5 years.
5. (1) Except with the permission of the Faculty Board, which shall be given only in special circumstances, a part-time candidate enrolled in the Faculty of Science shall:
(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 carrying out his research.
(2) Except with the permission of the Faculty Board, a candidate enrolled in the Faculty of Engineering shall take part in the research seminars within the Department in which he is carrying out his research.

Schedule 15 — Master of Surveying
1. The Faculty of Engineering shall be responsible for the course leading to the degree of Master of Surveying.
2. To be eligible for admission to candidature an applicant shall:
(a) have satisfied the requirements for admission to a degree in Surveying with honours in the University of Newcastle or other university approved for this purpose by the Faculty Board; OR
(b) have satisfied the requirements for admission to a degree in the University of Newcastle or other tertiary institution approved for this purpose by the Faculty Board and have completed to the satisfaction of the Faculty Board such work and such examinations as determined by the Faculty Board; OR
(c) in exceptional cases produce evidence of possessing such other qualifications as may be approved by the Faculty Board on the recommendation of the Head of the Department of Civil Engineering and Surveying.
3. To qualify for admission to the degree a candidate shall complete to the satisfaction of the Faculty Board a programme consisting of:
(a) such work and examinations as may be prescribed by the Faculty Board; and
(b) a thesis embodying the results of an original investigation or design.
4. The programme shall be completed:
(a) in not less than two academic years except that, in the case of a candidate who has completed the requirements for a degree of Bachelor with honours or a qualification deemed by the Faculty Board to be equivalent or who has had previous research experience, the Faculty Board may reduce this period to not less than one academic year; and
(b) except with the permission of the Faculty Board, in not more than five years.
5. Except with the permission of the Faculty Board a candidate shall take part in research seminars within the Department of Civil Engineering and Surveying.

Approved M.Eng.Sc. Subjects
The following subjects have been approved for inclusion in the M.Eng.Sc. course programme. Not all subjects will be offered in any one year. For details of which subjects will be offered in 1987 consult the Department concerned.

DEPARTMENT OF ELECTRICAL ENGINEERING

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE513</td>
<td>Power System Analysis and Operation</td>
</tr>
<tr>
<td>EE516</td>
<td>Advanced Power Systems</td>
</tr>
<tr>
<td>EE517</td>
<td>Variable Speed Drive Systems</td>
</tr>
<tr>
<td>EE525</td>
<td>Microprogrammed and Microprocessor Systems</td>
</tr>
<tr>
<td>EE526</td>
<td>Advanced Digital Systems</td>
</tr>
<tr>
<td>EE527</td>
<td>VLSI and Design Automation</td>
</tr>
<tr>
<td>EE541</td>
<td>Advanced Digital Signal Processing</td>
</tr>
<tr>
<td>EE542</td>
<td>Modern Control</td>
</tr>
<tr>
<td>EE543</td>
<td>Optimization Techniques</td>
</tr>
<tr>
<td>EE545</td>
<td>Advanced Communication Systems</td>
</tr>
<tr>
<td>EE547</td>
<td>Digital Communications</td>
</tr>
<tr>
<td>EE551</td>
<td>Electromagnetic Propagation and Antennas</td>
</tr>
<tr>
<td>EE562</td>
<td>Topics in Switching Theory</td>
</tr>
<tr>
<td>EE563</td>
<td>Computer Operating Systems</td>
</tr>
<tr>
<td>EE564</td>
<td>Compiler Construction</td>
</tr>
<tr>
<td>EE566</td>
<td>Automata Theory</td>
</tr>
<tr>
<td>EE567</td>
<td>Computer Process Control</td>
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<td>Advanced Computer Architecture</td>
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<td>Multivariable Control Systems</td>
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<tr>
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<tr>
<td>EE642</td>
<td>Stochastic Control</td>
</tr>
<tr>
<td>EE661</td>
<td>Computer Networks</td>
</tr>
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</table>

DEPARTMENT OF MECHANICAL ENGINEERING

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME503</td>
<td>Design of Experiments for Engineering Research</td>
</tr>
<tr>
<td>ME505</td>
<td>Advanced Numerical Programming</td>
</tr>
<tr>
<td>ME507</td>
<td>Environmental Engineering</td>
</tr>
<tr>
<td>ME509</td>
<td>Introduction to Noise Pollution Control</td>
</tr>
<tr>
<td>ME510</td>
<td>Advanced Design Concepts I</td>
</tr>
<tr>
<td>ME514</td>
<td>Computer Aided Design and Manufacturing</td>
</tr>
<tr>
<td>ME519</td>
<td>Bulk Materials Handling Systems I</td>
</tr>
<tr>
<td>ME520</td>
<td>Bulk Materials Handling Systems II</td>
</tr>
<tr>
<td>ME521</td>
<td>Conveying of Bulk Solids</td>
</tr>
<tr>
<td>ME545</td>
<td>Mechanics of Solids III</td>
</tr>
<tr>
<td>ME553</td>
<td>Fluid Mechanics III</td>
</tr>
<tr>
<td>ME573</td>
<td>Thermodynamics III</td>
</tr>
<tr>
<td>ME574</td>
<td>Heat Transfer II</td>
</tr>
<tr>
<td>ME582</td>
<td>Industrial Computations</td>
</tr>
<tr>
<td>ME583</td>
<td>Production Scheduling</td>
</tr>
<tr>
<td>ME584</td>
<td>Engineering Economics II</td>
</tr>
<tr>
<td>ME585</td>
<td>Numerical Control and Computer Aided Manufacturing</td>
</tr>
<tr>
<td>ME587</td>
<td>Operations Research — Fundamental Techniques</td>
</tr>
<tr>
<td>ME588</td>
<td>Operations Research — Planning, Inventory Control and Management</td>
</tr>
<tr>
<td>ME589</td>
<td>Simulation</td>
</tr>
<tr>
<td>ME609</td>
<td>Vibration and Noise Problems in Industry</td>
</tr>
<tr>
<td>ME610</td>
<td>Advanced Design Concepts II</td>
</tr>
<tr>
<td>ME621</td>
<td>Materials Handling and Transportation Systems</td>
</tr>
</tbody>
</table>

36
Candidates may, if they wish, select subjects offered in other Faculties subject to the approval of the Faculty Board, Faculty of Engineering.

Faculty Policies

About This Section
This section contains Faculty Policies which are relevant to students enrolled in undergraduate programmes within the Faculty. The following matters are included:

- Undergraduate Performance and Progress Requirements
- Criteria for Honours Awards
- Weighted Average Mark (WAM) Calculation Method
- Final Dates for Addition of Subjects
- Late Withdrawal from Subjects
- Year/Stage Classification
- Standing for Certificate Holders
- Industrial Experience Requirements
- Exemptions
- Special Consideration
- Special Examinations
- Deferred Examinations
- Submission of Final Year Project Reports

Note that Faculty Policies do not remain static. Students should regularly consult Faculty and Departmental notice boards in order to make themselves aware of any proposals or decisions which may affect them.

Enquiries regarding Faculty Policy may be directed to the Faculty Secretary.
POLICIES ON UNDERGRADUATE PERFORMANCE AND PROGRESS

The Faculty Board reviewed a number of its policies in 1984 and 1985 and adopted the following policies for introduction in 1985 with full implementation from 1986. These policies replaced the Faculty Board's previous policies with respect to compensation, unsatisfactory progress and the award of honours and merit (refer to previous editions of this Handbook).

1. GENERAL

1.1 The following policies are made under the powers vested in the Faculty Board, Faculty of Engineering, by the Regulations Governing Bachelor Degrees offered in the Faculty of Engineering and various By-laws and Regulations of the University including, but not limited to, By-law 2.4 — The Faculties, the Examination Regulations, and the Regulations Governing Unsatisfactory Progress.

1.2 In these Policies, unless the context or subject matter otherwise indicates or requires:

- "course" means the total requirements as prescribed in these Policies and the Regulations Governing Bachelor Degrees offered in the Faculty of Engineering which, when completed, qualify a candidate for the award of the relevant degree.
- "Dean" means the Dean of the Faculty of Engineering.
- "Degree Regulations" means the Regulations Governing Bachelor Degrees in the Faculty of Engineering.
- "Department" means a department of the Faculty of Engineering.
- "Faculty Board" means the Faculty Board, Faculty of Engineering.
- "Responsible department" means the department designated as such in the relevant Schedule of the Degree Regulations.
- "Student" means a person enrolled in an undergraduate course offered in the Faculty of Engineering.
- "Sub-dean" means the Sub-dean of the Faculty of Engineering.

2. RESERVATION

2.1 Faculty Board reserves its rights to consider each case on its merits and to amend its policies without notice as it judges to be proper to maintain appropriate standards of attainment.

3. ASSESSMENT

3.1 Assessment within each subject offered by a Department may take into account work in: assignments, reports, laboratory exercises, tutorials, class tests and formal examinations.

3.2 Students will be informed of the method of assessment to be adopted in each subject before the fourth week of lectures in that subject. This information will include an indication of the type of tasks comprising the assessment and the weighting each task will have in the determination of the final result in the subject concerned.

It should be noted that the final result in a subject is not necessarily determined simply by the addition of marks awarded for assessment tasks although the weightings of each task and class ranking will be maintained except where an application for Special Consideration is granted.

3.3 In the case of subjects offered to students enrolled in any undergraduate course in the Faculty by Departments of the Faculty (and any department of another faculty willing to take part in this procedure), the result in each subject will be reported as follows:

<table>
<thead>
<tr>
<th>Result</th>
<th>Reported as:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks in the range of 45 to 100% inclusive</td>
<td>Percentage Mark</td>
</tr>
<tr>
<td>Marks less than 45%</td>
<td>FF (Fail)</td>
</tr>
<tr>
<td>Other non-passing grades</td>
<td>Grades approved by Senate for specific purposes.</td>
</tr>
</tbody>
</table>

3.4 Percentage marks in the range of 45 to 54 inclusive, are regarded as indicating that a student, whilst not performing clearly at a satisfactory level in the subject concerned, had nevertheless demonstrated sufficient understanding of the subject to proceed, provided other progress requirements are met, without repeating the material contained in that subject. (see Policy 5 below)

3.5 In the case of subjects offered by departments of other faculties, results may be awarded as grades (rather than percentage marks) in accordance with University By-laws and Regulations and the Policies of the Faculty Board.

4. ACADEMIC PERFORMANCE

4.1 The academic performance of each student enrolled in an undergraduate course offered in the Faculty shall be measured by a Weighted Average Mark (WAM).

4.2 The WAM is calculated from the results of all subjects taken towards satisfaction of Degree Requirements, except as provided in Policy 4.5 below, in the following manner:

\[ \text{WAM} = \frac{\sum (m \times w)}{\sum u} \]

Where:
- \( m \) — The Mark as defined in Policy 4.3 below.
- \( u \) — The Unit Value of the subject concerned.
- \( w \) — The Weighting of the subject concerned as determined under Policy 4.4 below.

4.3 The Mark ("m") will be calculated as follows:
- Where the result in a subject is given in the range of 45 to 100 inclusive, 'm' is equal to that percentage mark.
- Where the result in a subject is a grade of FF, AF, EF or WF, 'm' is equal to 44.
- Where the result in a subject is a passing grade (rather than a percentage mark), the Mark ("m") will be deemed to be the relevant number listed below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>'m'</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD</td>
<td>93</td>
</tr>
<tr>
<td>D</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>70</td>
</tr>
<tr>
<td>P</td>
<td>58</td>
</tr>
</tbody>
</table>

(see Policy 5 below)
Where grades of W, X, S or I are awarded the subject concerned shall not be included in the calculation of the students WAM until a mark or a final grade shall be awarded in that subject, at which time, the student's WAM shall be re-calculated to include the newly approved mark or grade.

Each student shall have a weighting of 1, 2, 3 or 4 as determined by Faculty Board. The weighting so determined will be published in the Faculty Handbook. Weightings will generally be determined according to the level at which a subject is offered as set out below.

<table>
<thead>
<tr>
<th>Engineering Subject Level</th>
<th>Non-engineering Subject Year Level or equivalent</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Year I</td>
<td>1</td>
</tr>
<tr>
<td>200</td>
<td>Year II</td>
<td>2</td>
</tr>
<tr>
<td>300</td>
<td>Year III</td>
<td>3</td>
</tr>
<tr>
<td>400, 500 or 600</td>
<td>Year IV</td>
<td>4</td>
</tr>
</tbody>
</table>

The following will be taken into account when calculating the WAM:

- Subjects taken in satisfaction of course Elective requirements shall be considered to satisfy those requirements in the order in which they are taken during the course.
- Subjects taken extraneous to Degree Requirements shall not be included in the calculation of a student's WAM.
- Students re-admitted to a course after being granted leave of absence for the previous academic year, will retain their previous WAM as the basis of future calculations.
- Students permitted to transfer from one course offered in the Faculty to another shall, provided standing in all subjects previously passed in the original course is granted in the new course, retain the WAM achieved in the original course as the basis for future WAM calculations in the new course.
- Students re-admitted to a course without having been granted leave of absence for the previous academic year, shall be considered in the same way as if they had completed their previous studies at another Institution and re-commence calculation of their WAM from the year of their re-admission: provided that a student who was last enrolled in a course not more than three (3) years prior to the year of their re-admission to that course, may request that the WAM applying at the conclusion of the last year of their enrolment in that course be reinstated as the basis of future calculations. Such a request must be made to the Secretary, in writing, by 30 April in the year of re-admission and may be approved by the Dean or his nominee.
- Students admitted to a course for the first time shall, subject to the above provisions, commence calculation of their WAM from the year of their admission, whether they be granted standing or not.

Each student's WAM shall be included in the schedule of recommended results presented to Faculty Board, included on each student's notification of results and placed on the student's academic record; except that should a grade of S, X or I be awarded to a student, the WAM calculated for that student will be re-calculated and included on the student's notification of results and placed upon the student's academic record in place of the provisional WAM; provided that subjects awarded a deferred examination (grade X) may not subsequently be awarded a mark greater than 64 or a grade higher than Pass.

Students may elect to repeat any subject in which they were awarded a result in the range of 45 to 54 or a grade of TP, or to enrol in a subject which replaced a subject in that category in the Approved Programme of the course in which they are enrolled. In such a case:

- the subject originally taken remains part of the student's academic record and continues to be included in the calculation of the student's WAM as before.
- the repeated subject is included in the WAM calculations of the year in which it is taken.
- if the student is awarded a failing grade in the repeated subject, the failure is treated in the same way as if the subject were attempted for the first time and the subject must be repeated.

Note: Students will not normally be permitted to repeat subjects in which they were awarded a Final Assessment of 55 or more, or a passing grade.

5. ACADEMIC PROGRESSION AND UNSATISFACTORY PROGRESS

5.1 A student who maintains a WAM of 55 or more is considered to be a student in good standing.

5.2 If the WAM of a student previously in good standing is less than 55 at the conclusion of an academic year, the student shall be placed on probation for the next academic year in which they enrol in any course offered in the Faculty.

5.3 If a student on probation withdraws without penalty from all subjects in which they are enrolled whilst on probation, the term of their probation shall be deemed to be extended to the following academic year.

5.4 A student on probation is strongly advised to repeat all subjects, other than elective or extraneous subjects, which were taken in the academic year in which he or her WAM became less than 55 and for which he or she received a result of less than 55, before enrolling in subjects not previously attempted.

5.5 Except as otherwise approved by the Dean or his nominee, a student on probation shall not be permitted to enrol in an annual programme of study of more than 12 units.

5.6 A student on probation who attains a WAM of 55 or more at the end of their probationary year, shall be released from probation and be considered to be a student in good standing.

5.7 A student on probation who fails to attain a WAM of 55 or more at the end of their probationary year, shall be deemed not to have maintained a rate of progress considered satisfactory to the Faculty Board under Regulation 3(1) of the Regulations Governing Unsatisfactory Progress and shall be required to show cause as to why he or she should not be excluded from the Faculty under the terms of those Regulations.

5.8 Students required to show cause under Policy 5.7 shall be advised of their rights to make representations either in writing or in person prior to decisions under Regulation 3(1) being taken.

5.9 The Dean or Sub-dean shall determine the time and place at which persons required to show cause under Policy 5.7 may make representations in person.
5.10 In respect of students required to show cause under Policy 5.7, the Dean or Sub­
dean shall, after considering any representations made by such a student and on
the recommendation of the Head of the responsible department, either:
• determine the action to be taken under Regulation 3(1) of the Regulations
 Governing Unsatisfactory Progress on behalf of Faculty Board; or
• refer the case to Faculty Board for consideration.

5.11 A student who is required to show cause under Policy 5.7 and permitted to
continue studies within the Faculty is deemed to remain on probation and
continues to be subject to the provisions of the Policies of Faculty Board as
would a student placed on probation under the provisions of Policy 5.2.

6. SATISFACTION OF DEGREE REQUIREMENTS

6.1 Students are considered to have passed the programme of subjects approved by
Faculty Board in accordance with the relevant schedule of the Regulations
Governing Bachelor Degrees Offered in the Faculty of Engineering when they
have:
(i) Attained a Final Assessment of 45 or more (or a passing grade) in each of
the subjects comprising the relevant programme of subjects approved by
Faculty Board; and
(ii) Attained at the completion of that programme, a WAM of 55 or more.

6.2 If a student completes the relevant programme of subjects but has not achieved a
WAM of 55 or more, the student is regarded as not having passed the
programme of subjects approved by Faculty Board and is therefore ineligible for
the award of a bachelor's degree and is placed on probation under the terms of
section 5 of these policies.

6.3 A student who is ineligible for the award of a bachelor's degree under the terms of
Policy 6.2 may repeat any subject in which they were awarded a result in the
range of 45 to 54 (in which case the conditions of Policy 4.8 apply) or enrol in
such other subjects not previously attempted as the
Dean, on the recommendation
of the Head of the responsible department, may approve, until such time as he or
she attains a WAM of 55 or is excluded under the provisions
of section 5 of these policies.

7. AWARDS OF HONOURS AND MERIT

7.1 Honours grades will normally be awarded by Faculty Board on the basis of a
graduating student's performance as measured by the WAM according to the
following schedule:

<table>
<thead>
<tr>
<th>Minimum WAM</th>
<th>Honours</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>Class II Division 2</td>
</tr>
<tr>
<td>72</td>
<td>Class II Division 1</td>
</tr>
</tbody>
</table>

7.2 If a student was granted standing at the time of his or her admission or re­
admission to a course offered within the Faculty, the record of that student upon
which the standing was based may be considered by Faculty Board in
connection with the determination of the award of honours to that student.

7.3 A Head of Department may recommend to Faculty Board that a grade of
honours be awarded other than that indicated by the WAM of the student
concerned, or that no honours be awarded to a particular student. In such a case,
Faculty Board may make an award of honours in accordance with the
recommendation of the Head of the Department concerned or in accordance
with the schedule contained in Policy 7.1, as it sees fit.

7.4 Merit grades will normally be awarded by Faculty Board to students enrolled in
the Bachelor of Science (Metallurgy) programme who attain, at the conclusion
of the programme, a WAM of 72 or more. Policies 7.2 and 7.3 shall also apply,
where appropriate, to the awarding of Merit grades.

7.5 Faculty Board will normally consider recommending graduates who achieve a
WAM in the order of 85 or more for the award of a University Medal.

Example WAM Calculation
The following calculation is presented as an example of the method of calculation resulting
from the above policies.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mark or Grade</th>
<th>Unit Value</th>
<th>Honours Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE111</td>
<td>86</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ME111</td>
<td>92</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GE112</td>
<td>86</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ME131</td>
<td>80</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GE151</td>
<td>65</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ME223</td>
<td>72</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>P</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Physics IA</td>
<td>STANDING</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry IS</td>
<td>P</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

WAM = (829 + 1702) / (12 + 29)

- 2531 / 41

= 62
### Subject Mark or Unit Honours Grade Value Weighting

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mark</th>
<th>Grade</th>
<th>Value</th>
<th>Unit</th>
<th>Honours</th>
<th>Weighting</th>
<th>(UW)i</th>
<th>(MUW)i</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE 4</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ME232</td>
<td>63</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>126</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>EM2CO</td>
<td>58</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>232</td>
<td></td>
<td></td>
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<tr>
<td>EE211</td>
<td>60</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE301</td>
<td>70</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>420</td>
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<tr>
<td>GE360</td>
<td>82</td>
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<td>3</td>
<td>3</td>
<td>246</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ME302</td>
<td>79</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>237</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME092</td>
<td>80</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2531 + 1461) / (41 + 21)</td>
<td>3992 / 62</td>
<td>64</td>
<td></td>
</tr>
</tbody>
</table>

### STAGE 5

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mark</th>
<th>Grade</th>
<th>Value</th>
<th>Unit</th>
<th>Honours</th>
<th>Weighting</th>
<th>(UW)i</th>
<th>(MUW)i</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME312</td>
<td>82</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>246</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME333</td>
<td>92</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>276</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME342</td>
<td>87</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>261</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME343</td>
<td>71</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>213</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME352</td>
<td>78</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>234</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME372</td>
<td>67</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>201</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME373</td>
<td>62</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>186</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EM2H</td>
<td>55</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME093</td>
<td>80</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(3992 + 1807) / (62 + 24)</td>
<td>5799 / 86</td>
<td>67</td>
<td></td>
</tr>
</tbody>
</table>

### YEAR IV

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mark</th>
<th>Grade</th>
<th>Value</th>
<th>Unit</th>
<th>Honours</th>
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<td>(5799 + 3264) / (86 + 46)</td>
<td>9063 / 132</td>
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### OTHER FACULTY POLICIES

#### ADDITION OR SUBSTITUTION OF SUBJECTS

Students enrolled in courses offered by the Faculty of Engineering should ensure that all applications to ADD OR SUBSTITUTE SUBJECTS to their annual programmes of study are submitted by the following dates:

- First Semester subjects: 30 April (in each year)
- Full Year subjects: 30 April (in each year)
- Second Semester subjects: 4th Friday (7 August in 1987) of Second Semester

APPLICATIONS TO ADD OR SUBSTITUTE SUBJECTS AFTER THESE DATES WILL NOT NORMALLY BE APPROVED

Note:

1. It is the responsibility of each student to ensure that the University has an accurate record of the subjects which they are attending.
2. The Lecturer of a subject may refuse to mark the work of a student who is not officially enrolled in that subject.
3. The specification of the last dates for enrolment does not imply that all applications made before that date will be approved. Applications to enrol in a subject made before the above dates may be refused on a number of grounds including, for example, that the subject has progressed past the point where enrolment is acceptable or that resources have been fully allocated to students already enrolled. For this reason all applications to add subjects should be made as early as possible.
4. University Regulations and Policy in regard to withdrawal from subjects remain unchanged.

#### SPECIAL CONSIDERATION

It is recognized that during the course of their studies, students may suffer from illness or other serious circumstances which affect their preparation for or performance at an examination. University Regulations provide for students who believe that their performance in a subject has been adversely affected by such circumstances to apply for Special Consideration (refer to the General University Information section of this Handbook).

All applications should be addressed to The Secretary, University of Newcastle, and including the student's name, student number and course. The subject(s) in which Special Consideration is requested should also be indicated. Each application should give full particulars of the circumstances which are relied upon and the way in which it is believed that performance has been adversely affected due to these circumstances. Applications must be accompanied by medical certificates or other relevant documentary evidence.
Medical Certificates should be submitted with any request for special consideration because of illness. Such certificates should, as a minimum:

- be signed by a medical practitioner
- indicate the date(s) on which attention was sought
- certify unambiguously a specified illness or medical disability
- specify the period during which the student was so affected
- indicate the degree of incapacity and express a professional opinion as to the effect of the illness on the student’s ability to undertake an examination or attend to other course requirements.

Where a request for Special Consideration is made on the basis of non-medical grounds, all available supporting evidence should be attached to the application. In some cases the submission of a statutory declaration will be appropriate.

Requests should be made as soon as possible after the occurrences of the circumstances leading to the request. University Regulations provide that requests must be submitted within 7 days in cases where study during the year or preparation for an examination was affected (or by such later time as the Dean may approve). Requests made regarding attendance or performance in a formal written examination must be made within 3 days of the date of the examination (or by such later time as the Vice-Chancellor may approve). It should be noted that, where a student is unable to make application personally, another person may take action on the student’s behalf.

When considering requests for Special Consideration, it is the intention of the Faculty to take account of circumstances which adversely affect performance such that the performance of the student concerned does not reflect his or her true competence in a subject. In doing so, the Faculty will be conscious that any Special Consideration given should not act to the disadvantage of other students.

Enquiries regarding Special Consideration may be directed to the Faculty Secretary.

SPECIAL EXAMINATIONS

Special Examinations are not awarded automatically. If it is considered to be appropriate, a Special Examination may be awarded, following an application for Special Consideration, whether the examination in the subject concerned was attended or not.

Students requesting that they be awarded a Special Examination because they were prevented from attending a scheduled examination due to illness or did not attend on medical advice, should support their request by a detailed medical report which confirms the circumstances on which they rely (see Special Consideration above).

Students requesting a Special Examination on the basis that they were prevented from attending a scheduled examination due to misadventure, should support their application by a statutory declaration setting out the circumstances which prevented their attendance and attach any other relevant documentary evidence.

DEFERRED EXAMINATIONS

Deferred examinations in subjects offered by Departments of the Faculty will not normally be awarded to students other than those students enrolled in a programme of subjects sufficient to complete degree requirements in the current year.

Where a student fails a single subject and is thereby prevented from qualifying to graduate, a deferred examination may be awarded in that subject. If the subject concerned is a final year project subject, special conditions apply (see Submission of Final Year Project Reports below).

Deferred examinations recommended to the Faculty Board by departments of other faculties will normally be approved.

It should be noted that the maximum result which can be awarded on the basis of a deferred examination is that of pass (either a ‘P’ grade or a mark no higher than 64).

REVIEW OF RESULTS

Students may apply through the University Examinations Office for a review of final results in subjects (see the General University Information section of this Handbook for details of the procedure and the fee involved). All requests for review must be made by this procedure. If considered necessary, students may attach a statement to the official request for a review in which any facts believed to point to an error or omission having been made may be brought to the attention of the department concerned. Note that any such statement is not a replacement for requests for Special Consideration.

While staff may discuss aspects of performance in examinations with the individual students concerned within a short period after final results have been published in order to provide feedback for educational purposes, the assessment of individual pieces of work will not be discussed.

SUBMISSION OF FINAL YEAR PROJECT REPORTS

Meeting the deadline for submission of final year project reports is considered to be an important element of the subjects concerned. Departments within the Faculty have been requested by Faculty Board to adopt the following policies regarding the submission of final year project reports.

- The time for submission of final year project reports will be set at 5:00 p.m. on a date (to be specified by the Department concerned) during the November examination period. This date is regarded in the same way as a final formal examination. That is, failure to submit the report at or before the due time is regarded in the same way as failure to attend a formal written examination. The result will be failure, subject to any other decision which may be taken as a result of a request for Special Consideration.

- An extension of time for a submission, by way of an Incomplete grade (I) being awarded in December, may only be granted in response to a formal request for Special Consideration made through the Secretary to the University (see Special Consideration policy above). As students are expected to anticipate some delay or difficulties during the course of their project, Special Consideration will not normally be granted for circumstances involving less than 4 weeks loss of working time for the student.

- Submissions presented by the due date but not up to final presentation standard, or which require an acceptably small amount of additional work, may be granted a result of deferred (X). Final submission of the report will then be required on a date (to be specified by the Department concerned) during the January examination period and the Project will not be awarded a result higher than 64.

LATE WITHDRAWAL FROM SUBJECTS

Applications to withdraw from subjects lodged after the final date for withdrawal without penalty are normally either approved with penalty or not approved.

In exceptional circumstances the Dean may approve withdrawal without penalty. Such applications are viewed in the same light as requests for Special Consideration and should be documented accordingly (see policy on Special Consideration above).
YEARS/STAGE CLASSIFICATION

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

<table>
<thead>
<tr>
<th>Units</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>I</td>
</tr>
<tr>
<td>15-29</td>
<td>II</td>
</tr>
<tr>
<td>30-44</td>
<td>III</td>
</tr>
<tr>
<td>45+</td>
<td>IV</td>
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</table>

<table>
<thead>
<tr>
<th>Units</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
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<td>7-15</td>
<td>II</td>
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<td>16-24</td>
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<td>34-41</td>
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<tr>
<td>42-50</td>
<td>VI</td>
</tr>
<tr>
<td>51+</td>
<td>VII</td>
</tr>
</tbody>
</table>

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

STANDING FOR TAFE CERTIFICATES

Faculty Board has approved the granting of standing to students enrolling in courses who hold certain TAFE Certificates. For details of the standing available students should contact the Faculty Secretary.

List of Certificate Courses For Which Standing is Granted
- Civil Engineering Certificate
- Electrical Engineering Certificate
- Electronics and Communications Certificate
- Engineering Survey Certificate
- Marine Engineering Technology Certificate
- Mechanical Engineering Certificate
- Metallurgy Certificate
- Land and Engineering Survey Drafting Certificate
- Production Engineering Certificate
- Structural Engineering Certificate
- Surveying Certificate

INDUSTRIAL EXPERIENCE

1. General
For the degrees of Bachelor of Engineering and Bachelor of Metallurgy, students will normally be required to complete a total of at least 12 weeks of practical work of a nature acceptable to the Faculty Board. This practical experience may be either gained during long vacations or as part of an Industrial Experience elective.

2. Full-Time Students
Full-time students will normally gain their practical experience during vacation employment. Students should obtain a statement from their employer certifying the nature and period of the employment undertaken and retain the statement so as to be in a position to provide it when called upon to do so.
Students experiencing difficulty in obtaining suitable employment during long vacations may be able to obtain assistance in finding such employment by contacting the University's Careers and Student Employment Office.

3. Part-Time and Sandwich Pattern Students
Students enrolled in the degree of Bachelor of Engineering on a part-time basis may choose to take Industrial Experience units as part of their elective programmes. To be eligible for an Industrial Experience unit, the student must be in approved employment on the 1st November preceding the year in which the unit is to be taken. This approved employment must continue for one calendar year, that is, until the 31st October of the year in which the unit is to be counted. Students enrolled in Industrial Experience units must attend such lectures, seminars, etc. and submit such reports as the relevant Head of Department may require. Normally no Industrial Experience unit will be allowed in the first year of enrolment.

The following is a list of the maximum number of Industrial Experience units that may be counted towards the degree in the various courses offered.
- Mechanical Engineering - 3 units
- Chemical Engineering - 4 units
- Civil Engineering - 3 units
- Computer Engineering - 5 units
- Electrical Engineering - 4 units
- Industrial Engineering - 3 units

Students following the sandwich patterns offered by the Departments of Electrical and Mechanical Engineering should consult with the Heads of those Departments before enrolling in Industrial Experience units.
Note: The University can accept no responsibility for finding suitable employment for students wishing to enrol for Industrial Experience units.

The successful completion of one Industrial Experience unit satisfies the requirement that students complete 12 weeks practical experience.

4. B.Sc.(Met.) Students
(i) For the degrees of Bachelor of Science (Engineering) and Bachelor of Science (Metallurgy) students must complete at least three years of practical experience before the 31st January in the year in which the student is to be admitted to the Degree. If this requirement is not met admission to the degree may be deferred.
(ii) Students transferring from the degree of Bachelor of Science (Metallurgy) to the degree of Bachelor of Metallurgy may claim up to five Industrial Experience units as Met. 400 subjects.

EXEMPTIONS

Failure in a Subject
Failure in a core subject (grades FF, AF, WF or EF) means that the subject must be repeated in full (except where exemption may be given for laboratory classes — see below). Failure in an Elective subject means that either that subject must be repeated in full or another Elective subject(s) of equivalent unit value must be taken in its place.

Exemptions Within Subjects
Exemptions will not be given in a part subject or topic taken within a larger subject even if the content of that part subject or topic is offered separately as a smaller unit value subject.
Standing for Work Completed as Part of a Larger Subject
Standing may be granted, where appropriate, for work completed as part of a larger subject ONLY where the larger subject was successfully completed. That is, standing will not be granted on the basis of work completed in a part subject or topic which formed part of a larger subject if a failing grade was awarded in the larger subject concerned.

Exemptions for Laboratory Component of a Subject
In some cases, a student who fails a subject but completes the laboratory component of that subject satisfactorily, may be exempted from repeating that laboratory component. Exemption from a laboratory component is not automatic and should not be assumed. Students should apply to the lecturer responsible for the subject concerned for exemption from laboratory work at the commencement of classes in that subject.

Bachelor Degree Course Programmes

About This Section
This section contains the detailed undergraduate course programmes which have been approved by Faculty Board in accordance with the Regulations Governing Bachelors Degrees in the Faculty of Engineering.

Each course is outlined as an approved full-time programme taken over 4 years. All students complete the relevant approved programme regardless of their pattern of attendance. In some cases, part-time students may take Industrial Experience subjects as units of Elective.

There are also a number of other sections associated with each approved programme. These cover such aspects as:
- Options within the Approved Programme
- The Recommended Pattern of Part-time Attendance
- Elective Requirements
- Transition Arrangements

Students are expected to be aware of all aspects of the Approved Programme and associated requirements of the course in which they are enrolled.

Enquiries may be directed to the Faculty Secretary or the Head of the Department indicated in the course entry concerned.
CHEMICAL ENGINEERING

The Department of Chemical and Materials Engineering is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the specialisation of Chemical Engineering.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Engineering (BE) in the specialisation of Chemical Engineering.

Students enrolled prior to 1987 should carefully note the transition requirements.

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR I</strong></td>
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<tr>
<td>Chemistry I</td>
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<tr>
<td>Mathematics I</td>
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</tr>
<tr>
<td>Physics IA</td>
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<tr>
<td>ChE141 Industrial Process Principles</td>
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<tr>
<td>ChE153 Chemical and Manufacturing Processes</td>
<td>2</td>
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<tr>
<td>GE151 Introduction to Materials Science</td>
<td>1</td>
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<tr>
<td></td>
<td>16</td>
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<tr>
<td><strong>YEAR II</strong></td>
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</tr>
<tr>
<td>Chemistry IIC</td>
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<tr>
<td>ChE242 Process Analysis I</td>
<td>3</td>
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<tr>
<td>ChE262 Transfer Processes I</td>
<td>3</td>
</tr>
<tr>
<td>ChE291 Laboratory</td>
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</tr>
<tr>
<td>EM2CO Vector Calculus and Differential Equations</td>
<td>2</td>
</tr>
<tr>
<td>EM2BD Complex Analysis and Linear Algebra</td>
<td>1</td>
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<tr>
<td></td>
<td>16</td>
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<tr>
<td><strong>YEAR III</strong></td>
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<tr>
<td>ChE343 Process Analysis II</td>
<td>2</td>
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<tr>
<td>ChE355 Transfer Processes II</td>
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<td>ChE363 Separation Processes</td>
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<td>ChE371 Kinetics and Thermodynamics</td>
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<tr>
<td>ChE383 Modelling of Processes</td>
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<tr>
<td>ChE391 Laboratory</td>
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<tr>
<td>Electives</td>
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<tr>
<td><strong>YEAR IV</strong></td>
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<tr>
<td>ChE463 Safety and Environment</td>
<td>1</td>
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<tr>
<td>ChE483 Reaction Engineering</td>
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<tr>
<td>ChE486 Process Control</td>
<td>2</td>
</tr>
<tr>
<td>ChE491 Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ChE496 Research Project</td>
<td>4</td>
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<tr>
<td>ChE497 Design Project</td>
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<tr>
<td>Electives</td>
<td>2</td>
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<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

(See notes on following page.)

Notes:
1. Physics IB may be taken in lieu of Physics IA.
2. Mathematics IIA (Topics CO, B and D) may be taken in lieu of EM2CO, EM2BD and one unit of Elective.
3. Chemistry IIA (6 units: weight 2) may be taken in lieu of Chemistry IIC and 2 units of Elective. Students are encouraged to consider taking this option. Students wishing to enrol in Chemistry IIA as part of a full Year II programme should take EM2CO in Year III.

APPROVED PROGRAMME (PROCESS METALLURGY OPTION)

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR I</strong></td>
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<td>Chemistry I</td>
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<tr>
<td>Mathematics I</td>
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<tr>
<td>Physics IA</td>
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<tr>
<td>ChE141 Industrial Process Principles</td>
<td>1</td>
</tr>
<tr>
<td>ChE153 Chemical and Manufacturing Processes</td>
<td>2</td>
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<tr>
<td>GE151 Introduction to Materials Science</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>YEAR II</strong></td>
<td></td>
</tr>
<tr>
<td>Chemistry IIC</td>
<td>4</td>
</tr>
<tr>
<td>ChE242 Process Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>ChE262 Transfer Processes I</td>
<td>3</td>
</tr>
<tr>
<td>ChE291 Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>EM2CO Vector Calculus and Differential Equations</td>
<td>2</td>
</tr>
<tr>
<td>EM2BD Complex Analysis and Linear Algebra</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>YEAR III</strong></td>
<td></td>
</tr>
<tr>
<td>ChE343 Process Analysis II</td>
<td>2</td>
</tr>
<tr>
<td>ChE355 Transfer Processes II</td>
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<td>ChE363 Separation Processes</td>
<td>2</td>
</tr>
<tr>
<td>ChE371 Kinetics and Thermodynamics</td>
<td>1</td>
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<tr>
<td>ChE374 Theory of Metallurgical Processes</td>
<td>2</td>
</tr>
<tr>
<td>ChE383 Modelling of Processes</td>
<td>1</td>
</tr>
<tr>
<td>ChE392 Extractive Metallurgy Laboratory</td>
<td>2</td>
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<tr>
<td>Electives</td>
<td>2</td>
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<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>YEAR IV</strong></td>
<td></td>
</tr>
<tr>
<td>ChE463 Safety and Environment</td>
<td>1</td>
</tr>
<tr>
<td>ChE483 Reaction Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ChE486 Process Control</td>
<td>2</td>
</tr>
<tr>
<td>ChE491 Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ChE496P Research Project</td>
<td>4</td>
</tr>
<tr>
<td>ChE497P Design Project</td>
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</tr>
<tr>
<td>Electives</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Notes:
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3. Chemistry IIA (6 units: weight 2) may be taken in lieu of Chemistry IIC and 2 units of Elective. Students are encouraged to consider taking this option. Students wishing to enrol in Chemistry IIA as part of a full Year II programme should take EM2CO in Year III.

RECOMMENDED PART-TIME PROGRAMMES

CHEMICAL ENGINEERING

(PROCESS METALLURGY OPTION)

STAGE 1
Mathematics I Mathematics I
ChE141 ChE141
ChE153 ChE153
GE151 8 units GE151 8 units

STAGE 2
Chemistry I Chemistry I
Physics IA Physics IA
ChE002 9 units ChE002 9 units

STAGE 3
Chemistry IIC Chemistry IIC
ChE262 ChE262
EM2CO EM2CO
ChE003 10 units ChE003 10 units

STAGE 4
ChE242 ChE242
ChE291 ChE291
ChE363 ChE363
EM2BD EM2BD
ChE004 10 units ChE004 10 units

STAGE 5
ChE343 ChE343
ChE355 ChE355
ChE371 ChE371
ChE383 ChE383
ChE391 ChE391
ChE005 10 units ChE005 10 units

YEAR IV (Full-time)
ChE463 ChE463
ChE483 ChE483
ChE486 ChE486
ChE491 ChE491
ChE496 ChE496
ChE497 ChE497
2 units of Elective 15 units ChE497P 15 units

TRANSITION ARRANGEMENTS

The Approved Programme of the Chemical Engineering course has been amended with effect from the 1987 academic year. All students enrolled in this course or a combined degree course of which it forms part, are required to meet the requirements of the new Approved Programme subject to the transition arrangements given below.

YEAR BY YEAR TRANSITION

Year Completed in 1986 Required to Complete in Subsequent Years
Year I Year II, Year III and Year IV
Year II Year III less 1 unit of Elective plus ChE300 and Year IV
Year III Year IV less 1 unit of Elective plus ChE300

SUBJECT BY SUBJECT TRANSITION

Students out of phase with year by year progression in the Approved Programme and who have completed a particular subject(s) in the list below will not be required to complete the corresponding subject(s) listed.

In the case of multi-unit subjects, students who have completed some but not all of the "old" subjects listed may complete the remaining subject(s) in that group in 1987 and will then not be required to complete the corresponding "new" subject.

These transition arrangements are only available where at least one core subject in each group listed below was passed prior to 1987. They are not alternatives available to students who have not completed any of the subjects in a group. Completion of a unit of Elective but not the associated previous core subject(s), does not entitle a student to enrol in that previous core subject.

Subjects Corresponding Subjects
ChE151 and ChE152 ChE153
ChE251, GE206 and GE207 ChE224
ChE241, ChE261 and ChE272 or Met261, ChE261 and ChE272
ChE271 One half-unit of Elective
ChE351, ChE342 and ChE352 ChE343
ChE353, ChE354, ChE362 ChE355
and 1 unit of Elective
ChE361 ChE363
ChE382 ChE383
ChE381 1 unit of Elective
ChE462 and ChE471 ChE463
ChE472 1 unit of Elective
ChE482 and 1 unit of Elective ChE486

EXCEPTIONAL CIRCUMSTANCES ARISING IN TRANSITION

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

ELECTIVE REQUIREMENTS

(a) The number of elective units to be taken are:
B.E. (Chemical Engineering) 6 units
B.E. (Chemical Engineering with Process Metallurgy Option) 4 units
(b) Elective units may consist of any subjects offered within the Faculty of Engineering or other Faculties, subject to the approval of the Head of the Department of Chemical and Materials Engineering and of the Department responsible for the subject.

(c) Students may count up to four units from the Department of Chemical and Materials Engineering's list of Industrial Experience Subjects towards the Electives.

Note: The Faculty Board, Faculty of Engineering has resolved that the subject Introductory Quantitative Methods offered by the Department of Economics may not be taken as an elective subject by students enrolled in the Faculty of Engineering.

(d) List of Industrial Experience Subjects

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

The following subjects have been approved for this purpose:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE002</td>
<td>Industrial Experience</td>
<td>1 unit</td>
</tr>
<tr>
<td>ChE003</td>
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</tr>
<tr>
<td>ChE004</td>
<td>Industrial Experience</td>
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</tr>
<tr>
<td>ChE005</td>
<td>Industrial Experience</td>
<td>1 unit</td>
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</table>

(CIVIL ENGINEERING)

The Department of Civil Engineering and Surveying is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the specialisation of Civil Engineering.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Engineering (BE) in the specialisation of Civil Engineering.

Students enrolled prior to 1987 should carefully note the transition requirements.

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>Year</th>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR I</td>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physics IB</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CE111 Mechanics and Structures</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE150 Civil Engineering Practice</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE171 Engineering Surveying I</td>
<td>2</td>
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<tr>
<td></td>
<td>EE130 Introduction to Electrical Engineering</td>
<td>1</td>
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<tr>
<td></td>
<td>GE101 Introduction to Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>GE151 Introduction to Materials Science</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ME111 Graphics and Engineering Drawing</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
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<tr>
<td>YEAR II</td>
<td>Chemistry IS</td>
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<tr>
<td></td>
<td>CE212 Mechanics of Solids</td>
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<tr>
<td></td>
<td>CE213 Theory of Structures</td>
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<td></td>
<td>CE223J Engineering Geology</td>
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</tr>
<tr>
<td></td>
<td>CE224 Civil Engineering Materials</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CE231 Fluid Mechanics I</td>
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<tr>
<td></td>
<td>CE232 Fluid Mechanics II</td>
<td>1</td>
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<tr>
<td></td>
<td>EM2CO Vector Calculus and Differential Equations</td>
<td>2</td>
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<tr>
<td></td>
<td>GE204 Engineering Computations I</td>
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<tr>
<td></td>
<td>GE205 Engineering Computations II</td>
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<tr>
<td></td>
<td>GE211 Theory and Applications of Electrical Energy Conversion</td>
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<tr>
<td>YEAR III</td>
<td>CE314 Theory of Structures II</td>
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<td></td>
<td>CE315 Structural Design</td>
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<td>CE316 Stress Analysis</td>
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<td>CE324 Soil Mechanics</td>
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<td>CE325 Concrete and Metals Technology</td>
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<td>CE333 Fluid Mechanics III</td>
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<td>CE334 Open Channel Hydraulics</td>
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<td></td>
<td>CE341 Hydrology</td>
<td>1</td>
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<td></td>
<td>CE351 Civil Engineering Systems</td>
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<td></td>
<td>CE372 Transportation Engineering</td>
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<tr>
<td></td>
<td>CE381 Statistical Methods</td>
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<td></td>
<td>GE301 Technology and Human Values I</td>
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### YEAR IV

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CE417</td>
<td>Theory of Structures III</td>
<td>1</td>
</tr>
<tr>
<td>CE426</td>
<td>Geotechnical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE442</td>
<td>Public Health Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE443</td>
<td>Water Resources Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE452</td>
<td>Civil Engineering Management</td>
<td>1</td>
</tr>
<tr>
<td>CE453</td>
<td>Civil Engineering Construction</td>
<td>1</td>
</tr>
<tr>
<td>CE454</td>
<td>Civil Engineering Design</td>
<td>2</td>
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<tr>
<td>CE455</td>
<td>Project</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td>5</td>
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**Notes:**
1. Physics IA may be taken in lieu of Physics IB. This option is recommended for students with a strong mathematics/physics background who may wish to follow a combined degree programme or otherwise undertake further studies in Physics.
2. Chemistry I may replace Chemistry IS and 2 units of Elective.
3. Geology I may replace CE223J Engineering Geology and 2 units of Elective.
4. Physics II may replace EE130 Introduction to Electrical Engineering, GE211 Theory and Application of Electrical Energy Conversion and 2 units of Elective.
5. Mathematics IIA or IIB may replace EM2CO and 2 units of Elective provided Topic CO is included.
6. Students may substitute both GE206 Computational Methods I and GE207 Computational Methods II for both GE204 and GE205 respectively.
7. In exceptional circumstances and with the permission of the Head of the Department of Civil Engineering, CE456 Project may replace CE454 Civil Engineering Design and CE455 Project.

### RECOMMENDED PART-TIME PROGRAMME

#### STAGE 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
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<td>1</td>
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<td>GE151</td>
<td>Intro. to Engineering Design</td>
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<td>ME111</td>
<td>Intro. to Elec. Eng.</td>
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<tr>
<td>GE101</td>
<td>Intro. to Elec. Eng.</td>
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<td>GE206</td>
<td>Computational Methods I</td>
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<td>GE207</td>
<td>Computational Methods II</td>
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#### STAGE 2

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<tr>
<td>EE130</td>
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<tr>
<td>CE150</td>
<td>Intro. to Elec. Eng.</td>
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<tr>
<td>Mathematics I</td>
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#### STAGE 3

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<td>GE211</td>
<td>Intro. to Elec. Eng.</td>
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<tr>
<td>ME212</td>
<td>Intro. to Elec. Eng.</td>
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</tr>
<tr>
<td>GE224</td>
<td>Intro. to Elec. Eng.</td>
<td>1</td>
</tr>
<tr>
<td>GE211</td>
<td>Intro. to Elec. Eng.</td>
<td>1</td>
</tr>
<tr>
<td>EM2CO</td>
<td>Intro. to Elec. Eng.</td>
<td>1</td>
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#### TRANSITION ARRANGEMENTS

**YEAR BY YEAR TRANSITION**

Year Completed in 1986

<table>
<thead>
<tr>
<th>Year Completed</th>
<th>Year I</th>
<th>Year II</th>
<th>Year III</th>
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<td>6</td>
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<td></td>
<td>7</td>
<td>8</td>
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<table>
<thead>
<tr>
<th>Year I</th>
<th>Year II</th>
<th>Year III</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE417</td>
<td>CE426</td>
<td>CE442</td>
</tr>
<tr>
<td>CE443</td>
<td>CE452</td>
<td>CE454</td>
</tr>
<tr>
<td>CE455</td>
<td>CE453</td>
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<table>
<thead>
<tr>
<th>Subject(s)</th>
<th>Corresponding Subject(s)</th>
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<tbody>
<tr>
<td>CE411</td>
<td>CE111 Mechanics and Structures</td>
</tr>
<tr>
<td>CE426</td>
<td>CE150 Civil Engineering Practice</td>
</tr>
<tr>
<td>CE442</td>
<td>CE150 Intro. to Engineering Design</td>
</tr>
<tr>
<td>CE443</td>
<td>CE151 Theory of Structures I</td>
</tr>
<tr>
<td>CE452</td>
<td>CE151 Theory of Structures II</td>
</tr>
<tr>
<td>CE453</td>
<td>CE151 Stress Analysis</td>
</tr>
<tr>
<td>CE454</td>
<td>CE334 Open Channel Hydraulics</td>
</tr>
<tr>
<td>CE455</td>
<td>CE341 Hydrology</td>
</tr>
<tr>
<td>CE456</td>
<td>CE342 Geotechnical Engineering</td>
</tr>
<tr>
<td>CE457</td>
<td>CE342 Civil Eng. Management, and</td>
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<tr>
<td>CE458</td>
<td>CE342 Civil Eng. Construction</td>
</tr>
<tr>
<td>CE459</td>
<td>CE342 Civil Eng. Design, and</td>
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<tr>
<td>CE460</td>
<td>CE342 Project</td>
</tr>
<tr>
<td>CE461</td>
<td>GE301 Technology and Human Values I</td>
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</table>

**SUBJECT BY SUBJECT TRANSITION**

Students out of phase with year by year progression in the approved programme and who have completed a particular subject(s) in the list below will not be required to complete the corresponding subject(s) listed.

<table>
<thead>
<tr>
<th>Subject(s)</th>
<th>Corresponding Subject(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE111</td>
<td>CE111 Mechanics and Structures</td>
</tr>
<tr>
<td>CE325</td>
<td>CE325 Civil Engineering Practice</td>
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<tr>
<td>CE443</td>
<td>CE443 Intro. to Engineering Design</td>
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<tr>
<td>CE452</td>
<td>CE452 Theory of Structures I</td>
</tr>
<tr>
<td>CE454</td>
<td>CE454 Theory of Structures II</td>
</tr>
<tr>
<td>CE455</td>
<td>CE455 Stress Analysis</td>
</tr>
<tr>
<td>GE350</td>
<td>GE350 Open Channel Hydraulics</td>
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<td>GE351</td>
<td>GE351 Hydrology</td>
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<tr>
<td>GE352</td>
<td>GE352 Geotechnical Engineering</td>
</tr>
<tr>
<td>GE353</td>
<td>GE352 Civil Eng. Management, and</td>
</tr>
<tr>
<td>GE354</td>
<td>GE352 Civil Eng. Construction</td>
</tr>
<tr>
<td>GE355</td>
<td>GE352 Civil Eng. Design, and</td>
</tr>
<tr>
<td>GE356</td>
<td>GE352 Project</td>
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<tr>
<td>GE357</td>
<td>GE352 Technology and Human Values I</td>
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</tbody>
</table>
1 Structures Elective Unit
2 Structures Elective Units
+ 8 Elective Units
(Inc. Dept. elective)

Students completing degree requirements in 1987 will not be required to complete the subjects CE325 Concrete and Metals Technology and CE381 Statistical Methods but may substitute Elective units instead.

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

ELECTIVE REQUIREMENTS
Five units of electives may be chosen from the following list of subjects offered by the Department of Civil Engineering subject to the approval of the Head of the Department of Civil Engineering.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE418 Masonry and Timber Design</td>
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</tr>
<tr>
<td>CE419 Dynamics and Stability of Structures</td>
<td>1</td>
</tr>
<tr>
<td>CE427 Rock Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>CE435 River and Coastal Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE472 Engineering Surveying II</td>
<td>1</td>
</tr>
<tr>
<td>CE474 Highway Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE482 Finite Element Methods</td>
<td>1</td>
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<tr>
<td>CE490 Special Topic</td>
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<tr>
<td>CE491 Special Topic</td>
<td>1</td>
</tr>
<tr>
<td>CE092 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>CE093 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>CE094 Industrial Experience</td>
<td>1</td>
</tr>
<tr>
<td>CE095 Industrial Experience</td>
<td>1</td>
</tr>
</tbody>
</table>

The five units may consist of any subjects from the above list or any subjects offered within the Faculty of Engineering or by other Faculties subject to the approval of the Heads of the Department of Civil Engineering and of the Department responsible for the subject.

MINING ENGINEERING
As pointed out in Section 2 of this Handbook, students who have completed two years of the Civil Engineering course in this University may complete the B.E. degree in the Mining Engineering speciality at the University of New South Wales. Such students are normally admitted to the third year of that course by the University of New South Wales. Students wishing to complete the Mining Engineering course should complete Years I and II of the approved Civil Engineering programme as set out on page 59 above. This programme may be completed by part-time attendance or a combination of part-time and full-time attendance.

COMPUTER ENGINEERING
The Department of Electrical and Computer Engineering is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the specialisation of Computer Engineering.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Engineering (BEng) in the specialisation of Computer Engineering.

Students enrolled prior to 1987 should carefully note the transition requirements.

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>Subjects Units</th>
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<td>Physics IA</td>
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<td>CE111 Mechanics and Structures</td>
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<td>EE100 Electrical and Computer Engineering I</td>
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<td>GE101 Introduction to Engineering</td>
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<tr>
<td>GE151 Introduction to Materials Science</td>
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</tr>
<tr>
<td>ME111 Graphics and Engineering Drawing</td>
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<td>Computer Science I</td>
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<td>Mathematics IA</td>
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<tr>
<td>EE200 Electrical Engineering II</td>
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<td>Ph221 Electromagnetics and Quantum Mechanics</td>
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<tr>
<td>EE323 Linear Electronics I</td>
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<td>EE326 Digital Design and Technology</td>
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<td>EE333 Advanced Circuit Analysis</td>
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<td>EE344 Communications</td>
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<td>EE345 Digital Signal Processing</td>
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<tr>
<td>EE362 Switching Theory and Logic Design</td>
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<tr>
<td>GE325 Microprocessor Systems and Applications</td>
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<tr>
<td>GE361 Automatic Control</td>
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<tr>
<td>Electives</td>
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<tr>
<td>EE421 Electronic Design A</td>
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<td>EE422 Electronic Design B</td>
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<tr>
<td>EE426 Advanced Digital Systems</td>
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<tr>
<td>EE436 Computer Operating Systems</td>
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<td>EE464 Compiler Construction</td>
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<tr>
<td>EE486 Project/Seminar</td>
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<tr>
<td>4 units from List 1</td>
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(See notes on following page.)
Notes:
1. Part-time students may take Mathematics IIB (topics CO, B and D) in two parts in lieu of Mathematics IIA.
2. Students enrolled prior to 1987 are not required to complete GE101.
3. Students may, with the approval of the Head of Department, replace EE486 with EE484 and two units of EE300/400/500.

RECOMMENDED PART-TIME PROGRAMME

<table>
<thead>
<tr>
<th>STAGE 1</th>
<th>Mathematics I</th>
<th>STAGE 5</th>
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<td>EE333</td>
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<td></td>
<td>EE095</td>
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<tr>
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<table>
<thead>
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<th>Computer Science I</th>
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<td>EE323</td>
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</tr>
<tr>
<td></td>
<td>9 units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STAGE 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE421</td>
</tr>
<tr>
<td>EE422</td>
</tr>
<tr>
<td>EE426</td>
</tr>
<tr>
<td>EE463</td>
</tr>
<tr>
<td>EE464</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STAGE 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE486</td>
</tr>
<tr>
<td>2 from list 1</td>
</tr>
<tr>
<td>8 units</td>
</tr>
</tbody>
</table>

SANDWICH PROGRAMMES

Sandwich programmes are attendance patterns which "sandwich" periods of attendance at University with periods of industrial experience or other employment. It may be possible in some circumstances for students to arrange their annual programme in such a way that attendance is required only in one semester. However, the timetabling needs of full-time and part-time students, as well as the existence of full-year subjects, means that semester based sandwich programmes cannot always be provided at the present time.

Students should note that a "thick sandwich", which is taken on a year on/ year off basis is available. Leave of absence will be granted for up to three years during the course.

TRANSITION ARRANGEMENTS

YEAR BY YEAR TRANSITION

<table>
<thead>
<tr>
<th>Year Completed in 1986</th>
<th>Required to Complete in Subsequent Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td>Year II less ME209 plus GE151 and ME272</td>
</tr>
<tr>
<td>Year II</td>
<td>Year III and Year IV</td>
</tr>
<tr>
<td>Year III</td>
<td>Year IV</td>
</tr>
</tbody>
</table>

SUBJECT BY SUBJECT TRANSITION

Students out of phase with year by year progression in the Approved Programme and who have completed particular subject(s) will be required to complete the corresponding subject(s) listed.

In the case of multi-unit subjects, students who have completed some but not all of the "old" subjects listed may complete the remaining subject(s) in that group in 1987 and will then not be required to complete the corresponding "new" subject.

These transition arrangements are only available where at least one core subject in each group listed below was passed prior to 1987. They are not alternatives available to students who have not completed any of the subjects in a group. Completion of a unit of Elective but not the associated previous core subject(s) does not entitle a student to enrol in that previous core subject.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Corresponding Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE111 Statics</td>
<td>EE111 Mechs. and Structures</td>
</tr>
<tr>
<td>Chemistry IS, EE131</td>
<td>EE100 Electrical and Computer Engineering I</td>
</tr>
<tr>
<td>EE161</td>
<td></td>
</tr>
<tr>
<td>ME131</td>
<td>1 unit of Elective</td>
</tr>
<tr>
<td>EE262, EE263, EE264</td>
<td>Computer Science I</td>
</tr>
<tr>
<td>1 unit of Elective</td>
<td></td>
</tr>
<tr>
<td>EE211, EE221, EE232</td>
<td>EE200 Electrical Engineering II</td>
</tr>
<tr>
<td>2 units of Elective</td>
<td></td>
</tr>
<tr>
<td>GE360 and 1 unit of Elective</td>
<td>GE361</td>
</tr>
</tbody>
</table>

Notes:
1. Students who have completed some but not all subjects in this group prior to 1987 must complete the group by completing 2 units of Elective in lieu of Chemistry IS, EE131T in lieu of EE131; and/or EE161T in lieu of EE161. They will then not be required to complete EE100 Electrical and Computer Engineering I. Note that the transition subjects will only be offered in 1987.
2. Students who completed ME131 are required to complete GE151 and ME272 in lieu of ME209.
3. Note that EE262, EE263 and EE264 will only be offered in 1987.
4. Students who have completed some but not all subjects in this group prior to 1987 must complete: EE211T in lieu of EE211; EE221T in lieu of EE221; and EE232T in lieu of EE232. When the complete set of subjects, including the 2 units of Elective, have been completed, students will then not be required to complete EE200 Electrical Engineering II. Note that the transition subjects will only be offered in 1987.
5. Students who have not completed GE360 but have completed all 9 units of Elective required in previous course programmes, are required to complete GE361 but count 1 unit of that subject in lieu of 1 unit of List 1 subjects.
EXCEPTIONAL CIRCUMSTANCES ARISING IN TRANSITION

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

ELECTIVE REQUIREMENTS

Five units of electives shall be chosen in accordance with the following rules subject to the approval of the Head of Department:

1. Students may count up to five units from the Department of Electrical and Computer Engineering's List of Industrial Experience subjects as elective units.
2. All elective units other than Industrial Experience subjects shall be chosen from subjects offered by departments other than the Department of Electrical and Computer Engineering.

LIST 1 SUBJECTS

- Any EE300/400/500 subject.
- Any ME400/500 or GE400/500 level subject with approval of the Head of Department of Electrical and Computer Engineering.
- CS — Commercial Programming (1 unit).
- Any EM3 or EM4 subject offered by the Department of Mathematics with approval of the Head of Department of Electrical and Computer Engineering.

ELECTRICAL ENGINEERING

The Department of Electrical and Computer Engineering is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the specialisation of Electrical Engineering.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Engineering (BE) in the specialisation of Electrical Engineering.

Students enrolled prior to 1987 should carefully note the transition requirements.

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>YEAR I</th>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mathematics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physics IA</td>
<td>4</td>
</tr>
<tr>
<td>CE111</td>
<td>Mechanics and Structures</td>
<td>1</td>
</tr>
<tr>
<td>EE100</td>
<td>Electrical and Computer Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>GE101</td>
<td>Introduction to Engineering</td>
<td>1</td>
</tr>
<tr>
<td>GE151</td>
<td>Introduction to Materials Science</td>
<td>1</td>
</tr>
<tr>
<td>ME111</td>
<td>Graphics and Engineering Drawing</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>YEAR II</th>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE200</td>
<td>Electrical Engineering II</td>
<td>5</td>
</tr>
<tr>
<td>EE265</td>
<td>Electrical Engineering Computations</td>
<td>2</td>
</tr>
<tr>
<td>ME209</td>
<td>Mechanical Engineering Science</td>
<td>2</td>
</tr>
<tr>
<td>Ph221</td>
<td>Electromagnetics and Quantum Mechanics</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR III</th>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE313</td>
<td>Power Systems</td>
<td>1</td>
</tr>
<tr>
<td>EE314</td>
<td>Electrical Machines</td>
<td>1</td>
</tr>
<tr>
<td>EE315</td>
<td>Power Electronics</td>
<td>1</td>
</tr>
<tr>
<td>EE323</td>
<td>Linear Electronics I</td>
<td>1</td>
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<tr>
<td>EE324</td>
<td>Linear Electronics II</td>
<td>1</td>
</tr>
<tr>
<td>EE326</td>
<td>Digital Design and Technology</td>
<td>1</td>
</tr>
<tr>
<td>EE333</td>
<td>Advanced Circuit Analysis</td>
<td>1</td>
</tr>
<tr>
<td>EE344</td>
<td>Communications</td>
<td>1</td>
</tr>
<tr>
<td>EE362</td>
<td>Switching Theory and Logic Design</td>
<td>1</td>
</tr>
<tr>
<td>GE361</td>
<td>Automatic Control</td>
<td>2</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR IV</th>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE421</td>
<td>Electronic Design A</td>
<td>1</td>
</tr>
<tr>
<td>EE451</td>
<td>Electromagnetic Propagation and Antennas</td>
<td>1</td>
</tr>
<tr>
<td>EE486</td>
<td>Project/Seminar</td>
<td>1</td>
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<tr>
<td>7 units from EE300/400/500</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

(See notes on following page.)
Notes:
1. Part-time students may take Mathematics II B (topics CO, B and D) in two parts in lieu of Mathematics IIA.
2. Students enrolled prior to 1987 are not required to complete GE101.
3. GE325 Microprocessor Systems and Applications may be counted as one unit of EE300/400/500.
4. Students may, with the approval of the Head of Department, replace EE486 with EE484 and two units of EE300/400/500.

RECOMMENDED PART-TIME PROGRAMME

STAGE 1
Mathematics I
EE100 8 units

STAGE 2
Physics I A
CE111
GE101
GE151
ME111
EE092 9 units

STAGE 3
Mathematics IIA
EE200
EE093 10 units

STAGE 4
EE265
EE313
EE314
EE315
GE361
ME209 9 units

TRANSITION ARRANGEMENTS

YEAR BY YEAR TRANSITION
Year Completed in 1986
Year I
Year II less ME209 plus GE151 and ME272
Year III and Year IV
Year III and Year IV
Year IV

SUBJECT BY SUBJECT TRANSITION
Students out of phase with year by year progression in the Approved Programme and who have completed particular subject(s) will be required to complete the corresponding subject(s) listed.

In the case of multi-unit subjects, students who have completed some but not all of the "old" subjects listed may complete the remaining subject(s) in that group in 1987 and will then not be required to complete the corresponding "new" subject.

These transition arrangements are only available where at least one core subject in each group listed below was passed prior to 1987. They are not alternatives available to students who have not completed any of the subjects in a group. Completion of a unit of Elective but not the associated previous core subject(s), does not entitle a student to enrol in that previous core subject.

Subjects
Corresponding Subjects
CE111 Statics
CE111 Mechs. and Structures
Chemistry I, EE131 and EE161
EE100 Electrical and Computer Engineering I
ME131
1 unit of Elective
EE262 and EE264
EE265
EE211, EE221, EE232 and 2 units of Elective
EE200 Electrical Engineering II
GE360 and 1 unit of Elective
GE361

Notes:
1. Students who have completed some but not all subjects in this group prior to 1987 must complete the group by completing: 2 units of Elective in lieu of Chemistry I; EE131 in lieu of EE131; and/or EE161 in lieu of EE161. They will then not be required to complete EE100 Electrical and Computer Engineering I. Note that the transition subjects will only be offered in 1987.
2. Students who completed ME131 are required to complete GE151 and ME272 in lieu of ME209.
3. Electrical Engineering students only. Note that EE262 and EE264 will only be offered in 1987.
4. Students who have completed some but not all subjects in this group prior to 1987 must complete: EE211 in lieu of EE211; and/or EE221 in lieu of EE221; and/or EE232 in lieu of EE232. When the complete set of subjects, including the 2 units of Elective, have been completed, students will then not be required to complete EE200 Electrical Engineering II. Note that the transition subjects will only be offered in 1987.
5. Students who have not completed GE360 but have completed all 9 units of Elective required in previous course programmes, are required to complete GE361 but count 1 unit of that subject in lieu of 1 unit of EE300/400/500 subjects.

EXCEPTIONAL CIRCUMSTANCES ARISING IN TRANSITION
In order to provide for exceptional circumstances arising in particular transition cases, the Dean may determine the transition programme to be followed.

ELECTIVE REQUIREMENTS
Four units of electives shall be chosen in accordance with the following rules subject to the approval of the Head of Department:
1. Students may count up to four units from the Department of Electrical and Computer Engineering's List of Industrial Experience Subjects as electives.
2. All electives, other than Industrial Experience subjects, shall be selected from subjects offered by departments other than the Department of Electrical and Computer Engineering.
SANDWICH PROGRAMMES

Sandwich programmes are attendance patterns which 'sandwich' periods of attendance at University with periods of industrial experience or other employment. It may be possible in some circumstances for students to arrange their annual programme in such a way that attendance is required only in one semester. However, the timetabling needs of full-time and part-time students, as well as the existence of full-year subjects, mean that semester based sandwich programmes cannot always be provided at the present time.

Students should note that a 'thick sandwich', which is taken on a year on/year off basis is available. Leave of absence will be granted for up to three years during the course.

INDUSTRIAL ENGINEERING

The Department of Mechanical Engineering is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the specialisation of Industrial Engineering.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Engineering (BE) in the specialisation of Industrial Engineering.

Students enrolled prior to 1987 should carefully note the transition requirements.

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR I</td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Physics I</td>
<td>4</td>
</tr>
<tr>
<td>CE111 Mechanics and Structures</td>
<td>1</td>
</tr>
<tr>
<td>EE100 Electrical and Computer Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>GE101 Introduction to Engineering</td>
<td>1</td>
</tr>
<tr>
<td>GE151 Introduction to Materials Science</td>
<td>1</td>
</tr>
<tr>
<td>ME111 Graphics and Engineering Drawing</td>
<td>1</td>
</tr>
<tr>
<td>YEAR II</td>
<td>16</td>
</tr>
<tr>
<td>EM2CO Vector Calculus and Differential Equations</td>
<td>2</td>
</tr>
<tr>
<td>EM2AS Applied Statistics</td>
<td>1</td>
</tr>
<tr>
<td>GE204 Engineering Computations I</td>
<td>1</td>
</tr>
<tr>
<td>GE205 Engineering Computations II</td>
<td>1</td>
</tr>
<tr>
<td>MA211 Selection and Use of Materials I</td>
<td>1</td>
</tr>
<tr>
<td>ME204 Experimental Methods I</td>
<td>2</td>
</tr>
<tr>
<td>ME214 Mechanics of Solids I</td>
<td>1</td>
</tr>
<tr>
<td>ME215 Mechanical Engineering Design I</td>
<td>2</td>
</tr>
<tr>
<td>ME231 Dynamics</td>
<td>1</td>
</tr>
<tr>
<td>ME251 Fluid Mechanics I</td>
<td>1</td>
</tr>
<tr>
<td>ME271 Thermodynamics I</td>
<td>1</td>
</tr>
<tr>
<td>YEAR III</td>
<td>15</td>
</tr>
<tr>
<td>GE211 Theory and Applications of Electrical Energy Conversion</td>
<td>1</td>
</tr>
<tr>
<td>GE301 Technology and Human Values I</td>
<td>2</td>
</tr>
<tr>
<td>GE325 Microprocessor Systems and Applications</td>
<td>1</td>
</tr>
<tr>
<td>GE361 Automatic Control</td>
<td>2</td>
</tr>
<tr>
<td>ME316 Mechanical Engineering Design II</td>
<td>2</td>
</tr>
<tr>
<td>ME333 Dynamics of Machines</td>
<td>1</td>
</tr>
<tr>
<td>ME343 Mechanics of Solids II</td>
<td>1</td>
</tr>
<tr>
<td>ME381 Methods Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME383 Quality Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ME482 Engineering Economics I</td>
<td>1</td>
</tr>
<tr>
<td>ME487 Operations Research — Fundamental Techniques</td>
<td>1</td>
</tr>
<tr>
<td>ME488 Operations Research — Planning, Inventory Control and Management</td>
<td>1</td>
</tr>
</tbody>
</table>
Notes:

1. Physics IA may be taken in lieu of Physics IB. This is recommended for students with a strong mathematics/physics background who may wish to follow a combined degree programme or otherwise undertake further studies in Physics.

2. The final year project may be expanded by the selection of Project Elective Units ME497 or ME498. Students may enrol in either of these electives only with the written approval of the Head of the Department, after suitable supervisory arrangements have been made.

RECOMMENDED APPROVED PROGRAMME

STAGE 1
Mathematics I
CE111
GE101
GE151
ME111
8 units

STAGE 2
Physics IB
EE100
8 units

STAGE 3
EM2CO
Mat211
ME204
ME214
ME231
ME092
9 units

STAGE 4
EM2AS
GE204
GE205
GE211
ME215
ME251
ME271
ME093
9 units

STAGE 5
GE325
GE361
ME333
ME343
ME381
ME383
ME482
ME094
9 units

STAGE 6
GE301
ME316
ME484
ME487
ME488
2 units - Electives 9 units

STAGE 7
ME483
ME485
ME496
3 units - Electives 9 units

STAGE 8
ME482
ME487
ME488
2 units - Electives 9 units

STAGE 9
ME483
ME484
ME485
ME496
3 units - Electives 9 units

TRANSITION ARRANGEMENTS

The Approved Programme of the Industrial Engineering course has been amended with effect from the 1987 academic year. All students enrolled in this course or a combined degree course of which it forms part, are required to meet the requirements of the new Approved Programme subject to the transition arrangements given below.

YEAR BY YEAR TRANSITION

Year Completed in 1986
Year II less ME215 and ME231
plus EE131T, ME212, ME232 and 1 unit of Elective
Year III and Year IV

Year III less GE325 plus GE205,
Year IV less 1 unit of elective plus GE325

SUBJECT BY SUBJECT TRANSITION

Subject by subject transition arrangements are identical to the arrangements for the Mechanical Engineering programme (see the Mechanical Engineering section for details) except in the case of those students who have completed ME413 Design III prior to 1987. Industrial Engineering students who have completed ME413 will count that subject as one unit of Elective.

EXCEPTIONAL CIRCUMSTANCES ARISING IN TRANSITION

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

ELECTIVE REQUIREMENTS

Eight elective units shall be chosen in accordance with the following rules:

1. Elective units shall be selected from the list of Approved Elective Subjects (except as provided below).

2. At least one unit of Elective must be chosen from ME400 level subjects.

3. Part-time students may select up to 3 units from the Industrial Experience units offered by the Department of Mechanical Engineering.

4. In exceptional circumstances, the Head of the Department of Mechanical Engineering may approve the selection of elective units not listed in the list of Approved Elective Subjects.

APPROVED ELECTIVE SUBJECTS

The list of approved Elective subjects is set out in the Mechanical Engineering section. In addition, Industrial Engineering students may select ME413 Mechanical Engineering Design III.
SANDWICH PROGRAMMES

Sandwich programmes are attendance patterns which ‘sandwich’ periods of attendance at University with periods of industrial experience or other employment. It may be possible in some circumstances for students to arrange their annual programme in such a way that attendance is required only in one semester. However, the timetabling needs of full-time and part-time students, as well as the existence of full-year subjects, mean that semester based sandwich programmes cannot always be provided at the present time.

Students should note that a ‘thick sandwich’, which is taken on a year on/year off basis is available. Leave of absence will be granted for up to three years during the course.

MECHANICAL ENGINEERING

The Department of Mechanical Engineering is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the specialisation of Mechanical Engineering.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Engineering (BE) in the specialisation of Mechanical Engineering.

Students enrolled prior to 1987 should carefully note the transition requirements.

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR I</strong></td>
<td></td>
</tr>
<tr>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td>Physics IB</td>
<td>4</td>
</tr>
<tr>
<td>CE111</td>
<td>1</td>
</tr>
<tr>
<td>EE100</td>
<td>4</td>
</tr>
<tr>
<td>GE101</td>
<td>1</td>
</tr>
<tr>
<td>GE151</td>
<td>1</td>
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<td>ME111</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>YEAR II</strong></td>
<td></td>
</tr>
<tr>
<td>EM2AS</td>
<td>1</td>
</tr>
<tr>
<td>EM2CO</td>
<td>2</td>
</tr>
<tr>
<td>GE204</td>
<td>1</td>
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<tr>
<td>GE205</td>
<td>1</td>
</tr>
<tr>
<td>Mat211</td>
<td>1</td>
</tr>
<tr>
<td>ME204</td>
<td>2</td>
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<tr>
<td>ME214</td>
<td>1</td>
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<tr>
<td>ME215</td>
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<tr>
<td>ME231</td>
<td>2</td>
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<td>ME251</td>
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<td>ME271</td>
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<td><strong>Total</strong></td>
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<tr>
<td><strong>YEAR III</strong></td>
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</tr>
<tr>
<td>GE211</td>
<td>1</td>
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<tr>
<td>GE301</td>
<td>2</td>
</tr>
<tr>
<td>GE361</td>
<td>2</td>
</tr>
<tr>
<td>Mat311</td>
<td>1</td>
</tr>
<tr>
<td>ME305</td>
<td>1</td>
</tr>
<tr>
<td>ME316</td>
<td>2</td>
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<tr>
<td>ME333</td>
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<td>ME343</td>
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<td>ME353</td>
<td>3</td>
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<tr>
<td>ME373</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>
**YEAR IV**

- ME413  Mechanical Engineering Design III  1
- ME496  Project/Seminar  4
- Electives  10
- 15

**Notes:**

1. Physics IA may be taken in lieu of Physics IB. This is recommended for students with a strong mathematics/physics background who may wish to follow a combined degree programme or otherwise undertake further studies in Physics.

2. The final year project may be expanded by the selection of Project Elective Units ME497 or ME498. Students may enrol in either of these electives only with the written approval of the Head of the Department, after suitable supervisory arrangements have been made.

**RECOMMENDED PART-TIME PROGRAMME**

<table>
<thead>
<tr>
<th>STAGE 1</th>
<th>STAGE 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics I</td>
<td>Mat311</td>
</tr>
<tr>
<td>CE111</td>
<td>ME305</td>
</tr>
<tr>
<td>GE101</td>
<td>ME333</td>
</tr>
<tr>
<td>GE151</td>
<td>ME343</td>
</tr>
<tr>
<td>ME111</td>
<td>ME353</td>
</tr>
<tr>
<td>8 units</td>
<td>ME373</td>
</tr>
<tr>
<td></td>
<td>ME094</td>
</tr>
<tr>
<td><strong>STAGE 2</strong></td>
<td><strong>STAGE 5</strong></td>
</tr>
<tr>
<td>Physics IB</td>
<td>GE301</td>
</tr>
<tr>
<td>EE100</td>
<td>ME316</td>
</tr>
<tr>
<td></td>
<td>ME361</td>
</tr>
<tr>
<td><strong>STAGE 3</strong></td>
<td><strong>STAGE 7</strong></td>
</tr>
<tr>
<td>EM2CO</td>
<td>ME413</td>
</tr>
<tr>
<td>Mat211</td>
<td>ME496</td>
</tr>
<tr>
<td>3 units - Electives 9 units</td>
<td>4 units - Electives 9 units</td>
</tr>
<tr>
<td><strong>STAGE 4</strong></td>
<td><strong>STAGE 8</strong></td>
</tr>
<tr>
<td>EM2AS</td>
<td>ME413</td>
</tr>
<tr>
<td>GE204</td>
<td>ME496</td>
</tr>
<tr>
<td>GE205</td>
<td>ME093</td>
</tr>
<tr>
<td>GE211</td>
<td>9 units</td>
</tr>
</tbody>
</table>

**TRANSITION ARRANGEMENTS**

The Approved Programme of the Mechanical Engineering course has been amended with effect from the 1987 academic year. All students enrolled in this course or a combined degree course of which it forms part, are required to meet the requirements of the new approved Programme subject to the transition arrangements given below.

**YEAR BY YEAR TRANSITION**

<table>
<thead>
<tr>
<th>Year Completed in 1986</th>
<th>Required to Complete in Subsequent Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year I</td>
<td>Year II less ME215 and ME231 plus EE131, EE122, ME232 and 1 unit of Elective</td>
</tr>
<tr>
<td>Year II</td>
<td>Year III and Year IV</td>
</tr>
<tr>
<td>Year III</td>
<td>Year IV less 1 unit of Elective plus ME305</td>
</tr>
</tbody>
</table>

**SUBJECT BY SUBJECT TRANSITION**

Students out of phase with year by year progression in the Approved Programme and who have completed a particular subject(s) in the list below will not be required to complete the corresponding subject(s) listed.

In the case of multi-unit subjects, students who have completed some but not all of the "old" subjects listed may complete the remaining subject(s) in that group in 1987 and will then not be required to complete the corresponding "new" subject.

These transition arrangements are only available where at least one core subject in each group listed below was passed prior to 1987. They are not alternatives available to students who have not completed any of the subjects in a group. Completion of a unit of Elective but not the associated previous core subject(s), does not entitle a student to enrol in that previous core subject.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Corresponding Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME123</td>
<td>GE101</td>
</tr>
<tr>
<td>CE111 Statics</td>
<td>CE111 Mechanics and Structures</td>
</tr>
<tr>
<td>Chemistry IS, EE131 and 1 unit of Elective</td>
<td>EE100 Electrical and Computer Engineering I</td>
</tr>
<tr>
<td>EM2BD</td>
<td>1 unit of Elective</td>
</tr>
<tr>
<td>EM2H</td>
<td>ME241</td>
</tr>
<tr>
<td>ME215</td>
<td>GE360</td>
</tr>
<tr>
<td>ME305</td>
<td>ME316</td>
</tr>
<tr>
<td>GE361</td>
<td>ME353</td>
</tr>
<tr>
<td>ME312 and 1 unit of Elective</td>
<td>ME313 Mechanical Engineering Design III</td>
</tr>
<tr>
<td>ME352, ME372 and 1 unit of Elective</td>
<td>ME353</td>
</tr>
<tr>
<td>ME413 Design III</td>
<td>ME413 Mechanical Engineering Design III</td>
</tr>
</tbody>
</table>

**Notes:**

1. Students who completed Chemistry IS prior to 1987 but have not completed EE131, must complete EE130 and 1 unit of Elective. They will then not be required to complete EE100 Electrical and Computer Engineering I.

2. Students who completed ME202 prior to 1987 but have not completed GE360, must complete GE361, ME202 will then count as 1 unit of Elective.

**EXCEPTIONAL CIRCUMSTANCES ARISING IN TRANSITION**

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

Ten elective units shall be chosen in accordance with the following rules:
1. Elective units shall be selected from the list of Approved Elective Subjects (except as provided in rules 3 and 4 below).
2. At least four units of Elective must be chosen from ME400 level subjects.
3. No more than 4 units may be selected from Strand 7 — Humanities.
4. Part-time students may select up to 3 units from the Industrial Experience units offered by the Department of Mechanical Engineering.
5. In exceptional circumstances, the Head of the Department of Mechanical Engineering may approve the selection of elective units not listed in the list of Approved Elective Subjects.

APPROVED ELECTIVE SUBJECTS

The following subjects have been approved for selection by Mechanical Engineering and Industrial Engineering students in accordance with the Elective Requirements of their respective courses.

It is strongly recommended that students concentrate their choice of elective units in at least one of strands 1 to 5.

Notes:
1. Not all of the subjects listed below may be available in every year. Before selecting Electives, students should consult the University Timetable.
2. Timetable clashes may prevent the selection of certain combinations of Elective subjects.

Strand 1 — Engineering Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM280</td>
<td>Complex Analysis and Linear Algebra</td>
<td>1</td>
</tr>
<tr>
<td>MA311</td>
<td>Selection and Use of Materials II</td>
<td>1</td>
</tr>
<tr>
<td>MA411</td>
<td>Selection and Use of Materials III</td>
<td>1</td>
</tr>
<tr>
<td>ME353</td>
<td>Fluid Mechanics and Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME434</td>
<td>Dynamics of Machines II</td>
<td>1</td>
</tr>
<tr>
<td>ME445</td>
<td>Mechanics of Solids III</td>
<td>1</td>
</tr>
<tr>
<td>ME453</td>
<td>Fluid Mechanics III</td>
<td>1</td>
</tr>
<tr>
<td>ME473</td>
<td>Thermodynamics III</td>
<td>1</td>
</tr>
<tr>
<td>ME474</td>
<td>Heat Transfer II</td>
<td>1</td>
</tr>
</tbody>
</table>

Strand 2 — Computing

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE342</td>
<td>Linear System Theory</td>
<td>1</td>
</tr>
<tr>
<td>GE325</td>
<td>Microprocessor Systems and Applications</td>
<td>1</td>
</tr>
<tr>
<td>ME405</td>
<td>Advanced Numerical Programming</td>
<td>1</td>
</tr>
<tr>
<td>ME414</td>
<td>Computer Aided Design and Manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>ME485</td>
<td>Numerical Control and Computer Aided Manufacturing</td>
<td>1</td>
</tr>
</tbody>
</table>

Strand 3 — Design

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE314</td>
<td>Theory of Structures III</td>
<td>1</td>
</tr>
<tr>
<td>CE315</td>
<td>Structural Design</td>
<td>2</td>
</tr>
<tr>
<td>ME384</td>
<td>Design for Production I</td>
<td>1</td>
</tr>
<tr>
<td>ME410</td>
<td>Advanced Design Concepts</td>
<td>1</td>
</tr>
<tr>
<td>ME414</td>
<td>Computer Aided Design and Manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>ME485</td>
<td>Commercial Programming</td>
<td>1</td>
</tr>
<tr>
<td>ME490</td>
<td>Bulk Materials Handling Systems I</td>
<td>1</td>
</tr>
</tbody>
</table>

Sandwich Programmes

Sandwich programmes are attendance patterns which 'sandwich' periods of attendance at University with periods of industrial experience or other employment. It may be possible in some circumstances for students to arrange their annual programme in such a way that attendance is required only in one semester. However, the timetabling needs of full-time and part-time students, as well as the existence of full-year subjects, mean that semester based sandwich programmes cannot always be provided at the present time.

Students should note that a 'thick sandwich', which is taken on a year on/year off basis is available. Leave of absence will be granted for up to three years during the course.
METALLURGY

The Department of Chemical and Materials Engineering is the department responsible for matters relating to the degree programmes in Metallurgy under The Regulations Governing Bachelor Degrees offered in the Faculty of Engineering (see Section 3). The Bachelor of Metallurgy and Bachelor of Science (Metallurgy) programmes were closed to new enrolments in 1986.

Students who were enrolled in either programme in 1986 may continue their enrolment in their current course in order to complete it within a reasonable time. Such students should refer to the course requirements and subject descriptions published in the 1986 Faculty of Engineering Handbook.

SURVEYING

The Department of Civil Engineering and Surveying is the department responsible, under the Regulations Governing Bachelors Degrees Offered in the Faculty of Engineering (see Section 3) and the policies of the Faculty Board (see Section 4), for matters relating to the discipline of Surveying.

The programme of subjects set out below has been approved by the Faculty Board and leads to the award of the degree of Bachelor of Surveying (BSurv).

APPROVED PROGRAMME

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR I</td>
<td>Mathematics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Economics I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV111 Surveying I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SV121 Survey Camp I</td>
<td>4</td>
</tr>
<tr>
<td>YEAR II</td>
<td>SV213 Surveying II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>SV222 Survey Camp II</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV232 Survey Computations I</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV233 Survey Computations II</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV271 Basic Regional and Urban Economics</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV291 Introduction to Legal Studies</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV292 Property and Survey Law</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE111 Mechanics and Structures</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE223J Engineering Geology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>EM2AS Applied Statistics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>EM2CO Vector Calculus and Differential Equations</td>
<td>2</td>
</tr>
<tr>
<td>YEAR III</td>
<td>Geography IIB</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CE302 Civil Engineering IIS</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV313 Surveying III</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV314 Hydrographic Surveying</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV334 Survey Computations III</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV351 Geodesy I</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV361 Photogrammetry I</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV393 Land Boundary Definition</td>
<td>1</td>
</tr>
<tr>
<td>YEAR IV</td>
<td>CE351 Civil Engineering Systems</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CE372 Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV416 Surveying IV</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV441 Astronomy</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV452 Geodesy II</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV462 Photogrammetry II</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV465 Advanced Cartography</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV472 Land Valuation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV473 Town Planning</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SV475 Surveying Management and Planning</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SV481 Project</td>
<td>2</td>
</tr>
</tbody>
</table>

(See notes on following page.)
Notes:
1. With the approval of the Head of Department, Physics IA may be substituted for Physics IB.
2. CE223J involves two compulsory one-day field excursions.
3. SV313 includes a 10-day live-in survey camp.
4. Geography IIB involves up to five compulsory one-day field excursions.

RECOMMENDED PART-TIME PROGRAMME

STAGE 1  
Mathematics I  
SV111  
SV121  8 units

STAGE 2  
Physics IB  
Economics I  8 units

STAGE 3  
CE201  
CE223J  
EM2AS  
EM2CO  
SV232  
SV233  9 units

STAGE 4  
SV213  
SV271  
SV291  
SV292  
SV361  
SV222  9 units

STAGE 5  
Geography IIB  
CE202  
SV313  
SV314  
SV334  10 units

STAGE 6  
SV351  
SV393  
SV416  
SV441  
SV462  
SV473  10 units

STAGE 7  
CE351  
CE372  
SV452  
SV465  
SV472  
SV475  
SV481  8 units

TRANSITION ARRANGEMENTS

Students who completed CE201 Civil Engineering IS prior to 1987 are not required to complete CE211 Mechanics and Structures. Such students will complete a programme of 62 units which was the unit value of the B.Surv. programme prior to 1987.

In order to provide for exceptional circumstances arising in particular transition cases, the Dean may determine the transition programme to be followed.
**GUIDE TO SUBJECT DESCRIPTIONS**

**UNITS**

In undergraduate engineering subjects, one unit involves a total of 42 hours per year (1½ hours per week for the whole year, or 3 hours per week for half a year) of lectures, laboratories, and tutorials. Where subjects from other faculties form part of an Engineering course, the unit value is assessed on the basis of the work-load required for that subject as part of a normal year’s programme. Normally, Part I subjects each count as 4 units, 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.

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 postgraduate students are expected to do more work per contact-hour than undergraduate students.

**WEIGHTINGS**

Each subject undertaken as part of an undergraduate programme in the Faculty has a weighting for use in Weighted Average Mark (WAM) calculations (refer to Faculty Policies). Unless otherwise determined by Faculty Board, each engineering subject shall have a weighting associated with the level at which it is offered as set out below.

<table>
<thead>
<tr>
<th>Level</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>200</td>
<td>2</td>
</tr>
<tr>
<td>300</td>
<td>3</td>
</tr>
<tr>
<td>400/500/600</td>
<td>4</td>
</tr>
</tbody>
</table>

**COMPUTER NUMBERS**

The six digit number which precedes the subject number and title of each subject is the Computer Code Number. The computer code numbers of relevant subjects should be quoted on all enrolment and variation of programme forms. The computer code numbers of all subjects offered within the Faculty of Engineering appear with the subject descriptions and are also listed in Section 6 of this Handbook.

**SUBJECT NUMBERS**

Each subject offered by Departments within the Faculty of Engineering has been given an identification number with prefixed letters to aid identification of subjects. This is known as the Subject Number.

---

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE</td>
<td>Chemical Engineering (Department of Civil Engineering)</td>
</tr>
<tr>
<td>EE</td>
<td>Electrical and Computer Engineering (Department of Electrical and Computer Engineering)</td>
</tr>
<tr>
<td>CE</td>
<td>Civil Engineering (Department of Civil Engineering and Surveying)</td>
</tr>
<tr>
<td>ME</td>
<td>Mechanical and Industrial Engineering (Department of Mechanical Engineering)</td>
</tr>
<tr>
<td>SV</td>
<td>Surveying (Department of Civil Engineering and Surveying)</td>
</tr>
</tbody>
</table>

The letter prefix indicates the area of specialisation and often indicates the department responsible for the teaching of the subject concerned. The letter prefixes are as follows:

- **ChE**: Chemical Engineering (Department of Civil Engineering)
- **CE**: Civil Engineering (Department of Civil Engineering and Surveying)
- **EE**: Electrical and Computer Engineering (Department of Electrical and Computer Engineering)
- **EM**: Engineering Mathematics (Department of Mathematics)
- **GE**: General Engineering (Departments of the Faculty of Engineering)
- **ME**: Mechanical and Industrial Engineering (Department of Mechanical Engineering)
- **Mat**: Materials Engineering (Department of Materials Engineering)
- **SV**: Surveying (Department of Civil Engineering and Surveying)

The identification numbers which follow the letter prefix often indicate a particular field of study. The fields of study so indicated are listed in the table below.

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE-4</td>
<td>Process Analysis</td>
</tr>
<tr>
<td>ChE-5</td>
<td>Design, Economics</td>
</tr>
<tr>
<td>ChE-6</td>
<td>Separation Processes</td>
</tr>
<tr>
<td>ChE-7</td>
<td>Transport, Phenomena, Thermodynamics, Combustion</td>
</tr>
<tr>
<td>ChE-8</td>
<td>Reactor Design, Process</td>
</tr>
<tr>
<td>ChE-9</td>
<td>Projects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE-0</td>
<td>Service Courses</td>
</tr>
<tr>
<td>CE-1</td>
<td>Structures</td>
</tr>
<tr>
<td>CE-2</td>
<td>Materials</td>
</tr>
<tr>
<td>CE-3</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>CE-4</td>
<td>Water Resources</td>
</tr>
<tr>
<td>CE-5</td>
<td>Civil Engineering Practice</td>
</tr>
<tr>
<td>CE-6</td>
<td>Surveying — Specialist Courses</td>
</tr>
<tr>
<td>CE-7</td>
<td>Surveying and Transportation</td>
</tr>
<tr>
<td>CE-9</td>
<td>Special Topics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE-0</td>
<td>General Electrical Engineering</td>
</tr>
<tr>
<td>EE-1</td>
<td>Electrical Machines or Power Systems</td>
</tr>
<tr>
<td>EE-2</td>
<td>Electronics</td>
</tr>
<tr>
<td>EE-3</td>
<td>Electrical Circuit Theory or Measurements</td>
</tr>
<tr>
<td>EE-4</td>
<td>Control or Communication Systems</td>
</tr>
<tr>
<td>EE-5</td>
<td>Field Theory</td>
</tr>
<tr>
<td>EE-6</td>
<td>Computer Science or Automata Theory</td>
</tr>
<tr>
<td>EE-8</td>
<td>Project/Directed Reading</td>
</tr>
<tr>
<td>EE-9</td>
<td>Seminar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicating Numerals</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME-0</td>
<td>General Courses</td>
</tr>
<tr>
<td>ME-1</td>
<td>Analysis and Design</td>
</tr>
<tr>
<td>ME-2</td>
<td>Mechanical Engineering Practice</td>
</tr>
<tr>
<td>ME-3</td>
<td>Machines</td>
</tr>
<tr>
<td>ME-4</td>
<td>Materials</td>
</tr>
<tr>
<td>ME-5</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>ME-6</td>
<td>Automatic Control</td>
</tr>
<tr>
<td>ME-7</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>ME-8</td>
<td>Industrial Engineering</td>
</tr>
<tr>
<td>ME-9</td>
<td>Project and Seminar</td>
</tr>
</tbody>
</table>

---

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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

SUBJECT TITLE
Each subject is provided with a title which, together with the subject number, forms the subject name as described below.

SUBJECT NAME
The Subject Name of each subject contains the subject number and title in the following way:

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Subject Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEl31 Circuit Fundamentals</td>
<td></td>
</tr>
</tbody>
</table>

The Computer Number and Subject Name of appropriate subjects should be included on all enrolment and variation of programme forms.

PREREQUISITES AND COREQUISITES
Prerequisites are those subjects which the student must have already passed before enrolling in the subject.
Corequisites are those subjects in which the student must enrol concurrently unless he or she has already passed them.

The Dean, on the recommendation of the Head of Department, may relax pre- and corequisites.

ASSUMED KNOWLEDGE
Many subjects are taught on the basis of an assumption that students have previously completed certain other subjects although those subjects have not been determined to be prerequisites. The particular subject(s) which are assumed to have been completed in each case are indicated in the appropriate Subject Entries set out in the following pages.

It is the responsibility of each student to ensure that they have met the assumed knowledge requirement of each subject in which they enrol. If in doubt, students should discuss the matter with the lecturer of the subject in which they intend to enrol.

It should be noted that students may enrol only in those subjects approved by the Dean. Such approval may be withheld where it becomes apparent that a student has not attained the level of knowledge assumed by a subject in which enrolment has been sought.

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.

Students will be advised of the form the assessment in a particular subject will take before the end of 4th week of lectures.

HOURS
All subjects in the Faculty of Engineering are based on units of 42 contact hours each.
The 42 contact hours are spread over a whole year (1½ hours per week for 28 weeks) or over a half year (3 hours per week for 14 weeks). As far as possible this information is given in the University timetable. If in doubt, students should check with Departments before completing their enrolment.

CONTENT
Each subject entry gives a general description of the content of the subject and indicates the broad areas covered.

TEXTS
Where appropriate, each subject entry indicates the texts used. In most cases it is recommended that students purchase the texts indicated, however, students may wish to consult with the lecturer concerned before finalising the purchase of texts.

REFERENCES
Information on reference material applicable to a particular subject will be provided by the lecturer in charge of that subject.

AVAILABILITY OF SUBJECTS
Not all of the subjects listed on the following pages are necessarily offered in each academic year. Elective subjects may not proceed if the Department offering the subject considers there is insufficient demand for that subject.
SUBJECTS OFFERED BY DEPARTMENTS COMPRISING THE FACULTY OF ENGINEERING

Chemical Engineering Subjects

511104 ChE002  INDUSTRIAL EXPERIENCE  1 unit each
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 will be required to present a report giving a connected account and critical evaluation of their engineering activities and experience during the year. These units may be counted by students towards Elective I.

511108 ChE141 INDUSTRIAL PROCESS PRINCIPLES  1 unit

511109 ChE151 INDUSTRIAL CHEMICAL PROCESSES AND EQUIPMENT  1 unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Part 1

Design of unfired pressure vessels. Membrane theory, stresses in thin-walled vessels. Code requirements.

Texts:
- S.A.A. Code Unfired Pressure Vessels (AS 1210-1977)
- S.A.A. Code Steel Structures (AS 1250-1981)
- Nassi, W.A. Theory and Problems of Strength of Materials (Schaum 1977)

Part 2

Computer programming with particular emphasis on programming style. The use of terminals, files and editing techniques will be covered. Also some aspects of computer hardware and data handling will be considered. Some numerical analysis techniques will be discussed to provide examples for programming. These will include solution of single non-linear equations, interpolation, curve fits, differentiations, integration and systems of equations, linear and non-linear.

Texts:
- Handbook for VAX/VMS University of Newcastle Computing Centre
- Bolllot, M. Understanding FORTRAN 77 (West 1984)

511110 ChE152 INDUSTRIAL PROCESS DESIGN I  1 unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.


Text
- Australian Standard Engineering Drawing Practice CZI 1982 (Institution of Engineers, Australia)

511111 ChE153 CHEMICAL AND MANUFACTURING PROCESSES  2 units
An introduction to the structure and organisation of the chemical and process metallurgical industries in Australia, with reference to the world scene. Descriptions of the processes used in the manufacture of the major industrial chemicals, including hydrometallurgical and smelting operations. Outline of typical unit operations.

512224 ChE241 PROCESS ANALYSIS I  1 unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Prerequisite
ChE151
Visits to selected plants in the Newcastle (or Sydney) area. Detailed reports required on specified plants.

512231 ChE242 PROCESS ANALYSIS I  3 units
Prerequisite Mathematics I

Part 1

Elementary statics, equilibrium in two dimensional force systems, axial and shear forces, bending and twisting of bars, first and second moments of area with applications to design of simple structures and piping systems.

Description of various processes used in the fabrication and utilisation of materials. Visits to a number of industrial plants illustrative of the course material, and preparation of process flow diagrams.

Text

Description of various processes used in the fabrication and utilisation of materials. Visits to a number of industrial plants illustrative of the course material, and preparation of process flow diagrams.

Text

**Text**

Roberts, J. *Lecture Notes on Numerical Methods of Solving Ordinary Differential Equations and Partial Differential Equations* (Department of Chemical and Materials Engineering)

### 512225 ChE251 STRUCTURES AND PRESSURE VESSEL DESIGN 1 unit

**Note:** This subject is only available in 1987 to students requiring it for transition purposes.

Elementary statics, equilibrium in two dimensional force systems, axial and shear forces, bending and twisting of bars, first and second moments or area with applications to design of simple structures and piping systems.

Design of unfired pressure vessels. Membrane theory, stresses in thin-walled vessels. Code requirements.

**Texts**

- S.A.A. Code *Engineering Drawing Practice (AS CZ1-1982)*
- S.A.A. Code *Unfired Pressure Vessels (AS A120-1977)*
- S.A.A. Code *Steel Structures (AS 1250-1981)*

### 512230 ChE252 CHEMISTRY LABORATORY 2 units

**Prerequisites** Chemistry IIC

The laboratory courses in Organic and Inorganic Chemistry taken in the Department of Chemistry as part of Chemistry IIA may be taken as two elective units. Students passing ChE252 will be deemed to have passed Chemistry IIA for prerequisite purposes.

### 512226 ChE261 SEPARATION PROCESSES I 1 unit

**Note:** This subject is only available in 1987 to students requiring it for transition purposes.

**Prerequisites** Chemistry I, Mathematics I, ChE141


**Texts**

- Pitts, R.D. and Sissan, L.E. *Heat Transfer* (Schaum 1977)
- Sarofim, A.C. and Wall, T.W. *Notes on Radiation Heat Transfer* (University of Newcastle)

### 512232 ChE262 TRANSFER PROCESSES I 3 units

**Prerequisites** Chemistry I, Mathematics I, ChE141

#### Part 1


**Texts**

- Pitts, R.D. and Sissan, L.E. *Heat Transfer* (Schaum 1977)
- Sarofim, A.C. and Wall, T.F. *Notes on Radiation Heat Transfer* (University of Newcastle)

#### Part 2


**Text**


#### Part 3

Fuel types, their origin and characteristics. Combustion stoichiometry. The classification of coals, the comparison of Australian coals with those of the northern hemisphere, and allocation for combustion and conversion. Burners for solid, liquid and gaseous fuels. Brief outline of combustion mechanisms. Furnace efficiency and losses.

**Texts**

Part 4
Principles and current technology and fundamentals in the process metallurgy of ferrous and non-ferrous metals.

Texts
Gilchrist, J.D. Fuels, Refactories and Furnaces 2nd edn (Pergamon)

512228 ChE272 FLUID MECHANICS 1 unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Prerequisites
Mathematics I, Physics IIA


Text

512229 ChE291 LABORATORY 2 units
A set of experiments illustrating the fundamentals of fluid flow, heat and mass transfer.

Texts
Crow, E.L. Statistics Manual (Dover 1972)

513244 ChE300 SELECTED TOPICS IN CHEMICAL ENGINEERING ½ unit
This subject may only be taken with the approval of the Head of the Department of Chemical and Materials Engineering.

This subject may only be taken with the approval of the Head of the Department of Chemical and Materials Engineering.

Content: A topic in Chemical Engineering to be approved by the Head of Department.

513109 ChE342 PROCESS ANALYSIS II 1 unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Inspection of plants of particular technical interest and relevance to course material in the Sydney or Newcastle area.

513238 ChE343 PROCESS ANALYSIS II 2 units
Prerequisites
ChE242, Mathematics I

Part 1
Design of process and storage vessels; process reticulation systems including compressed air, cooling water, steam and refrigeration. Process energy systems and drives. Process instrumentation for flow, pressure and temperature measurement. The fail-safe concept. This course will consider technical and administrative aspects leading to the successful commissioning of a process plant. Industrial relations; legal and sociological considerations.

Part 2
Estimation of capital and operating costs of process plants; break-even analysis; project profitability; discounted cash flow techniques. Economic design. Introduction to process optimisation. Effects of process uncertainties and risk. Basic cost accounting procedures.

Text

Part 3
Inspection of plants of particular technical interest and relevance to course material in the Sydney or Newcastle area.

513226 ChE351 EQUIPMENT DESIGN ½ unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Prerequisite
ChE251

Design of process and storage vessels; process reticulation systems including compressed air, cooling water, steam and refrigeration. Process energy systems and drives. Process instrumentation for flow, pressure and temperature measurement. The fail-safe concept.

513227 ChE352 PROCESS ENGINEERING ½ unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Corequisite
ChE351

Content
This course will consider technical and administrative aspects leading to the successful commissioning of a process plant. Industrial relations; legal and sociological considerations. Elements of AC circuitry and power units.

513228 ChE353 PROCESS ECONOMICS ½ unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Prerequisite
Mathematics I

Estimation of capital and operating costs of process plants; break-even analysis; project profitability; discounted cash flow techniques. Economic design. Introduction to process optimisation. Effects of process uncertainties and risk. Basic cost accounting procedures.

Text

513229 ChE354 ELECTROCHEMISTRY AND CORROSION ½ unit
Note: This subject is only available in 1987 to students requiring it for transition purposes.

Prerequisite
Chemistry IIC

513239 ChE355 TRANSFER PROCESSES II  3 units

Prerequisites  ChE262, Chemistry IIC, EM2CO

Part 1

Part 2

Texts
McCabe, W.L. and Smith, J.C. Unit Operations of Chemical Engineering (McGraw-Hill 1985)
Shaw, D.C. Introduction to Colloid and Surface Chemistry (Butterworth 1980)
An introduction to the unsteady-state behaviour of chemical plant and modelling of selected processes.

Revision of Laplace transformations, transfer function concept, unsteady state materials and energy balances as a technique for system modelling, first order systems, second order systems, extraction, response to disturbances — modelling of steam jacketed reactor, gas absorber and simple heat exchanger.

The principles of process control instrumentation, applied to flow, temperature, pressure, liquid level, etc. measurement, with laboratory experiments.

Sample data methods, the z-transform.

Text
Stephanopoulos, G. Chemical Process Control (Prentice Hall 1984)

A number of open-ended investigations illustrating Year III lecture topics, including experiments on instrumentation and control of process plant.

Texts
Anderson, J. Thesis and Assignment Writing (Wiley 1972)
Crow, E.L. Statistics Manual (Dover 1972)

A series of experiments illustrating process metallurgical principles for ferrous and non-ferrous metals.

This subject may only be taken with the approval of the Head of the Department of Chemical and Materials Engineering.

A topic in Chemical Engineering to be approved by the Head of the Department.

Content to be advised.


Levenspiel, O. Chemical Reaction Engineering 2nd edn (Wiley 1972)
514137 ChE485 ADVANCED PROCESS CONTROL 1 unit
Content to be advised.

514150 ChE486 PROCESS CONTROL 2 units
Prerequisite EM2CO
Description of components of servo-mechanisms and process control systems. Laboratory experiments and demonstrations.

Texts
Fortmann, T.E. and Hitz, K.L. Introduction to Linear Control Systems Theory (Dekker 1977)
or Cannon, R.H. Dynamics of Physical Systems (McGraw-Hill 1967)
or Distefano, et al Feedback and Control Systems (Schaum's Outline Series 1976)
or Stephanopoulos, G. Chemical Process Control (Prentice-Hall 1984)

514138 ChE490 DESIGN PROJECT 2 units
Prerequisites All Year III subjects
Preparation of a design report for a specified plant for chemical production, including mass and energy balances, preparation of process flow diagrams, and the detailed design of one or more items of equipment, or equivalent. In addition to the report, students are required to take a two-day design paper.

514139 ChE491 SEMINAR 1 unit
Regular two hour seminar sessions will be held during the year for discussion of literature reviews, chemical engineering practice and research within the department. Each student will present not less than two half-hour papers in the course of the year.

514140 ChE492 RESEARCH PROJECT 3 units
An assigned task of experimental investigation, or the design, construction and testing of experimental equipment to be reported formally in a thesis.

514143 ChE493 DESIGN PROJECT 3 units
Prerequisites All Year III subjects
Preparation of a design report for a specified plant for chemical production, including mass and energy balances, preparation of process flow diagrams, and the detailed design of one or more items of equipment, or equivalent. In addition to the report, students are required to take a design paper.

514141 ChE494 LABORATORY PROJECT 2 units
Content to be advised.

514142 ChE495 DESIGN PROJECT 2 units
Content to be advised.

514144 ChE496 RESEARCH PROJECT 4 units
An assigned task of experimental investigation, or the design, construction and testing of experimental equipment to be reported formally in a thesis.

514151 ChE496P RESEARCH PROJECT 4 units
As for ChE496, with an emphasis on topics drawn from the field of extractive metallurgy.

514145 ChE497 DESIGN PROJECT 4 units
Preparation of a design report for a specified plant for chemical production, including mass and energy balances, preparation of process flow diagrams, and the detailed design of one or more items of equipment, or equivalent.

514152 ChE497P DESIGN PROJECT 4 units
As for ChE497, with particular emphasis being given to processes involving extractive metallurgy.
Civil Engineering Subjects

521092 CE092
521093 CE093
521094 CE094 INDUSTRIAL EXPERIENCE 1 unit each
521095 CE095

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 will also be required to present a report giving a connected account and critical evaluation of their engineering activities and experience during the year. Such units may be counted by part-time students as electives. (See Section 4 of this Handbook.

521105 CE111 MECHANICS AND STRUCTURES 1 unit

Texts
Atkins, K.J. et al. Mechanics and Structures (Science Press)
Atkins, K.J. Teaching Programmes in Mechanics and Structures (Science Press)
Atkins, K.J. and Darvall, P. Mechanics and Structures: Worked Problems (Science Press)

521106 CE150 CIVIL ENGINEERING PRACTICE 1 unit
Introduction to the structure, nature and scope of civil engineering work. Role of professionals and organization of the civil engineering profession. Requirements placed on civil engineers in design, construction and maintenance, and legal liability.

History of the civil engineering profession, its current status and likely future directions. Influence of high technology and computers. Relationship to overall economic activity and political climate, particularly of construction industry.

Introduction to plant, processes and techniques involved in civil engineering construction, including earthworks rock excavation, concreting and steel erection. Need to plan and design for these activities. Need for management, quality, labour and material control. Overview of basic structural elements.

Report writing exercise based on field observations.

521104 CE171 ENGINEERING SURVEYING I 2 units
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. Students are required to attend a three-day survey camp during the August vacation.

Text
Uren, J. and Price, W.F. Surveying for Engineers (Macmillan 1978)

522113 CE212 MECHANICS OF SOLIDS 1 unit
Prerequisite CE111
Assumed Knowledge Mathematics I
Revise stress and strain, mechanical properties of materials, extension of bars, simple statically indeterminate problems, thermal stresses, superposition, general case of axial deformation (variable P, A and nonlinear stress-strain), strain energy (axially loaded member only), thin shells subject to internal pressure, Mohr's circle of stresses, shear strain, generalised stress-strain relationship, axial force, shear force and bending moment diagrams in beams and statically determinate frames. Revise geometrical properties of plane figures, bending stresses and strains, shear stresses in beams, deflection of beams. Shear centre and torsion of circular sections and open thin walled sections, combined stresses, failure criteria; column stability.

522114 CE213 THEORY OF STRUCTURES I 1 unit
Prerequisite CE212

732900 CE223J ENGINEERING GEOLGY 2 units
Introduction to principles of geology and their application to engineering problems.

Text

522112 CE224 CIVIL ENGINEERING MATERIALS 2 units
Assumed Knowledge GE151
Theoretical background and laboratory tests of elastic and inelastic properties, creep, hardness and fracture of metals and timber. (½ unit)

Properties and behaviour of brick masonry and timber. (¼ unit)

Properties and behaviour of bituminous materials.

Concrete: component materials, properties of plastic and hardened concrete, concrete mix design, manufacturing and field control. (¼ units)

Texts
Jackson, N. Civil Engineering Materials (Macmillan 1983)
Nagarajan, N. and Antill, J.M. Australian Concrete Inspection Manual (Pitman, Australia 1978)

522202 CE231 FLUID MECHANICS I 1 unit
Assumed Knowledge Mathematics I, Physics IA or Physics IB
Fluid properties. Fluid statics, stability of submerged and floating bodies, relative equilibrium. Fluid-flow concepts and basic equations of continuity, energy, linear and angular momentum.

Text
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<td>522204</td>
<td>CE232 FLUID MECHANICS II</td>
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<td>Dimensional Analysis and Dynamic Similitude.</td>
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<td>Viscous effects. Fluid Resistance.</td>
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<td>Laminar and turbulent flow. Boundary layer</td>
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<td>concepts. Drag on immersed bodies. Frictional</td>
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<td>resistance in conduits. Compressible flow in</td>
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<td>CE302 CIVIL ENGINEERING IIS</td>
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<td>Fluid Mechanics: fluid properties, hydrostatics,</td>
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<td>fluid dynamics, continuity, energy</td>
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<td>momentum. Flow in pipes, conduits and open</td>
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<td>channels. Hydrology: hydrological cycle.</td>
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<td>Precipitation and stream flow. Flood</td>
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<td>Soil Mechanics: soil properties, seepage,</td>
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<td>soil stresses, settlement, compaction,</td>
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<td>Giles, R.V.</td>
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<td>Fluid Mechanics and Hydraulics 2nd edn (Schaum</td>
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<td>523112</td>
<td>CE314 THEORY OF STRUCTURES II</td>
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<td>CE212 or ME214</td>
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<td>Revised moment distribution, introduce sway,</td>
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<td>Revise flexibility (force) method. Stiffness</td>
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<td>method; member stiffness matrix, structure</td>
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<td>Influence lines. Introduct plastic theory of</td>
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<td>structures, bounding theorems.</td>
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<td>523118</td>
<td>CE315 STRUCTURAL DESIGN</td>
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<td>Loads and loading combinations. Design process,</td>
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<td>parties involved, conceptual design.</td>
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<td>Exercises in reinforced concrete and steel</td>
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<td>members and connections.</td>
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<td>Text</td>
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<td>B.H.P. Co. Ltd.</td>
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<td>Hot Rolled Carbon Steel Sections and Plates</td>
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<td>(B.H.P. Co. Ltd.)</td>
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<td>Gorenc, B.E. and Tinyou, R. Steel Designer's</td>
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<td>Handbook (N.S.W.U.P.)</td>
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<td>Warner, R.F. et al.</td>
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<td>Reinforced Concrete (Pitman 1976)</td>
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<td>Relevant S.A.A. Codes</td>
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<td>523113 CE316 STRESS ANALYSIS</td>
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<td>General theory of elasticity. Application to</td>
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<td>bending, thermal, dynamic and centrifugal</td>
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<td>concentrations, fatigue. Membrane analogy,</td>
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<td>torsion of closed sections. Laterally loaded</td>
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<td>plates: Narver, Levi, finite difference and</td>
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<td>Rayleigh-Ritz solutions. Axi-symmetric shells.</td>
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<td>Timoshenko, S.</td>
<td>Theory of Elasticity</td>
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<td>and Goodier, N.</td>
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<td>523102</td>
<td>CE324 SOIL MECHANICS</td>
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<td>Index properties, classification of soils,</td>
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<td>permeability, capillarity, seepage and flow</td>
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<td>nets; stresses in soils; settlement and</td>
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<td>consolidation; compaction, shear strength</td>
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<td>and failure criteria; stability of retaining</td>
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<td>Scott, C.R.</td>
<td>An Introduction to</td>
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<td>Soil Mechanics and Foundations 2nd edn (Applied</td>
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<td>Soil Mechanics and</td>
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<td>Science 1974)</td>
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<td>Foundations</td>
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<td>523114</td>
<td>CE325 CONCRETE AND METALS TECHNOLOGY</td>
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<td>CE224, CE151</td>
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<td>Resume of important properties of concrete.</td>
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<td>Stress-strain and time dependent behaviour,</td>
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<td>permeability, durability. Additives,</td>
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<td>accelerated curing, protection of reinforcement,</td>
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<td>reinforcement corrosion. Water proofing,</td>
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<td>deterioration and repair of concrete.</td>
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<td>Non-destructive testing.</td>
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<td>Metals used in structures. Corrosion causes,</td>
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<td>prevention and control. Effect of welding.</td>
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<td>Metal fatigue, brittle fracture, laminar</td>
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<td>tearing.</td>
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<td>523306</td>
<td>CE333 FLUID MECHANICS III</td>
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<td>Ideal-fluid flow. Flow nets. Seepage flow,</td>
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<td>Fluid measurement. Turbomachinery. Specific</td>
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<td>speed, pumps and turbines, cavitation. Steady-</td>
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<td>closed conduit flows. Pipe networks.</td>
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<td>523117</td>
<td>CE334 OPEN CHANNEL HYDRAULICS</td>
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<td>Concepts of fluid flow as applied to open</td>
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<td>channels. Specific energy, Subcritical and</td>
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<td>supercritical flows. Transitions. Hydraulic</td>
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<td>jump. Uniform flow. Gradually varied flow.</td>
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<td>Lateral inflow. Measurement and controls.</td>
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<td>French, R.H.</td>
<td>Open Channel</td>
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<td>Hydrodynamics (McGraw-Hill 1986)</td>
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<td>Hydraulics</td>
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<td>523115</td>
<td>CE341 HYDROLOGY</td>
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<td>CE333, CE381</td>
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<td>Corequisites</td>
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<td>Hydrologic cycle processes; precipitation,</td>
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<td>infiltration, evapotranspiration, runoff and</td>
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<td>groundwater. Measurement of precipitation and</td>
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<td>streamflow. Flood hydrology; rainfall and</td>
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<td>flood frequency analysis, rational method,</td>
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<td>unitgraph methods, runoff and flood routing.</td>
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<td>Flood frequency analysis, rational method,</td>
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<td>Yield hydrology; water balance, rainfall-</td>
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<td>runoff relationships, flow duration, storage</td>
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<td>yield analysis. Groundwater hydrology;</td>
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<td>aquifers, well hydraulics, recharge and</td>
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<td>extraction, geohydrology, digital models.</td>
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<td>523119</td>
<td>CE351 CIVIL ENGINEERING SYSTEMS</td>
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<td>General introduction to the systems approach.</td>
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<td>Techniques available as aids to the</td>
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<td>identification of optimal policies —</td>
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<td>mathematical modelling, computer simulation,</td>
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<td>various mathematical programming techniques,</td>
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<td>heuristics. Choice of techniques, problem</td>
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<td>formulation. Example applications of the</td>
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<td>systems approach to civil engineering problems.</td>
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523108 CE372 TRANSPORTATION ENGINEERING 1 unit
Elements of regional planning, land-use/transport interaction; transportation modes and
system characteristics; transportation demand estimates, data collection, highway
engineering: driver, vehicle and road characteristics, road geometry; traffic engineering;
road construction, drainage, pavements, maintenance.

Texts
Lay, M.G. Source Book for Australian Roads (Australian Road
Research Board)
Interim Guide to Geometric Design of Rural Roads
(NAASRA 1980)

523116 CE381 STATISTICAL METHODS 1 unit
Assumed Knowledge or
Corequisites
EM2CO, GE204

This course provides an introduction to probability and statistics useful in civil engineering
practice.

Overviews of probability and distribution theory. Probability distributions commonly used
in civil engineering. Descriptive methods. Theories of statistical inference. Fitting
probability distributions with emphasis on extreme events. Regression models of linear and
Stochastic processes. Data generation. Computer packages. Example applications in
water resource, structural and transport engineering.

524065 CE417 THEORY OF STRUCTURES III 1 unit
Assumed Knowledge
CE314, CE315

Plastic analysis of frames. Lower bound design, main code requirements, plastic stability.
Yield line analysis of slabs, strip method of design, flat slab systems. Retaining walls. Basic
design of prestressed concrete structures.

524073 CE418 MASONRY AND TIMBER DESIGN 1 unit
Assumed Knowledge
CE314 and CE315

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

524074 CE419 DYNAMICS AND STABILITY OF STRUCTURES 1 unit
Assumed Knowledge
CE314

Vibration of single degree of freedom systems, lumped mass systems, multi-degrees of
freedom systems, frequency of vibration, introduction to random vibrations, impulse
loading.

Stability concept; vanishing stiffness matrix. Elastic stability of framed structures using
matrix stability functions. Tabulated solutions.

524066 CE426 GEOTECHNICAL ENGINEERING 1 unit
Assumed Knowledge
CE324

Site investigation, design of shallow foundations, piled foundations, soil improvement,
design of embankments, cuttings, earth dams.

Text
Bowles, J.E. Foundation Analysis and Design 3rd edn
(McGraw-Hill 1982)

524075 CE427 ROCK MECHANICS 1 unit
Assumed Knowledge
CE324

Index properties and classification, rock strength and failure criteria, deformation of rocks,
in situ stress, planes of weakness, foundations on rock, underground openings, rock slopes.

524076 CE435 RIVER AND COASTAL ENGINEERING 1 unit
Assumed Knowledge
CE334

Review and extension of elementary principles of open channel flow. Erosion by currents,
waves, rainfall and overland flow. Sediment transportation by streams. Measuring
devices. Fluvial morphology, river training. Scour protection at artificial river constric.
tions. Tides and currents. Waves. Reflection, refraction and diffraction. Movement of material
by the sea, littoral drift. Coastal protection. River and coastal models.

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

524068 CE442 PUBLIC HEALTH ENGINEERING 1 unit
Assumed Knowledge
Chemistry IS

Elements of microbiology; self-purification of natural waters; water quality management;
municipal water supply and sewage systems.

524067 CE443 WATER RESOURCES ENGINEERING 1 unit
Assumed Knowledge
CE341, CE332, CE351

This course considers several areas of applied water resources engineering emphasizing
synthesis of basic principles and design.

Flood management: mitigation schemes, land management.
Urban drainage: layout and design, runoff and flood routing, retaining basins.
Water resource systems: objectives, economics, stochastic behaviour, design, operation,
modelling.

524069 CE452 CIVIL ENGINEERING MANAGEMENT 1 unit
Assumed Knowledge
CE314, CE315, CE316

Management: construction company failures and the need for efficient management;
principles of management, management functions and techniques; nature and type of
organisational structures. Industrial relations and law.
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.

524070 CE453 CIVIL ENGINEERING CONSTRUCTION 1 unit
Assumed Knowledge
CE324

Construction Plant: classification, selection and use of plant; plant organisation; 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.

Text
Anil, J.M. and Ryan, P.W.S. Civil Engineering Construction (Angus and Robertson,
1973)
CE454 CIVIL ENGINEERING DESIGN 2 units

Assumed Knowledge
The greater part of Year III of the Civil Engineering course.

Examples of Civil Engineering design in steel and concrete structures, geomechanics and water resource systems. Visits to works of interest. Interaction between professionals, regulatory authorities and practising engineers.

CE455 PROJECT 2 units
Pre- and Corequisites
According to nature of topic.

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

In exceptional circumstances and with the permission of the Head of the Department of Civil Engineering and Surveying a four unit project may be taken in lieu of CE454 Civil Engineering Design and CE455 Project. The nature of the investigation will depend upon the topic.

CE473 ENGINEERING SURVEYING II 1 unit
Pre-requisite
CE171

Precise levelling, trigonometric levelling, barometric levelling, single-second theodolites, approximate adjustment of plane triangulation.

Texts

Lay, M.G. Source Book for Australian Roads (Australian Road Research Board)

Dept. of Main Roads, N.S.W. Form 76 Pavement Thickness Design

CE474 HIGHWAY ENGINEERING 1 unit
Pre-requisite
CE372

Structure of road pavements; failure modes; pavement design methods. Material requirements, strength, strain at failure, fatigue, skid resistance. Testing of materials, subgrade, granular and stabilized bases, bituminous materials.

Texts
Lay, M.G. Source Book for Australian Roads (Australian Road Research Board)

Dept. of Main Roads, N.S.W. Form 76 Pavement Thickness Design

CE482 FINITE ELEMENT METHODS 1 unit
Pre-requisites
GE204, GE205

Introduction to finite element, boundary element and finite difference methods. Emphasis on the generality of these techniques and their application to various problems in structures, soils and fluids. Theory reinforced by programming assignments.

Texts
Cheung, Y.K. and Yeo, M.F. A Practical Introduction to Finite Elements Analysis (Pitman 1979)


CE490 SPECIAL TOPIC 1 unit

CE491 SPECIAL TOPIC 1 unit

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Electrical and Computer Engineering Subjects

Note: 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. See also Section 3, III(e) of this Handbook.

EE092 EE093 EE094 INDUSTRIAL EXPERIENCE 1 unit each

EE095 EE096 INDUSTRIAL EXPERIENCE II 2 units

This 2-unit elective is available to “sandwich” course students only. The student must be in appropriate full-time employment for one calendar year from 1st July in the year preceding enrolment to 30th June in the year of enrolment. A diary must be kept, a seminar presented, and a detailed report submitted to the student’s adviser. The report must indicate that the student has been engaged in a major engineering project. See also Section 3, III(e) of this Handbook.

EE100 ELECTRICAL AND COMPUTER ENGINEERING I 4 units

Note: Enrolment in this subject is limited to students enrolled in the BE programmes in Computer Engineering, Electrical Engineering, Industrial Engineering and Mechanical Engineering.

The lectures will be supported by tutorials and extensive laboratory work. Included in the laboratory component will be an introduction to oscilloscopes, function generators, electronic power supplies and other laboratory instruments.

Part 1

- Introduction to Electrical Engineering: Concepts of voltage, current impedance, power and units of same.
- Inductors and capacitors and their properties. Response of series RC and LC networks when fed from switched d.c. sources.
- a.c. power sources. Peak and r.m.s. quantities. Resistors, capacitors and inductors fed from sinusoidal voltage sources. Concept of phase.
- Balanced 3-phase circuit analysis.
- Natural and forced response. Simple LCR circuits.
Part 2

— The binary numbering system.
— Introduction to logic functions and logical circuits. Combinational logic, analysis and synthesis, MSI and LSI circuits.
— Elementary sequential logic, flip-flops, registers, counters and memory devices.
— Octal and hexadecimal number systems. Introduction to coding.
— Basic structures of computers. The function of the processor, main and secondary memory, I/O devices.
— Concept of buses. Memory, processor, I/O device interconnection. Function of data, address and control buses.
— Introduction to microprocessors. Basic elements of the processor, registers, ALU and control logic. Description of machine cycles.
— Introduction to microprocessor instruction sets.
— Examples of microcomputer interfacing and applications.

Part 1

— Faraday's Law, Lenz's Law, principles of motors and generators.
— Flux linkage and inductance, self-magnetising, mutual and leakage inductance of coupled circuits. Voltage equations for mutually coupled coils and the air-cored transformer. The practical iron-cored transformer, its equivalent circuit and phasor diagram. Transformer testing. Polyphase transformers and their connections.
— The per-unit system.
— Electromechanical transducers. Law of conservation of energy and its application to singly-excited and double excited systems.

Part 2

— Solid state physics. Conduction mechanisms in semiconductors.
— PN junctions. Bi-polar transistors. FETs.
— Circuit models of semiconductor devices.

Part 3

— Review of a.c. circuit theory.
— Nodal and mesh analysis, Thevenin's, Nortons and super position theorems.
— Star delta transformations.
— Laplace transformation techniques for time domain solutions.
— Transfer functions.
— Fourier series.
— Dependent sources.
— Applications of circuit analysis techniques.

531205 EE130 INTRODUCTION TO ELECTRICAL ENGINEERING 1 unit
This subject is a service course offered by the Department of Electrical and Computer Engineering for students enrolled in courses other than Computer Engineering, Electrical Engineering, Industrial Engineering and Mechanical Engineering.
EE130, EE131, EE131T and EE100 are mutually exclusive.
The course comprises lectures and tutorials.
Syllabus: to be arranged.

531208 EE131T CIRCUIT FUNDAMENTALS 1 unit
This subject is a transition course for students who have partially met the requirements of EE100 Electrical and Computer Engineering I. Only students in this situation may enrol.
The course comprises lectures and tutorials.
Syllabus: see syllabus of EE100 — part 1.

531207 EE161T INTRODUCTION TO COMPUTER TECHNOLOGY 1 unit
This subject is a transition course for students who have partially met the requirements of EE100 Electrical and Computer Engineering I. Only students in this situation may enrol.
The course comprises lectures and tutorials.
Syllabus: see syllabus of EE100 — part 2.

532202 EE200 ELECTRICAL ENGINEERING II 4 units
Prerequisites
Electrical Engineering I, Physics IA, Mathematics I
Corequisite
Mathematics IIA or IIB Part 1 (Topic CO)
Electrical Engineering II expounds the fundamental concepts of electrical engineering. The subject builds on and expands the year I circuits topics. The student is also introduced to semiconductor devices, which form the basis of future courses in electronics, and to electro-mechanical energy conversion principles which form the basis of future power courses.
532113 EE262 SYSTEMATIC PROGRAMMING 1 unit
Note: Computer Engineering students may only enrol in this subject if they have completed EE263 and/or EE264 prior to 1987.
Electrical Engineering students may only enrol in this subject if they have completed EE264 prior to 1987.
Prerequisite    Mathematics I
Content
An introduction to structured programming and the design of algorithms. The high level language Pascal is covered in some detail. It is used to demonstrate the techniques of structured programming and stepwise refinement, good coding style and documentation and methods of program debugging and testing. Topics include the formal definition of high level languages, conditional statements, looping, case statements, the role of goto constructs, procedures, recursion and basic data structures.

532114 EE263 INTRODUCTION TO STRUCTURING OF INFORMATION 1 unit
Note: Computer Engineering students may only enrol in this subject if they have completed EE262 and/or EE264 prior to 1987.
Prerequisite    Mathematics I
Content
Basic data structures and the design and analysis of algorithms which use these data structures are investigated. Topics covered will include a review of elementary data structures, an introduction to the concept of an abstract data type and the abstraction and implementation of data types including lists, stacks, queues, trees, graphs and sets. Particular attention is given to the problem of sorting and some common algorithm design techniques such as divide-and-conquer, backtracking and greedy algorithms.

532116 EE264 INTRODUCTION TO COMPUTER ARCHITECTURE AND ASSEMBLY LANGUAGE 1 unit
Note: Computer Engineering students may only enrol in this subject if they have completed EE262 and/or EE263 prior to 1987.
Electrical Engineering students may only enrol in this subject if they completed EE262 prior to 1987.
Prerequisite    Mathematics I
Content
This course is divided into two sections. The first section provides an introduction to computer organisation and assembly language programming. Topics covered include data representation, computer structures, registers, addressing modes, instruction sets, subroutines and the use of stacks. The second section of the course is an introduction to operating system principles. Topics covered include process management, synchronisation, memory management and file systems.

Text
Deitel, H.M. An Introduction to Operating Systems (Addison Wesley 1984)

532119 EE265 ELECTRICAL ENGINEERING COMPUTATIONS 2 units
This subject introduces the discipline of computer programming and illustrates the key concepts through the programming languages PASCAL and FORTRAN. The course consists of two equal parts, one covering software and programming languages and one covering numerical methods. The course comprises approximately 50% lectures and 50% tutorials and practical computer programming.

533117 EE323 LINEAR ELECTRONICS I 1 unit
Prerequisite    EE221
Signal processing in electronic systems. Biasing requirements and techniques for BJTs and FETs. Single stage amplifier design, small signal and large signal effects. Multistage design, gain, frequency response, linearity, noise, impedance interaction. Stability and feedback. Directly coupled stages, the differential pair, frequency performance, design and cascading.
The course consists of lectures and laboratories which will be supplemented by tutorials.
The course consists mainly of lectures which are supplemented by laboratory work. Feedback structures.

The course consists mainly of lectures and laboratory work, supplemented by tutorials.

Prerequisite


Logic families: Static and dynamic characteristics, noise performance.

Switching performance of digital devices and systems: signal skewing, set-up/hold time requirements; metastable behaviour at asynchronous/synchronous interfaces.

Random Logic Techniques: ROM, PLA and MSI module based design.

Pipelining and Parallelism: space-time tradeoff.

Digital System Interconnections: Single and differential transmission; open collector and tristate bases; nonlinear digital interconnection transients. Noise generation and suppression in digital systems.


Microprogrammed Systems.

Introduction to VLSI Design.

Prerequisite

Transmission Lines and Networks (McGraw-Hill) (J. Wiley and Sons)

Texts

Transmission Lines and Networks (McGraw-Hill)

Principles of Active Network Synthesis and Design (J. Wiley and Sons)

Text

Mano, M.M.

Digital Design (Prentice-Hall 1984)

EE326 DIGITAL DESIGN AND TECHNOLOGY 1 unit

Prerequisites

EE362 or consent of Instructor

Logic families: Static and dynamic characteristics, noise performance.

Switching performance of digital devices and systems: signal skewing, set-up/hold time requirements; metastable behaviour at asynchronous/synchronous interfaces.

Random Logic Techniques: ROM, PLA and MSI module based design.

Pipelining and Parallelism: space-time tradeoff.

Digital System Interconnections: Single and differential transmission; open collector and tristate bases; nonlinear digital interconnection transients. Noise generation and suppression in digital systems.


Microprogrammed Systems.

Introduction to VLSI Design.

Prerequisite


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Switching performance of digital devices and systems: signal skewing, set-up/hold time requirements; metastable behaviour at asynchronous/synchronous interfaces.

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Microprogrammed Systems.

Introduction to VLSI Design.

Prerequisite

Transmission Lines and Networks (McGraw-Hill) (J. Wiley and Sons)

Texts

Transmission Lines and Networks (McGraw-Hill)

Principles of Active Network Synthesis and Design (J. Wiley and Sons)

Text

Mano, M.M.

Digital Design (Prentice-Hall 1984)
Dynamic analysis: Dynamic models, electromechanical transient behaviour of synchronous machines, stability, stabilizer design.

Power system operation: Operating states, supervisory control and data acquisition, automatic generation control, security.

The course will consist of lectures supplemented by assignment and laboratory work.

Text

534150 EE415 POWER SYSTEM EQUIPMENT AND PROTECTION 1 unit

Prerequisite EE313

Transformers: construction and connections, parameters, testing, tap changing.
Substation arrangement.

High voltage transmission: Design of towers and lines; insulators, strings, arc horns, surge diverters etc; corona effects. The design of high voltage cables.

Protection: Use of current transformers and summation transformers; time graded systems, directional systems. Circulating current protection methods. Generator and generator transformer protection. Feeder protection.


High voltage technology: testing properties of insulation, breakdown theories, insulation co-ordination, overvoltages.

The course will consist of lectures supplemented by tutorials, laboratory work and visits to local power facilities.

534144 EE416 ADVANCED ELECTRICAL MACHINE THEORY 1 unit

Prerequisite EE314


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

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

The course consists mainly of lectures supplemented by tutorial sessions.

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

534146 EE417 VARIABLE SPEED DRIVE SYSTEMS 1 unit

Prerequisite EE315

The design and analysis of d.c.-d.c. converters and their application to the control of d.c. machines.

The design and analysis of square wave, quasi-square wave and P.W.M. inverters and their application to the speed control of a.c. machines.

Performance evaluation of induction motors and synchronous machines in variable frequency systems. Control strategies for variable speed drive systems.

Text
Shanmugan, K.S. Digital and Analog Communication Systems (Wiley Paperback)
The course consists of lectures and a small project assignment.

**Prerequisite**
Ph221 and Mathematics IIB


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

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

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

Ground wave and ionospheric propagation.

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

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**534145 EE462 TOPICS IN SWITCHING THEORY** 1 unit

**Prerequisite**
EE362 or Consent of Instructor


**Text**

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**534124 EE463 COMPUTER OPERATING SYSTEMS** 1 unit

**Prerequisite**
EE264, (Topic ML) or Consent of Instructor

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

The course consists mainly of lectures supplemented by tutorial sessions.

**Text**

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**534143 EE464 COMPILER CONSTRUCTION** 1 unit

**Prerequisite**
EE264 or Topic ML


The course consists of lectures and a small project assignment.

**Text**

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**534127 EE484 PROJECT/SEMINAR** 4 units

As for EE486 save that this subject involves a smaller project. Students may not enrol in this subject without the permission of the Head of the Department of Electrical and Computer Engineering.

**LIST OF E500-600 SUBJECTS**

A limited selection of the following subjects will be offered each year subject to adequate enrolments.

**530144 EE513 POWER SYSTEM ANALYSIS AND OPERATION** 1 unit

As for EE413 with additional material.

**530107 EE516 ADVANCED POWER SYSTEMS** 1 unit

**Prerequisite**
EE313

Variable content selected from power systems operations, computer control centres, stability, security dispatch, emergency state control, probabilistic methods, load forecasting, reliability, and protection.

**530105 EE517 VARIABLE SPEED DRIVE SYSTEMS** 1 unit

As for EE417 with additional material.

**530148 EE525 MICROPROGRAMMED AND MICROPROCESSOR SYSTEMS** 1 unit

**Assumed Knowledge**
EE325

A course consisting of 50% lectures and 50% laboratory on:

a) Peripherals and interfacing.
b) Interrupt Structures.
c) Bus systems and arbitration techniques.
d) Microprogramming.

**530142 EE526 ADVANCED DIGITAL SYSTEMS** 1 unit

As for EE426 with additional material.

**530149 EE527 VLSI AND DESIGN AUTOMATION** 1 unit

**Assumed Knowledge**
EE362

A course on advanced digital design techniques with particular emphasis on VLSI:

Design options; Microlithography; MOS transistor patterning; MOS transistor theory and inverters; MOS processing and design rules, basic gates and MOS, Scaling Logic Design with MOS using registers, combinational logic, etc.; 2 phase clocking etc.; PLAs and state machines, RAM, ROM, etc.; Design styles; planning and layout, simulation, testing, design for testability, regular structures; other technologies - CMOS, Domino Logic, Ratio and Ratiocentric logic; Applications and Advantages.

**Text**
Mavor, Jack and Denyer *Introduction to MOS LSI Design* (Addison-Wesley)

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<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>530145</td>
<td>EE541 ADVANCED DIGITAL SIGNAL PROCESSING</td>
<td>1 unit</td>
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<tr>
<td>530102</td>
<td>EE542 MODERN CONTROL</td>
<td>1 unit</td>
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<tr>
<td>530120</td>
<td>EE543 OPTIMIZATION TECHNIQUES</td>
<td>1 unit</td>
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<tr>
<td>530146</td>
<td>EE545 ADVANCED COMMUNICATION SYSTEMS</td>
<td>1 unit</td>
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<tr>
<td>530129</td>
<td>EE547 DIGITAL COMMUNICATIONS</td>
<td>1 unit</td>
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<tr>
<td>530143</td>
<td>EE551 ELECTROMAGNETIC PROPAGATION AND ANTENNAS</td>
<td>1 unit</td>
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<tr>
<td>530141</td>
<td>EE562 TOPICS IN SWITCHING THEORY</td>
<td>1 unit</td>
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<tr>
<td>530117</td>
<td>EE563 COMPUTER OPERATING SYSTEMS</td>
<td>1 unit</td>
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<tr>
<td>530136</td>
<td>EE564 COMPILER CONSTRUCTION</td>
<td>1 unit</td>
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<tr>
<td>530147</td>
<td>EE566 AUTOMATA THEORY</td>
<td>1 unit</td>
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<tr>
<td>530125</td>
<td>EE567 COMPUTER PROCESS CONTROL</td>
<td>1 unit</td>
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<tr>
<td></td>
<td>Linear Discrete Dynamic Systems, Z-transforms, Digital Filtering, Sample Data Systems, Classical Approaches to Digital Control System design, State-Space Design Techniques, Quantization Techniques, Multivariable and Optimal Control, Adaptive Control.</td>
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<td></td>
<td>Text: Franklin, G.F. and Powell, J.D.</td>
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<td></td>
<td>Digital Control of Dynamic Systems</td>
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<td></td>
<td>(Addison-Wesley 1980)</td>
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<tr>
<td>530121</td>
<td>EE568 ADVANCED COMPUTER ARCHITECTURE</td>
<td>1 unit</td>
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<tr>
<td>530135</td>
<td>EE580 PROJECT</td>
<td>2 units</td>
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<tr>
<td>530139</td>
<td>EE580 PROJECT</td>
<td>3 units</td>
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<tr>
<td>530161</td>
<td>EE580 PROJECT</td>
<td>4 units</td>
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<tr>
<td>530111</td>
<td>EE590 SEMINAR</td>
<td>1 unit</td>
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<tr>
<td>530137</td>
<td>EE591 SEMINAR</td>
<td>1 unit</td>
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<tr>
<td>530138</td>
<td>EE592 SEMINAR</td>
<td>1 unit</td>
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<tr>
<td>530140</td>
<td>EE593 SEMINAR</td>
<td>1 unit</td>
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<td></td>
<td>A series of seminars for full-time postgraduate students who each will prepare approximately one seminar per semester on a technical or theoretical subject. Each student will also attend EE496 seminars.</td>
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<tr>
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<tbody>
<tr>
<td>530133</td>
<td>EE641 MULTIVARIABLE CONTROL SYSTEMS</td>
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<tr>
<td>530134</td>
<td>EE642 STOCHASTIC CONTROL</td>
<td>1 unit</td>
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<tr>
<td>530162</td>
<td>EE661 COMPUTER NETWORKS</td>
<td>1 unit</td>
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</tbody>
</table>

**Part 1**


**Part 2**

Local Networks and Examples.

**Part 3**


**Text**

Tanenbaum, A.S. Computer Networks (Prentice-Hall 1981)
General Engineering Subjects

501102 GE101 INTRODUCTION TO ENGINEERING 1 unit: weight 0
A course of lectures, seminars and plant visits intended to enhance an understanding of the role of the professional engineer in industry and society.

501102 GE151 INTRODUCTION TO MATERIALS SCIENCE 1 unit
The course provides a general introduction to materials of engineering significance and to the relationships which exist between structures, properties and applications. The detailed treatment of various aspects is left to the latter stages of the degree programme.

The following sections are given approximately equal amounts of time and emphasis:
- Atomic bonding; atomic arrangements in metals, glasses and polymers; the effects of stress and temperature on simple metals; the control of metallic structures by composition and thermal treatments; common metals of engineering importance; the structures and properties of ceramics and cement products.
- Polymers, rubbers and woods; engineering applications for polymers; the mechanical testing of materials; composite material; the electrical, magnetic, optical and thermal properties of solid materials.

Text

501104 GE152 PHYSICAL AND CHEMICAL PROPERTIES OF MATERIALS 1 unit

502001 GE204 ENGINEERING COMPUTATIONS I 1 unit
Prerequisite: Mathematics I
This course is concerned with computer programming, with particular emphasis on programming style. The use of terminals, files and editing techniques will be covered. Also some aspects of computer hardware and data handling will be considered. Some numerical analysis techniques will be discussed to provide examples for programming. These will include solution of single non-linear equations, interpolation and integration.

Text
Brown, L.W.B. A Fortran Primer (Prentice-Hall 1982)
Handbook for VAX/VMS (The University of Newcastle Computing Centre)

502002 GE205 ENGINEERING COMPUTATIONS II 1 unit
Prerequisite: GE204
This course is concerned with developing a student's ability to write computer programmes that use numerical analysis techniques to solve problems in the engineering field. Some discussion of the theories behind the numerical analysis techniques is given but the main emphasis is on computing.

The programming work of Engineering Computations I is extended to include some advanced Fortran programming techniques, the use of graph-plotting routines and the use of computer libraries such as the NAG library. Emphasis is placed on curve fitting to well-ordered data and to experimental data and the differentiation and integration of such data. Systems of equations, both linear and non-linear are considered. Other material covered includes solution of ordinary differential equations and partial differential equations.

Text
Gerald, C.F. and Wheatley, P.O. Applied Numerical Analysis 3rd edn (Addison-Wesley 1984)
Handbook for VAX/VMS (The University of Newcastle Computing Centre)

502003 GE206 COMPUTATIONAL METHODS I 1 unit
Prerequisite: Mathematics I
Note: This subject is only available in 1987 to students requiring it for transition purposes.
This course is concerned with computer programming, with particular emphasis on programming style. The use of terminals, files and editing techniques will be covered. Also some aspects of computer hardware and data handling will be considered. Some numerical analysis techniques will be discussed to provide examples for programming. These will include solution of single non-linear equations, interpolation, curve fits, differentiations, integration and systems of equations, linear and non-linear.

Text
— Handbook for VAX/VMS (University of Newcastle Computing Centre)
Hume, J.N.P. and Holt, R.C. Programming in Fortran 77 (Reston Publishing Co. 1979)

502004 GE207 COMPUTATIONAL METHODS II 1 unit
Prerequisite: GE206
Note: This subject is only available in 1987 to students requiring it for transition purposes.
This course is concerned with developing a student's ability to write and understand computer programmes that use numerical analysis techniques to solve problems in engineering. An outline of theories behind the numerical analysis techniques is given but the main emphasis is on computing methods.

Topics dealt with include: numerical solution of single ordinary differential equations by stepwise and multistep methods including step optimisation and stability convergence criteria, systems of differential equations, "stiff" equations and stability; boundary value problems.

Numerical solution of partial differential equations, the usual terminology. Explicit and implicit methods of computation; solution of Elliptic equations by the grid iterative and relaxation methods.
A team project on the role of technical and value factors in technological decision making.

Pre- or Corequisite

GE301 Technology and Human Values I

Technology and Human Values I

A team project on the role of technical and value factors in technological decision making. Students will form small teams under staff leadership for a year-long intensive study of a specific example of technological decision making. The aim is to provide a comprehensive and accurate understanding of the interaction between technical and value factors in the decision. Each team will produce a report of a quality aimed at management/ministerial discussion. Evaluation will be by the Yeam Report plus staff leader/te/a team’s assessment of individual contributions. Example projects are Nuclear Electric Power for Australia, A Study of Technology Assessment. A wider variety of projects can be undertaken, selection by teams will occur during the first two weeks of term.

Text

Fortmann, T.E. and Hitz, K.L.

Introduction to Linear Control Systems Theory

(Dekker 1977)

or

Cannon, R.H.

Dynamics of Physical Systems

(McGraw-Hill 1967)

or

Distefano, et al

Feedback and Control Systems

(Schaum’s Outline Series 1976)
504101 GE471 ENERGY 1 unit

Prerequisites
Physics IA or Physics IB, EM2CO

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

504102 GE472 ENERGY 1 unit

Prerequisite
Physics IA or Physics IB, EM2CO

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.

500101 GE501 AIR POLLUTION STUDIES I 1 unit

Content to be advised.

500102 GE502 COAL ANALYSIS AND PROPERTIES 1 unit


500103 GE503 MINERAL MATTER IN COAL 2 units

Prerequisite
A first course in coal properties

Types, composition and origins of the mineral matter in coal. Analytical methods for the analysis and characterisation of the inorganic matter in coal.
Examination of a number of coal applications in which minerals and inorganics determine successful usage and aspects of coal preparation and clean-up. Depending on interest this may include: grindability, furnace fouling, fly ash collection, No, and So, emissions, material aspects (including refractory).

500104 GE504 COAL PREPARATION 2 units

Prerequisite
A first course in coal properties

The principles of particle sizing, crushing, washability and separation techniques.
Analysis of the unit operations of coal preparation such as jig washing, dense medium, cyclones and flotation.
Flow sheeting of washeries, plant control, optimisation and computer modelling.

500105 GE505 METALLURGICAL ASPECTS OF COAL UTILISATION 2 units

Content to be advised.

500106 GE506 MINING GEOLOGY 2 units

Prerequisites
Relevant topics from Geology II and Geology III or their equivalents

Materials Engineering Subjects

Mat21 Selection and Use of Materials 1 unit

Assumed Knowledge GE151

The aim is to provide an introduction to the factors that must be considered when a material is chosen for a specific engineering application. Materials selection, manufacture and engineering design. The mechanical properties of materials, thermal and mechanical treatments, failure analysis, materials testing, economic considerations.

Text
Alexander, W.O., Davies, G.J., Reynolds, K.A., and Bradbury, E.J. Essential Metallurgy for Engineers (Van Nostrand Reinhold)

Mat31 Selection and Use of Materials II 1 unit

Assumed Knowledge Mat211

This course outlines the processes involved in choosing between alternative materials and how this process may be made quantitative. The factors to be considered are mechanical properties, the effects of mechanical and thermal cycling, corrosion and wear, processing methods.

Text

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Mechanical Engineering Subjects

541302 ME092 INDUSTRIAL EXPERIENCE 1 unit each
541303 ME093 INDUSTRIAL EXPERIENCE
541304 ME094

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 ME092-094 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 their engineering activities and experience during the year. Such units may be used by students in lieu of electives.

541307 ME097 INDUSTRIAL EXPERIENCE 2 units each
541308 ME098 INDUSTRIAL EXPERIENCE

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

541104 MElli GRAPHICS AND ENGINEERING DRAWING 1 unit

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

Text

542206 ME201 EXPERIMENTAL METHODS I 1 unit

Only available to students who completed ME203 prior to 1987.

Assumed Knowledge Mathematics I and Physics IA or Physics IB

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)
542207 ME203 EXPERIMENTAL METHODS II 1 unit

Only available to students who completed ME201 prior to 1987.

Assumed Knowledge ME201

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

542211 ME204 EXPERIMENTAL METHODS I 2 units

Assumed Knowledge Mathematics I, Physics IA or Physics IB

A series of laboratory experiments designed to give the student familiarity with mechanical, optical and electrical systems used to measure basic physical quantities such as length, strain, pressure, temperature, force, torque and fluid flow.

Problems of correct interpretation of experimental data and basic principles of error analysis are discussed. Proficiency in technical report writing is emphasised.

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

542208 ME212 ENGINEERING DESIGN I 1 unit

Only available to students who completed GE112 but not ME212 prior to 1987.

Assumed Knowledge ME111, ME214 or CE212, CE111, Mathematics I, GE112

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 belt drives and springs. Horsepower calculations for straight and helical spur gear reductions.

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

542105 ME214 MECHANICS OF SOLIDS I 1 unit

Assumed Knowledge Mathematics I, CE111

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

Text

542213 ME215 MECHANICAL ENGINEERING DESIGN I 2 units

Prerequisites CE111, ME111

Pre- or Corequisite ME214 or CE212


542214 ME231 DYNAMICS 2 units

Assumed Knowledge Mathematics I, Physics IA or Physics IB, CE111

Part A
Basic concepts. Newton's and Euler's laws of motion for particles and systems of particles, centre of mass. Laws of gravitation and friction.

Part B
Three dimensional motion of particles in inertial, translating and rotating reference frames.

Kinematics of plane mechanisms.

Kinetics of systems of particles and rigid bodies in three-dimensional motion.

Undamped and damped simple harmonic motion. Forced oscillations in simple 1st and 2nd order dynamic systems.

Text

542305 ME232 DYNAMICS OF MACHINES I 1 unit

Only available to students who have completed ME131 but not ME232 prior to 1987.

For content and text see ME231 Dynamics (Part B).

542210 ME251 FLUID MECHANICS I 1 unit

Assumed Knowledge Mathematics I, Physics IA or Physics IB

Fluid properties and definitions. Fluid statics—forces on surfaces, buoyant forces, stability of floating and submerged bodies. Types of flow, continuity equation, Euler's and Bernoulli equations, energy equation, linear and angular momentum applications. Introduction to dimensional analysis. Viscous effects, fluid resistance, laminar and turbulent flow in pipes and conduits. Fluid measurement.

Text

542205 ME271 THERMODYNAMICS I 1 unit

Assumed Knowledge Mathematics I, Physics IA or Physics IB


Calculations 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 cycles, Rankine cycle, reheat cycle, regenerative feed heating, Otto cycle, Diesel and mixed cycles, Stirling and Ericsson cycles, gas turbine cycles, refrigeration cycles.

Text
Black, W.Z. and Hartley, J.G. Thermodynamics (Harper and Row 1985)

543112 ME305 EXPERIMENTAL METHODS II 1 unit
Assumed Knowledge
EM204
Selected engineering laboratory experiments designed to extend the concepts of experimental procedures and to complement formal subject matter in the course.

543113 ME316 MECHANICAL ENGINEERING DESIGN II 2 units
Assumed Knowledge
EM214, ME212 or ME215
Film lubrication, Friction theory and applications, Hydrodynamic drives, Materials and failure theories, Fatigue, Fracture, Thermal Stresses, Residual Stresses. Belt conveyors as an example of the design of a system. Projects to solve problems related to the above; one involving the development of a computer programme.

Text
Burr, A.H. Mechanical Analysis and Design (Elsevier)

543115 ME333 DYNAMICS OF MACHINES 1 unit
Assumed Knowledge
EM2CO, ME231 or ME232

Text
Mabie, H. and Ocvirk, F. Mechanisms and Dynamics of Machinery SI Version 3rd edn (Wiley)

543109 ME343 MECHANICS OF SOLIDS II 1 unit
Assumed Knowledge
CE212 or ME214

Text
Antonia, R.A. Notes for Fluid Mechanics II (Department of Mechanical Engineering, University of Newcastle)

543114 ME353 FLUID MECHANICS AND HEAT TRANSFER 3 units
Assumed Knowledge
EM2CO, ME251

The fluid mechanics content of the course will include the following topics: Kinematics of fluids. Dynamics of incompressible fluids. Similarity and the application of dimensional analysis. Exact solutions of the Navier-Stokes equations. Hydrodynamic lubrication. Laminar and turbulent flows.


The course will include a number of laboratory experiments covering various aspects of fluid mechanics and heat transfer.

Texts
Antonia, R.A. Notes for Fluid Mechanics II (Department of Mechanical Engineering, University of Newcastle)
White, F.M. Heat Transfer (Addison-Wesley 1984)

543202 ME372 HEAT TRANSFER 1 unit
Only available to students who completed ME352 but not ME372 prior to 1987.
Assumed Knowledge
EM2CO, ME251

Text
White, F.M. Heat Transfer (Addison-Wesley 1984)

54311 ME373 THERMODYNAMICS II 1 unit
Assumed Knowledge
ME271

Texts
As for ME271 Thermodynamics I

543501 ME381 METHODS ENGINEERING 1 unit
Assumed Knowledge
Mathematics I, ME223

Text
Niebel, B.W. Motion and Time Study (Irwin) or Stevenson, M.G. Methods Engineering (N.S.W. University Press)

130
543502 ME383 QUALITY ENGINEERING 1 unit

Assumed Knowledge
EM2CO, EM2H, ME215 or ME212


543503 ME384 DESIGN FOR PRODUCTION 1 unit

Assumed Knowledge
ME215 or ME212

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.

544481 ME405 ADVANCED NUMERICAL PROGRAMMING 1 unit

Assumed Knowledge
GE205

Complex algebra, multiple entry and return points for segments, use of disc and magnetic tape files, use of library subroutines, etc. Some advanced computing techniques. For example:
(a) Solution of end value differential equations.
(b) Finite element techniques.
(c) Advanced finite difference techniques.
(d) Eigenvalue problems.

544453 ME407 ENVIRONMENTAL ENGINEERING 1 unit

Assumed Knowledge
Completed Year II

Physical and chemical interaction of air pollutants on the local and global scale. Meteorology, atmospheric diffusion models and ambient measurements of air pollutants and the control of exhausts from mobile and stationary sources.

544424 ME409 INTRODUCTION TO NOISE POLLUTION CONTROL 1 unit


Text

544426 ME410 ADVANCED DESIGN CONCEPTS I 1 unit

The application of system analysis principles to the solution of problems associated with the design of mechanisms. Formalising of the design process. Computer approach for mechanical design applications. The optimum design of typical mechanical components.

544419 ME411 BULK MATERIALS HANDLING SYSTEMS I 1 unit


Text

Selected research papers

544420 ME420 BULK MATERIALS HANDLING SYSTEMS II 1 unit

Assumed Knowledge
ME419

Texts
Arnold, P.C., Assumed Knowledge - pneumatic, hydraulic and capsule - and mechanical conveying
Rademacher, bucket elevators. Technical and economic considerations in the design of conveyors.

Selected research papers

544473 ME421 CONVEYING OF BULK SOLIDS 1 unit
Assumed Knowledge ME419
Comparison based on economic and technical considerations of different modes of continuous and discontinuous transportation of bulk solids. Overview of freight pipelines — pneumatic, hydraulic and capsule — and mechanical conveying — belt, screw and bucket elevators. Technical and economic considerations in the design of conveyors. Examples will be selected from the continuous conveyor systems mentioned above. In the case of belt conveyors the dynamic characteristics and the influence of these characteristics on design will be studied in some detail. In the case of pneumatic conveyors, the design of both lean and dense phase systems will be discussed.

Texts
Arnold, P.C., Bulk Solids: Storage, Flow and Handling (TUNRA)
McLean, A.G. and Roberts, A.W.
Roberts, A.W. and Hayes, J.W.

Selected research papers

544475 ME445 MECHANICS OF SOLIDS III 1 unit
Assumed Knowledge ME343
An introduction to the theory of plates and shells with extensions to thick pressure vessels and creep effects.

544476 ME453 FLUID MECHANICS III 1 unit
Assumed Knowledge ME352 or ME353
Lectures and laboratory work dealing with a selection from the following topics:—
Topics in turbomachinery.
One-dimensional compressible flow.
Fluid dynamic stability.
Elements of turbulent flows.
Turbulent flows in both the laboratory and atmosphere.

544477 ME473 THERMODYNAMICS III 1 unit
Assumed Knowledge ME373
Thermodynamic relations; the Maxwell relations; general equations for enthalpy, internal energy and entropy; compressibility factor; equations of state; generalised charts for enthalpy and entropy. Availability concepts and applications. Thermodynamics of irreversible processes. Applications of statistical thermodynamics. Direct energy conversion.

544478 ME474 HEAT TRANSFER II 1 unit
Assumed Knowledge ME372 or ME373
Development of the general forms of the continuity, momentum and energy equations. Application of these equations to a range of convection heat transfer problems. Advanced conduction and radiation heat transfer. Heat transfer with change of phase.

Texts

544483 ME483 PRODUCTION SCHEDULING 1 unit
Assumed Knowledge Mathematics I or GE205

544484 ME484 ENGINEERING ECONOMICS II 1 unit
Assumed Knowledge ME482

Texts
Smith, G.W., Engineering Economy: Analysis of Capital Expenditures 3rd edn (Iowa State U.P. 1979)

544485 ME485 NUMERICAL CONTROL AND COMPUTER AIDED MANUFACTURING 1 unit
Introduction to Computer Aided Manufacturing Concepts. Control systems for NC Machines; Programming of NC Machines; Systems with integrated materials handling; Robotic Systems. Group Technology concepts.
54447 ME487 OPERATIONS RESEARCH — FUNDAMENTAL TECHNIQUES 1 unit
Assumed Knowledge EM2CO, EM2H
Concept of optimisation; Optimisation approaches; Formulation of Models; Linear Programming; Allocation and assignment; Simplex Method; Duality; Theory of Games; Parametric Programming; Decomposition principle. Network theory; Dynamic Programming. Geometric Programming. Applications.
Texts
Hillier, F.S. and Lieberman, G.J. Introduction to Operations Research (Holden-Day)
or
Taba, H.A. Operations Research (Macmillan)
or
Wagner, H.M. Principles of Operations Research (Prentice-Hall)

544468 ME488 OPERATIONS RESEARCH — PLANNING, INVENTORY CONTROL AND MANAGEMENT 1 unit
Assumed Knowledge EM2CO, EM2H
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
As for ME487

544203 ME496 PROJECT/SEMINAR 4 units
Usually consists of literature survey and review, analytical and/or experimental investigation into a mechanical or industrial engineering problem. Presentation of seminars. Two (2) copies of the Project Report are required.
Invited guest seminars.
See Head of Department for further details.

544479 ME497 PROJECT/DIRECTED READING 2 units
Note: Students may not enrol in this subject without the permission of the Head of the Department of Mechanical Engineering.
Private work of laboratory, literature search or theoretical nature requiring preparation of a report. Work will be undertaken at the direction of a supervisor with whom the topic should be negotiated.
The work undertaken in this subject may form part of an extended ME496 Project or an independent topic.

544480 ME498 PROJECT/DIRECTED READING 1 unit
Note: Students may not enrol in this subject without the permission of the Head of the Department of Mechanical Engineering.
Private work of laboratory, literature search or theoretical nature requiring preparation of a report. Work will be undertaken at the direction of a supervisor with whom the topic should be negotiated.
The work undertaken in this subject may form part of an extended ME496 Project or an independent topic.

540137 ME503 DESIGN OF EXPERIMENTS FOR ENGINEERING RESEARCH 1 unit
Assumed Knowledge EM2CO, EM2H
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 laboratory operations.

540143 ME505 ADVANCED NUMERICAL PROGRAMMING 1 unit
Content as for ME405 with additional material.

540144 ME507 ENVIRONMENTAL ENGINEERING 1 unit
Content as for ME407 with additional material.

540145 ME509 INTRODUCTION TO NOISE POLLUTION CONTROL 1 unit
Content as for ME409 with additional material.

540146 ME510 ADVANCED DESIGN CONCEPTS I 1 unit
Content as for ME410 with additional material.

540147 ME514 COMPUTER AIDED DESIGN AND MANUFACTURING 1 unit
Content as for ME414A with additional material.

540148 ME519 BULK MATERIALS HANDLING SYSTEMS I 1 unit
Content as for ME419 with additional material.

540149 ME520 BULK MATERIALS HANDLING SYSTEMS II 1 unit
Assumed Knowledge ME519
Content as for ME420 with additional material.

540154 ME521 CONVEYING OF BULK SOLIDS 1 unit
Assumed Knowledge ME519
Content as for ME421 with additional material.

540156 ME545 MECHANICS OF SOLIDS III 1 unit
Content as for ME445 with additional material.
Content as for ME453 with additional material.

Assumed Knowledge GE204, ME353 (or ME352 and ME372)

Governing equations in primary and secondary variables.

Coordinate transformations.

Discretisation of the equations.

Solution algorithms for the discretised equations.

Examples from the marker-and-cell technique. Patankar-Spalding, Cobeci Smith, Bradshaw-Ferriss, Wilcox-Eybyl programs.

Content as for ME473 with additional material.

Content as for ME474 with additional material.

Assumed Knowledge ME487 or ME587

An introduction to non-linear optimization problems. Dynamic programming and its application to a range of resource allocation, production planning and inventory control problems. Linear programming problems in integer, introduction branch-and-bound methods and implicit enumeration algorithms for problems in binary variables.

Review and revision of probability theory, random variable and distribution Regression analysis and statistical tests. Applications in industry in quality control and sampling inspection schemes; in design of industrial experiments in analysing variability in production systems.


Beranek, L.L. Fundamentals of Vibrations (Macmillan)

A systematic study of both noise and vibration problems which are of common occurrence in industrial plants and structures.

It is divided into:

(i) Fundamentals underlying noise control. Criteria for noise and vibration control. Practical noise control. (This section continues on from ME509.)

(ii) Vibration measurement and analysis. Vibration control; shock and vibration isolation in machines and vehicles. Effects of shock and vibration on structures.


BERANEC, L.L. Fundamentals of Vibrations (Macmillan)

The application of system analysis principles to the solution of problems associated with the design of mechanisms. Formalisation of the design process. Fundamental concepts of reliability. Reliability analysis. Methods of improving the reliability of systems. Computer programming for mechanical design applications. The optimum design of typical mechanical components. (This subject continues on from ME510.)

Advanced study in the area of bulk solids handling and transportation. Topics for study will be chosen from the areas of powder mechanics, bulk solids storage and flow and conveying of bulk solids.

Text Selected research papers
540179 ME653 TURBULENT FLOWS 1 unit
Assumed Knowledge ME352 or ME353
Text
Tennekes, H. and Lumley, J.L. A First Course in Turbulence (M.I.T. Press 1972)

540183 ME654 COMPUTATION OF FLUID FLOW AND HEAT TRANSFER 1 unit
Assumed Knowledge GE204, ME335 (or ME352 and ME372)
Governing equations in primary and secondary variables.
Coordinate transformations.
Discretisation of the equations.
Solution algorithms for the discretised equation.
Examples from the marker-and-cell technique. Patankar-Spalding, Cobeci Smith, Bradshaw-Ferriss, Wilcox-Edybal programs.

540184 ME687 MODELLING OF MANAGEMENT PROBLEMS 1 unit
Assumed Knowledge ME587, ME588
Principles of model building; classification of models; cause-effect structures; organisational objectives; problem formulation; management problems in industry and government; models for marketing, manpower, production, inventory, distribution, and investment; case studies of management problems.

540185 ME688 PROBABILISTIC MODELS IN OPERATIONS RESEARCH 1 unit
Assumed Knowledge ME588
Review of relevant, probability and statistics 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.

540186 ME697 PROJECT/SEMINAR 2 units
540187 ME698 PROJECT/SEMINAR 3 units
540188 ME699 PROJECT/SEMINAR 4 units
450104 ME681 INDUSTRIAL LAW 4 units
For subject entry see Industrial Law entry in Economics and Commerce Handbook.

540189 ME684 PROJECT 2 units
For content see Head of Department of Mechanical Engineering.

540176 ME685 ADVANCED OPERATIONS RESEARCH 1 unit
Assumed Knowledge ME587, ME588, ME589
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.
### Surveying Subjects

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<th>Course Code</th>
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<th>Duration</th>
<th>Prerequisite</th>
<th>Corequisite</th>
<th>Notes</th>
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<td>521110</td>
<td>SURVEYING I</td>
<td>4 units</td>
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<tr>
<td><strong>Part A</strong></td>
<td>(Surveying)</td>
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<tr>
<td></td>
<td>Classes of surveys — nature, causes and classes of errors — elementary error propagation — linear measurement with tapes, ordinary differential levelling, angle measurement, plane table, tachometry optical square, Abney level, Indian clinometer, magnetic compass. Field notes — line ranging, chain surveys — traversing and traverse calculations — plane triangulation — contour surveys — plane table surveying. Route Surveys — areas and volumes — horizontal (circular and transition) and vertical curves. History of surveying and surveying instruments.</td>
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<td></td>
<td><strong>Part B</strong> (Surveying)</td>
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<td></td>
<td>Plan draughting for cadastral and engineering surveys. Survey draughting equipment and office procedures. Introduction to Acts of the N.S.W. Parliament, and Regulations, that affect the surveying profession and survey draughting practice in particular.</td>
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<tr>
<td>Text</td>
<td>Fryer, J.G. and Effick, M.H.</td>
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<tr>
<td></td>
<td>Elementary Surveying I (Harper and Row 1986)</td>
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<td>SURVEY CAMP I</td>
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<tr>
<td>Corequisite</td>
<td>SV111 Surveying I (B.Surv. students only)</td>
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<tr>
<td>Duration</td>
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<td></td>
<td>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.</td>
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<td>522411</td>
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<td><strong>Part A</strong></td>
<td>(Surveying)</td>
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<td>Part B (Optics)</td>
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<td>Corequisite</td>
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<td>Duration</td>
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<td>A Fortran Primer (Prentice-Hall 1982)</td>
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<td>BASIC REGIONAL AND URBAN ECONOMICS</td>
<td>2 units</td>
<td>Economics I</td>
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<td>Richardson, H.W.</td>
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<td>Regional Economics (Weidenfeld and Nicholson 1969)</td>
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<td>452109</td>
<td>INTRODUCTION TO LEGAL STUDIES</td>
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<tr>
<td></td>
<td>The Australian constitution and legal system — legal research and writing — areas of law — legal concepts and terminology — statute law — case law.</td>
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<td>452110</td>
<td>PROPERTY AND SURVEY LAW</td>
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<td></td>
<td>The notion of property — classifications of property — estates in land — interests in land — systems of title to land — dealing with land — statutory control of land use, with particular reference to the Local Government Act 1919 (N.S.W.).</td>
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</tbody>
</table>
The regulation and legal liability of surveyors — survey investigations and searches.

Text
Hallman, F. Legal Aspects of Boundary Surveying as apply in New South Wales (Inst. of Surveyors Aust. 1973)
Willis Notes on Survey Investigations (N.S.W. Govt. Printer)

523305 SV313 SURVEYING III 2 units
Prerequisites Physics IB, SV212 or SV213
Corequisites SV334, SV351
Revision of DC and AC circuits — transformers, vacuum tubes, semi-conductor devices — amplifiers, oscillators, transducers — wave-shaping — logic circuits — scalers — propagation of electromagnetic waves — modulation and heterodyning — phase measurement — principles of Electromagnetic Distance Measurement (EDM) — study of EDM systems — corrections to EDM distances — electronic angle measurement and total station instruments. Includes 10-day survey camp.

Text
Burnside, C.D. Electromagnetic Distance Measurement 2nd edn (Granada 1982)

523310 SV314 HYDROGRAPHIC SURVEYING 1 unit
(26 hours of lectures, plus field excursions)
Corequisites SV213 Surveying II


Text
Ingham, A.E. Hydrography for the Surveyor and Engineer, 2nd edn (Granada 1984)

523325 SV334 SURVEY COMPUTATIONS III 1 unit
Prerequisite SV231 or SV233
Revision and extension of error theory — adjustment by least squares — error ellipse calculations.

Text

523328 SV351 GEOGRAPHY I 2 units
Prerequisites SV212 or SV213, SV231 or both SV232 and SV233
Corequisites SV313, SV334
Historical development of geography — ellipsoidal and geocid, geodetic reference systems — outline of physical geography — differential geometry — geometry of the ellipsoid, normal sections and the geodetic — spherical excess, Legendre’s Theorem — polars and joins on the ellipsoid — Map projection theory, Transverse Mercator projection, Australian Map Grid, N.S.W. Integrated Surveys Grid — geodetic survey — geodetic surveys (horizontal control), adjustment of figures and networks by Condition Equations.
524128 SV452 GEODESY II 1 unit
Prerequisite
SV332 or SV334, SV351
Least squares adjustment of control surveys: variance/covariance matrix, variance factor and weight coefficient matrix, elementary statistical testing of observations and adjusted values. 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. Precise levelling.
Text
Torge, W.  
Geodesy (De Gruyter)
Mikhail, E.M.  
Observations and Least Squares (IEP)

524130 SV462 PHOTOGRAMMETRY II 1 unit
Prerequisite
SV361
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)

524140 SV465 ADVANCED CARTOGRAPHY 1 unit
Prerequisite
SV361

524135 SV472 LAND VALUATION 1 unit
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.
Texts
Hornby, D.  
Appraisal One (Jolyon 1976)
Murray, J.F.N.  
Principles and Practice of Land Valuation  
(Commonwealth Inst. of Valuers 1974)

524136 SV473 TOWN PLANNING 2 units
Review of historical planning concepts. Modern approaches to town planning including legal aspects. Practical consideration in subdivision design. Environmental impact considerations.

524141 SV475 SURVEY MANAGEMENT AND PLANNING 1 unit
Prerequisite
Nil
CORE SUBJECTS OFFERED OUTSIDE THE FACULTY OF ENGINEERING

The descriptions of subjects offered by departments other than the Departments comprising the Faculty of Engineering, which are specifically included as core subjects in engineering or surveying programmes, are set out below.

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<td>EM2B Complex Analysis</td>
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<td>EM2BD Complex Analysis and Linear Algebra</td>
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<td>EM2CO Vector Calculus and Differential Equations</td>
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<td>Physics IB</td>
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<td>Phil21 Electromagnetics and Quantum Mechanics</td>
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</tbody>
</table>

Department of Chemistry

721100 CHEMISTRY I  4 units: weighting = 1

Prerequisites
Nil.

Hours
About 3 lecture hours and 3 hours of tutorial and laboratory classes per week.

Examination
The subject is examined progressively with 3 examinations each of 2 hours duration distributed throughout the year. The laboratory mark counts 10% towards the final grading. A pass in the laboratory course is required in order to pass the subject.

Content
Inorganic Chemistry (30 lectures)
Revision of basic concepts; periodic properties of the elements and their compounds; bonding and structure; co-ordination compounds.

Organic Chemistry (30 lectures)
Historical development. The shapes, structures and names of organic compounds; reaction of common functional groups; synthesis, differentiation and structural elucidation of organic compounds.

Physical Chemistry (30 lectures)
Chemical equilibria; thermodynamics; electrochemistry; chemical kinetics.

Texts
Aylward, G.H. and Findlay, T.J.V.
Brown, T.L. and LeMay, H.E.
Hart, H.

S.L. Chemical Data 2nd edn (Wiley 1974)
Organic Chemistry 6th edn (Houghton Mifflin 1983)

721900 CHEMISTRY IIS  2 units: weighting = 1
(for Civil Engineering Students)

Prerequisites
Nil.

Hours
About 2 lecture hours and 1 hour of tutorials, computational classes and student participation per week.

Examination
A student may satisfy the examiners EITHER:
(i) by achieving an overall satisfactory performance in the three 1 hour examinations held at the end of each term; OR
(ii) by achieving performance in a 3 hour paper on the whole year's work, held in the November examination period.

Students who attempt both sets of examinations will be credited with the higher of the two results.

Content
The course deals primarily with material and energy resources.
One term is devoted to structures, properties and behaviour of inorganic materials, minerals and metals.
One term is devoted to chemical energetics and to chemical and physical equilibria.
One term is devoted to organic chemistry with special reference to petrochemicals, polymers, fuels and lubricants.

In all three terms tutorials designed to support the lecture are held.

Texts
Aylward, G.H. and Findlay, T.J.V.
Breck, W.G. et al
Steedman, W. et al

S.L. Chemical Data 2nd edn (Wiley 1974)
Chemistry for Science and Engineering (McGraw-Hill 1982)
Chemistry for the Applied Sciences (Pergamon 1970)

722200 CHEMISTRY IIC  6 units: weighting = 2
As for Chemistry IIS (below) with an additional 3 hours of laboratory classes per week. The laboratory mark counts 20% towards the final grade. A pass in the laboratory course is required in order to pass the subject.

722400 CHEMISTRY IIC  4 units: weighting = 2

Note: Chemical Engineering students may take Chemistry IIA (6 units) in lieu of Chemistry IIC and 2 units of Elective. Students are encouraged to consider taking this option — see Chemical Engineering Approved Programme.

Prerequisite
Chemistry I.
The first semester will examine the principles of Microeconomics and their applications. Microeconomics is concerned with the rules of rationality for decisions made by individuals who wish to maximise their wellbeing, and the impact these decisions have upon the allocation of resources throughout an economy or society. Emphasis will be placed on contrasting theoretical conclusions with real-world praxis.

The second semester is concerned with Macroeconomics. It will involve a study of the relationship between aggregates such as consumption, investment, employment, inflation and growth. Basic theoretical analysis will be used to explain policy alternatives and some of the problems involved in making appropriate policy decisions. The course will include a discussion of areas of theoretical controversy and provide some explanation as to why economists can advocate incompatible “solutions” to the same problem.

References

Gwartney, J.O. & Stroup, R. 
Positive Economics for Australian Students
(Weidenfeld and Nicholson, 1981)

Samuelson, P. et al.
Economics 3rd Australian edn (McGraw-Hill)

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

Department of Geography

352200 GEOGRAPHY IIB — Physical Geography 4 units: weighting = 1
(For B.Surv. students)

Hours

Five hours of lectures/practicals and one hour of Geographical Methods per week; up to six days of fieldwork. (Note: Students also enrolled in Geography IIA must count Geographical Methods in IIA only, and count the alternative strand Contemporary Australian Environments in IIB only*)

Examinations

To be advised.

Content

A study of the physical environment. In 1987 themes will be established following the specific fields of interest.

Climatology (Dr. H.A. Bridgman, Dr. G.N. McIntyre) An introduction to the study on a synoptic and meso-climatic scale including radiation and heat budgets; thermodynamics; precipitation processes; climates of the world; climatic change; agricultural climatology; applied climatology.

Geomorphology (Prof. E.A. Colhoun, Dr. R.J. Loughran) Rocks and their weathering, structural landforms, soils, slope development and mass movements, fluvial, aeolian and coastal processes and landforms.

*Contemporary Australian environments The physical and human background; rural Australia; industrial and urban Australia; changing Australian society.

Texts

Mahoney & Mahoney Positive Economics for Australian Students
(Weidenfeld and Nicholson, 1981)

Economics 3rd Australian edn (McGraw-Hill)

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

*Strands common to Geography IIA and IIB
Faculty of Mathematics

661400 COMPUTER SCIENCE I 4 units: weighting = 1

Corequisite Mathematics I

Hours 3 lecture hours and 3 laboratory hours per week.

Examinations Two 2-hour papers and one mid-year paper.

Content

Introduction to the following aspects of computer science: The design of algorithms. The theory of algorithms. How algorithms are executed as programs by a computer. The functions of software (compilers and operating systems). Applications of computers. Social issues raised by computers. An extensive introduction to programming in Pascal.

Text

Goldschlag, L. and Lister, A.

Computer Science, A Modern Introduction
(Prentice-Hall, 1982)

and either

Cooper, D. & Clancy, M.

Oh! Pascal 2nd edn (W.W. Norton & Co., 1982)

Savich, W.J.

Pascal. An Introduction to the Art and Science of Programming (The Benjamin/Cummings Publishing Co. Inc.)

661100 MATHEMATICS I 4 units: weighting = 1

Prerequisites Students intending to study Mathematics I are advised that although the minimum assumed knowledge for Mathematics I is 2 units of Mathematics at the Higher School Certificate, nevertheless students who have less than 3 units of preparation will usually find themselves seriously disadvantaged.

Hours 4 lecture hours and 2 tutorial hours per week.

Examination Two 3-hour papers.

Content

The following four topics:

Algebra
Introduction to basic algebraic objects and ideas. Induction, Binomial Theorem. Matrices. Vector geometry in two and three dimensions. Solution of systems of linear equations. Vector spaces, basis and dimension, subspaces. Linear maps, matrix representation, rank and nullity. Eigenvectors and eigenvalues. Determinants. Applications are illustrated throughout the course.

Text

Anton, H.

Elementary Linear Algebra 3rd edn (Wiley 1981)

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)

Lipschutz, S.

Linear Algebra (Schaum 1968)

Real Analysis


Text

References

Apostol, T.

Calculus Vol. 1 2nd edn (Blaisdell 1967)

Spivak, M.

Calculus (Benjamin 1967)

Stein, S.K.


Calculus


Examinations

Two 3-hour papers and one mid-year paper.

Examinations

Two 3-hour papers.

Content

The following four topics:

Algebra

Introduction to basic algebraic objects and ideas. Induction, Binomial Theorem. Matrices. Vector geometry in two and three dimensions. Solution of systems of linear equations. Vector spaces, basis and dimension, subspaces. Linear maps, matrix representation, rank and nullity. Eigenvectors and eigenvalues. Determinants. Applications are illustrated throughout the course.

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Liebeck, H.

Algebra for Scientists and Engineers (Wiley 1971)

Lipschutz, S.

Linear Algebra (Schaum 1968)

Real Analysis


Text

References

Apostol, T.

Calculus Vol. 1 2nd edn (Blaisdell 1967)

Spivak, M.

Calculus (Benjamin 1967)

Stein, S.K.


Calculus


Examinations

Two 3-hour papers and one mid-year paper.

Examinations

Two 3-hour papers.

Content

The following four topics:

Algebra

Introduction to basic algebraic objects and ideas. Induction, Binomial Theorem. Matrices. Vector geometry in two and three dimensions. Solution of systems of linear equations. Vector spaces, basis and dimension, subspaces. Linear maps, matrix representation, rank and nullity. Eigenvectors and eigenvalues. Determinants. Applications are illustrated throughout the course.

Text

Anton, H.

Elementary Linear Algebra 3rd edn (Wiley 1981)

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)

Lipschutz, S.

Linear Algebra (Schaum 1968)

Real Analysis


Text

References

Apostol, T.

Calculus Vol. 1 2nd edn (Blaisdell 1967)

Spivak, M.

Calculus (Benjamin 1967)

Stein, S.K.


Calculus


Examinations

Two 3-hour papers and one mid-year paper.
662200 MATHEMATICS IIIB 4 units: weighting = 2
Prerequisite Mathematics I.
Hours 4 lecture hours and 2 tutorial hours per week.
Examination Each topic is examined separately.
Content
Four topics chosen from A to G, 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 for Statistics II offered by the Department of Statistics, K or L may be included.

(Consult the Faculty of Mathematics Handbook for description of topics not set out below.)

Selected Part II Mathematics Topics

662204 TOPIC AS — APPLIED STATISTICS
Prerequisite Mathematics I
Hours Two lecture hours per week and practical work for Semester I only.
Examination Assignments, tests and one 2-hour examination.
Aim In this course emphasis is placed on data analysis using the statistical computer program MINITAB. Exercises and examples relate to the analysis of experimental and observational studies and quality control.

Content
Descriptive statistics, elementary probability theory, sampling, confidence intervals and hypothesis testing for means and proportions from single, paired and unpaired samples, simple linear regression and contingency tables.


662109 TOPIC CO — VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS
Prerequisites Nil.
Hours 2 lecture hours per week and 1 tutorial hour per week.
Examination One 3-hour paper.
Content

Text Either
Kreyszig, E. Advanced Engineering Mathematics 4th edn (paperback) (Wiley 1979) (4th edn is preferable but 3rd edn will suffice)
or
Greenberg, M.D. Foundations of Applied Mathematics (Prentice-Hall 1978)
662104 TOPIC D — LINEAR ALGEBRA

Prerequisites

Nil.

Hours

1 lecture hour per week and 1 tutorial hour per fortnight.

Examination

One 2-hour paper.

Content


Text

Lipschutz, S.  
Linear Algebra (Schaum 1974)

References

Anton, H.  
Elementary Linear Algebra 2nd edn (Wiley 1977)

Bloom, D.M.  
Linear Algebra and Geometry (Cambridge Uni. Press 1979)

Brusly, W.  
A Basis for Linear Algebra (Wiley 1973)

Nering, E.D.  
Linear Algebra and Matrix Theory (Wiley 1964)

Reza, F.  
Linear Spaces in Engineering (Glenn 1971)

Rorres, C. and Anton, H.  
Applications of Linear Algebra (Wiley 1977 or 2nd edn 1979)

An extended list of references will be available to students enrolling in the topic.

Selected Engineering Mathematics Topics

662112 EM2AS APPLIED STATISTICS  
1 unit weighting = 2

Content

See Topic AS.

662106 EM2B COMPLEX ANALYSIS  
1 unit weighting = 2

Content

See Topic B.

662111 EM2BD COMPLEX ANALYSIS AND LINEAR ALGEBRA  
1 unit weighting = 2

Pre- or Corequisite

EM2CO.

Content

Consists of first half year's work in Topic B Complex Analysis and Topic D Linear Algebra.

662110 EM2CO VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS  
2 units weighting = 2

Content

See Topic CO.

662108 EM2D LINEAR ALGEBRA  
1 unit weighting = 2

Content

See Topic D.

Department of Physics

741200 PHYSICS IA  
4 units: weighting = 1

Prerequisite

Nil.

Hours

3 lecture hours and an average of 3 hours of laboratory and tutorial work per week.

Examination

One paper mid-year, one paper at the end of year together with laboratory and tutorial assessment.

Content

Physics IA is the principle prerequisite for students wishing to proceed to Physics II. Some students in the Faculty of Engineering may be required to take the subject Physics IA while others may have the option of attempting Physics IB. Engineering students should consult the section of this handbook dealing with the approved programme for the particular branch of Engineering involved.

Physics IA is a rigorous, mathematically based discipline with emphasis on the unifying principles which link together different areas of the subject. Lectures will cover mechanics, oscillations and waves, electrostatics, current electricity and electromagnetism, thermal physics, geometrical and physical optics, and quantum physics. The treatment throughout will assume some knowledge of calculus.

Texts

Refer to Physics Department noticeboard.

741300 PHYSICS IB  
4 units: weighting = 1

Prerequisite

Nil.

Hours

3 lecture hours and 3 hours laboratory and tutorial per week.
Examination
One paper mid-year, one paper at the end of the year together with laboratory and tutorial assessment.

Content
For students who in general do not intend to proceed with further studies in Physics. The coverage of the subject will be somewhat broader than in Physics IA, but the treatment will involve a slightly lower level of mathematics.

Text
Weidner, R.T. *Physics* (Allyn and Bacon)

742101 PH221 ELECTROMAGNETICS AND QUANTUM MECHANICS 2 units: weighting = 2

Prerequisites
Mathematics IA, Physics IA, or normally a credit pass in IB.

Hours
45 lecture hours and 45 laboratory hours.

Examination
3 hours.

Content
This subject is intended for students in Electrical Engineering. The content covers topics in 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
Texts will be listed on the Physics Department noticeboard.

Approved Elective Subjects

All undergraduate engineering programmes include Elective units which may be selected in accordance with specific requirements. The Elective Requirements of each programme are set out following the Approved Programme and students should consult these requirements before selecting their elective subjects.

Subject to the Elective Requirements of the relevant course, Elective units may be selected from:
- Subjects offered by Departments of the Faculty of Engineering;
- Subjects offered by Departments outside the Faculty which are core subjects in an Engineering course and are therefore listed in the previous section;
- Subjects included in the list below; and
- Subjects which may be specially approved by Faculty Board on the recommendation of the Head of the responsible Department. The unit value and weighting of any subject so approved will also be determined by Faculty Board.

Full descriptions of the subjects listed below may be found in the relevant Faculty Handbook.

The unit value and weighting of the subjects listed below have been approved by Faculty Board for use in the event that such subjects are approved as Elective subjects in accordance with course Elective Requirements.

<table>
<thead>
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<th>Subject</th>
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<td>301100 Sociology I Sociology 4 1</td>
<td>664407 EM4 Advanced Operating System Principles 1 4</td>
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<td>751100 Psychology I</td>
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<td>ECONOMICS AND COMMERCE</td>
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<td>411100 Accounting I Commerce 4 1</td>
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<td>440126 CS Commercial Programming Management 1 3</td>
<td>664414 EM4 Astrophysical Applications of Magnetohydrodynamics 1 4</td>
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<td>421100 Economics I Economics 4 1</td>
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<td>421105 Economic History I Economics 4 1</td>
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<td>451100 Legal Studies I Law 4 1</td>
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<td>664194 EM4 Concurrency, Complexity and VSLI 1 4</td>
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<td>Notes: The descriptions of EM subjects offered by the Departments of Computer Science, Mathematics and Statistics correspond to the descriptions of the topic of the same name and level which may be found in the Faculty of Mathematics Handbook. For example: the content of EM2A Mathematical Model is identical to the content of Mathematics II, Topic A Mathematical Models.</td>
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<td>662105 EM2A Mathematical Models 1 2</td>
<td>664418 EM4 Demography and Survival Analysis 1 4</td>
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<td>662207 EM2K Topic in Pure Mathematics e.g. Group Theory 2 2</td>
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<td>662308 EM2L Analysis of Metric Spaces 1 2</td>
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<td>662317 EM2RP Random Processes and Simulation 1 2</td>
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<td>663135 EM3M General Tensors and Relativity 1 3</td>
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<td>663131 EM3N Variational Methods and Integral Equations 1 3</td>
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<td>663149 EM3Y Stochastic Processes 1 3</td>
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</table>
Combined Degree Programmes

About This Section
This section sets out the detailed programmes of combined degree courses which may be taken by students enrolled in the various BE programmes.

Admission to these programmes must be approved by the Dean of the Faculty of Engineering and the Dean of the other faculty concerned. Entry to the courses is normally made after completion of the first year of a BE Approved Programme. Students normally require a Weighted Average Mark (WAM) of at least 70 before permission will be given to enter a combined degree programme. Combined degree programmes are taken on a full-time basis.

ENTRY TO COMBINED DEGREE PROGRAMMES
Students wishing to enter a combined degree programme must apply for entry after completion of the first year of the Approved Programme of their BE course. Applications are made by submitting an Application for Course Transfer form attached to the Application for Re-enrolment form. The forms must be lodged at the Student Administration Office in the McMullin Building by the due date for return of the latter form.
Bachelor of Engineering in Chemical Engineering

The following combined courses leading to the degrees of Bachelor of Engineering (BE) in the specialty of Chemical Engineering, and the degree of Bachelor of Arts (BA), Bachelor of Commerce (BCom), Bachelor of Economics (BEC), Bachelor of Mathematics (BMath) or Bachelor of Science (BSc) are to be submitted to the relevant Faculty Boards.

Year I

Identical to Year I of the Approved Programme for the B.E. in Chemical Engineering, except that students contemplating enrolment in the BMath/BE and BSc/BE combined degrees programmes should include Physics IA in their first year programme rather than taking Physics IB.

<table>
<thead>
<tr>
<th>Bachelor of Arts</th>
<th>Bachelor of Commerce</th>
<th>Bachelor of Economics</th>
<th>Bachelor of Mathematics</th>
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<td>Chemistry II</td>
<td>Mathematics II A</td>
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<td>Economics I</td>
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<td>Mathematics IA</td>
<td>CHE343</td>
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Bachelor of Engineering in Civil Engineering

The following combined courses leading to the degrees of Bachelor of Engineering (BE) in the specialty of Civil Engineering, and the degree of Bachelor of Arts (BA), Bachelor of Mathematics (BMath) or Bachelor of Science (BSc) are to be submitted to the relevant Faculty Boards.

Combined courses leading to the degrees of Bachelor of Engineering (BE) in the specialty of Civil Engineering, and the degree of Bachelor of Commerce (BCom) or Bachelor of Economics (BEC) may be submitted to the relevant Faculty Boards for approval but will require 6 years full-time study for completion. Prospective students may prefer to consider a first degree in the specialty of Civil Engineering followed by a course leading to the award of Master of Business Administration (MBA).

Year I

Identical to Year I of the Approved Programme for the B.E. in Civil Engineering, except that Physics IA is recommended in place of Physics for the BMath/BE and BSc/BE combined degrees.

<table>
<thead>
<tr>
<th>Bachelor of Arts</th>
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<td>Bachelor of Engineering</td>
<td>Bachelor of Engineering</td>
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<td>Chemistry II</td>
<td>Mathematics II A</td>
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<td>Year III</td>
<td>Arts Subject - Part I</td>
<td>Mathematics II C</td>
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</table>

15
Bachelor of Engineering in Computer Engineering

The Bachelor of Engineering programme in Computer Engineering may be combined with studies leading to the award of the degrees of Bachelor of Arts (BA), Bachelor of Commerce (BCom), Bachelor of Economics (BEC), Bachelor of Mathematics (BMath) or Bachelor of Science (BSc). Two of these combined programmes may be taken over 5 years full-time. They are a combined BE/BMath and BE/BSc programme majoring in Physics. These programmes are listed below. Enquiries regarding other combined degree programmes may, in the first instance, be directed to the Faculty Secretary.

Year I
Identical to Year I of the Approved Programme for the B.E. in Computer Engineering.
Bachelor of Engineering in Electrical Engineering

The Bachelor of Engineering programme in Electrical Engineering may be combined with studies leading to the award of the degrees of Bachelor of Arts (BA), Bachelor of Commerce (BCom), Bachelor of Economics (BEc), Bachelor of Mathematics (BMath) or Bachelor of Science (BSc). These courses are to be submitted to the relevant Faculty Boards.

Two of these combined programmes may be taken over 5 years full-time. They are a combined BE/BMath and BE/BSc programme majoring in Physics. These programmes are listed below. Enquiries regarding other combined degree programmes may, in the first instance, be directed to the Faculty Secretary.

Year I

Identical to Year I of the Approved Programme for the B.E. in Electrical Engineering.

<table>
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<th>Bachelor of Science (Physics Major)</th>
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Bachelor of Engineering in Industrial Engineering

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Year I

Identical to Year I of the Approved Programme for the B.E. in Civil Engineering, except that Physics IA is recommended in place of Physics IB for the BMath/BE and BSc/BE combined degrees.

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**Bachelor of Engineering in Mechanical Engineering**

The following combined courses leading to the degrees of Bachelor of Engineering (BE) in the specialty of Mechanical Engineering, and the degree of Bachelor of Arts (BA), Bachelor of Commerce (BCom), Bachelor of Economics (BEc), Bachelor of Mathematics (BMath) or Bachelor of Science (BSc) are to be submitted to the relevant Faculty Boards.

**Year I**

Identical to Year I of the Approved Programme for the B.E. in Industrial Engineering, except that Physics IA is recommended in place of Physics IB for the BMath/BE and BSc/BE combined degrees.

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**Section 8**

**Subject Computer Numbers**

This section sets out the Computer Numbers for use by students when enrolling, re-enrolling or varying their enrolment. The computer numbers are the six-digit numbers (e.g. 541104) adjacent to the subject title. They should not be confused with the subject number (e.g. ME11) which is used for identification and should be used when referring to engineering subjects.

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**Table Notes:**
- Bachelor of Arts
- Bachelor of Commerce
- Bachelor of Economics
- Bachelor of Mathematics
- Bachelor of Science
The following subject computer numbers are presented as an aid in the completion of enrolment and variation of programme forms. They are set out in the following course order:

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<td>B.E. in Civil Engineering</td>
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<tr>
<td>B.E. in Electrical and Computer Engineering</td>
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**B.E. IN CHEMICAL ENGINEERING**

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### Computer Number SUBJECT NAME

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- 513199 CHE342 Process Analysis II
- 513238 CHE343 Process Analysis II
- 513226 CHE351 Equipment Design
- 513227 CHE352 Process Engineering
- 513228 CHE353 Process Economics
- 513229 CHE354 Electrochemistry and Corrosion
- 513239 CHE355 Transfer Processes II
- 513231 CHE362 Solid Handling and Minerals Processing
- 513240 CHE363 Separation Processes
- 513232 CHE371 Kinetics and Thermodynamics
- 513233 CHE372 Fuel Technology I
- 513234 CHE373 Power Heat Transfer
- 513241 CHE374 Theory of Metallurgical Processes
- 513242 CHE383 Modelling of Processes
- 513226 CHE391 Laboratory
- 513243 CHE392 Extractive Metallurgy Laboratory

#### Fourth Year Subjects
- 514153 CHE400 Special Topic
- 514146 CHE441 Special Topic — 1 unit
- 514147 CHE442 Special Topic — 2 units
- 514148 CHE443 Special Topic — 3 units
- 514125 CHE452 Process Evaluation and Optimization
- 514126 CHE462 Environmental Control
- 514149 CHE463 Safety and Environment
- 514127 CHE471 Industrial Safety
- 514129 CHE473 Radiant Heat Transfer
- 514130 CHE474 Selected Topics in Heat and Mass Transfer
- 514131 CHE475 Advanced Combustion
- 514132 CHE476 Fluid and Particle Mechanics
- 514133 CHE481 Advanced Computations
- 514135 CHE483 Reaction Engineering
- 514136 CHE484 Advanced Reaction Engineering
- 514137 CHE485 Advanced Process Control
- 514138 CHE486 Process Control
- 514139 CHE490 Design Project
- 514140 CHE492 Research Project
- 514143 CHE493 Design Project
- 514144 CHE494 Laboratory Project
- 514145 CHE495 Design Project
- 514146 CHE496 Research Project
- 514147 CHE497 Design Project
- 514148 CHE497P Design Project

**Industrial Experience Units**
- 511104 CHE502 Industrial Experience
- 511105 CHE503 Industrial Experience
- 511106 CHE504 Industrial Experience
- 511107 CHE505 Industrial Experience
### B.E. IN CIVIL ENGINEERING

#### First Year Subjects
- CS1011 Mechanics and Structures
- CS1010 Civil Engineering Practice
- CS1013 Engineering Surveying I
- CS1014 Introduction to Electrical Engineering
- CS1015 Introduction to Engineering
- CS1016 Introduction to Materials Science
- CS1017 Computer Graphics
- CS1018 Mathematics I
- CS1019 Physics I

#### Second Year Subjects
- CS2020 Chemistry I
- CS2021 Mechanics of Solids
- CS2022 Civil Engineering Materials
- CS2023 Civil Engineering Geology
- CS2024 Fluid Mechanics I
- CS2025 Fluid Mechanics II
- CS2026 GE111 Theory and Applications of Electrical Energy Conversion
- CS2027 GE204 Engineering Computations I
- CS2028 GE205 Engineering Computations II
- CS2029 EM200 Vector Calculus and Differential Equations

#### Third Year Subjects
- CS3030 Theory of Structures II
- CS3031 Structural Engineering
- CS3032 Stress Analysis
- CS3033 Soil Mechanics
- CS3034 Concrete and Metals Technology
- CS3035 Fluid Mechanics III
- CS3036 Open Channel Hydraulics
- CS3037 Hydrology
- CS3038 Civil Engineering Systems
- CS3039 Transportation Engineering
- CS3040 Statistical Methods
- CS3041 GE301 Technology and Human Values I

#### Fourth Year Subjects
- CS4043 Masonry and Timber Design
- CS4044 Structural Analysis II
- CS4045 Theory of Structures III
- CS4046 Masonry and Timber Design
- CS4047 Dynamics and Stability of Structures
- CS4048 Geotechnical Engineering
- CS4049 Rock Mechanics
- CS4050 Geodesy
- CS4051 Civil Engineering Surveying
- CS4052 Civil Engineering Construction
- CS4053 Engineering Design
- CS4054 Civil Engineering Design
- CS4055 Project
- CS4056 Project
- CS4057 Engineering Surveying II
- CS4058 Highway Engineering
- CS4059 Finite Element Methods
- CS4060 Special Topics
- CS4061 Special Topics

### B.E. IN ELECTRICAL AND COMPUTER ENGINEERING

#### First Year Subjects
- CS1010 Mathematics I
- CS1011 Mechanics of Solids
- CS1012 Civil Engineering Materials
- CS1013 Civil Engineering Geology
- CS1014 Fluid Mechanics I
- CS1015 Fluid Mechanics II
- CS1016 GE111 Theory and Applications of Electrical Energy Conversion
- CS1017 GE204 Engineering Computations I
- CS1018 GE205 Engineering Computations II
- CS1019 EM200 Vector Calculus and Differential Equations

#### Second Year Subjects
- CS2020 Chemistry I
- CS2021 Mechanics of Solids
- CS2022 Civil Engineering Materials
- CS2023 Civil Engineering Geology
- CS2024 Fluid Mechanics I
- CS2025 Fluid Mechanics II
- CS2026 GE111 Theory and Applications of Electrical Energy Conversion
- CS2027 GE204 Engineering Computations I
- CS2028 GE205 Engineering Computations II
- CS2029 EM200 Vector Calculus and Differential Equations

#### Third Year Subjects
- CS3030 Theory of Structures II
- CS3031 Structural Engineering
- CS3032 Stress Analysis
- CS3033 Soil Mechanics
- CS3034 Concrete and Metals Technology
- CS3035 Fluid Mechanics III
- CS3036 Open Channel Hydraulics
- CS3037 Hydrology
- CS3038 Civil Engineering Systems
- CS3039 Transportation Engineering
- CS3040 Statistical Methods
- CS3041 GE301 Technology and Human Values I

#### Fourth Year Subjects
- CS4043 Masonry and Timber Design
- CS4044 Structural Analysis II
- CS4045 Theory of Structures III
- CS4046 Masonry and Timber Design
- CS4047 Dynamics and Stability of Structures
- CS4048 Geotechnical Engineering
- CS4049 Rock Mechanics
- CS4050 Geodesy
- CS4051 Civil Engineering Surveying
- CS4052 Civil Engineering Construction
- CS4053 Engineering Design
- CS4054 Civil Engineering Design
- CS4055 Project
- CS4056 Project
- CS4057 Engineering Surveying II
- CS4058 Highway Engineering
- CS4059 Finite Element Methods
- CS4060 Special Topics
- CS4061 Special Topics
### B.E. IN MECHANICAL AND INDUSTRIAL ENGINEERING

#### First Year Subjects
- 531103 GE101 Mechanics and Structures
- 531206 EE100 Electrical and Computer Engineering I
- 531202 EE130 Introduction to Electrical Engineering
- 531208 EE131T Circuit Fundamentals
- 531207 EE161T Introduction to Computer Technology
- 531201 GE101 Introduction to Materials Science
- 531205 ME111 Graphics
- 661100 Mathematics I
- 741200 Physics 1A
- 741300 Physics 1B

#### Second Year Subjects
- 662112 EM2AS Applied Statistics
- 502001 GE204 Engineering Computations I
- 502003 GE205 Engineering Computations II
- 632100 Mat211 Selection and Use of Materials
- 542210 ME210 Engineering Design I
- 542208 ME212 Engineering Design II
- 542105 ME214 Mechanics of Solids I
- 542213 ME215 Mechanical Engineering Design I
- 542214 ME216 Dynamics
- 542305 ME222 Dynamics of Machines I
- 542210 ME251 Fluid Mechanics I
- 542205 ME271 Thermodynamics I
- 662110 EM2CO Vector Calculus and Differential Equations
- 662111 EM2BD Complex Analysis and Linear Algebra

#### Industrial Experience Units
- 531302 EE092 Industrial Experience
- 531303 EE093 Industrial Experience
- 531304 EE094 Industrial Experience
- 531305 EE095 Industrial Experience
- 531306 EE096 Industrial Experience
- 531307 EE097 Industrial Experience II

#### Third and Fourth Year Subjects
- 530205 GE211 Theory and Applications of Electrical Energy Conversion
- 662112 EM2AS Applied Statistics
- 502001 GE301 Technology and Human Values I
- 502002 GE302 Technology and Human Values II
- 530203 GE325 Microprocessor Systems and Applications
- 530206 GE361 Automatic Control
- 531100 ME311 Solution and Use of Materials II
- 542112 ME316 Mechanical Engineering Design II
- 543112 ME313 Dynamics of Machines
- 543115 ME314 Mechanics of Solids II
- 543110 ME315 Fluid Mechanics II
- 543114 ME313 Fluid Mechanics and Heat Transfer
- 543202 ME372 Heat Transfer
- 543111 ME373 Thermodynamics II
- 543501 ME381 Methods Engineering
- 543502 ME383 Quality Engineering
- 543503 ME384 Design for Production
- 504104 GE471 Energy
- 504102 GE472 Energy
- 544481 ME405 Advanced Numerical Programming
- 544453 ME407 Environmental Engineering
- 544424 ME409 Introduction to Noise Pollution Control
- 544426 ME410 Advanced Design Concepts I
- 544106 ME413 Mechanical Engineering Design III
- 544107 ME414A Computer Aided Design and Manufacturing
- 544506 ME415 Computer Aided Design and Manufacturing
- 544469 ME419 Bulk Materials Handling Systems I
- 544472 ME420 Bulk Materials Handling Systems II
- 544474 ME421 Conveying of Bulk Solids
- 544475 ME445 Mechanics of Solids III
- 544477 ME473 Thermodynamics III
- 544478 ME474 Heat Transfer III
- 544103 ME481 Engineering Administration
- 544433 ME482 Engineering Economics I
- 544470 ME483 Production Scheduling
- 544484 ME484 Engineering Economics II
- 544487 ME487 Operations Research — Fundamental Techniques
- 544468 ME488 Operations Research — Planning, Inventory, and Management
- 544203 ME496 Project/Directed Reading
- 544479 ME497 Project/Directed Reading
- 544489 ME498 Project/Directed Reading

#### Industrial Experience Units
- 541302 ME592 Industrial Experience
- 541303 ME593 Industrial Experience
- 541304 ME594 Industrial Experience
- 541307 ME599 Industrial Experience
- 541308 ME599 Industrial Experience
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**Second Year Subjects**

| 662110 | EM2CO Vector Calculus and Differential Equations |
| 662111 | EM2BD Complex Analysis and Linear Algebra |
| 502003 | GE206 Computational Methods I |
| 502004 | GE207 Computational Methods II |
| 112214 | Met214 Theory of Metallurgical Processes I |
| 112241 | MeQ41 Microplasticity |
| 112251 | MeQ51 Metallography |
| 112261 | MeQ61 Extraction Metallurgy |
| 112271 | MeQ71 Fabrication Metallurgy |

**Third Year Subjects**

| 513228 | ChE353 Process Economics |
| 513301 | Met301 Communication Skills |
| 513321 | Met311 Statistical Design and Optimisation of Metallurgical Processes |
| 513391 | Met312 Modelling and Control of Metallurgical Processes |
| 513395 | Met314 Theory of Metallurgical Processes II |
| 513325 | Met322 Electrochemistry, Corrosion and Hydrometallurgy |
| 513353 | Met323 Solidification Processes |
| 513350 | Met354 Quantitative Metallurgy |
| 513355 | Met355 Physical Metallurgy |
| 513356 | Met356 Metallurgical Techniques |
| 513364 | Met364 Refractories |
| 513397 | Met373 Polymer Processing |
| 513374 | Met374 Welding and Non-Destructive Testing |
| 513375 | Met375 Industrial Metallurgy |
| 513391 | MeQ91 Physical Metallurgy Laboratory |
| 513392 | MeQ92 Chemical Metallurgy Laboratory |
| 513367 | MeQ925 Furnace Heat Balance |

**Fourth Year Subjects**

| 114403 | Met401 Directed Reading |
| 114406 | Met402 Metallurgy Seminar |
| 114438 | Met411A Metallurgical Computations |
| 114437 | Met411B Metallurgical Computations |
| 114414 | Met414 Theory of Metallurgical Processes III |
| 114458 | Met451 Structure of Real Crystals |
| 114452 | Met452 Physical Metallurgy |
| 114453 | Met453 Metallurgy |
| 114451 | Met451 Dislocation Theory |
| 114482 | Met452 Metal Physics |
| 114490 | Met490 Design Project |
| 114483 | Met491 Laboratory Project |

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**B.SURV.**

**First Year Subjects**

| 421100 | Economics I |
| 661100 | Mathematics I |
| 741200 | Physics IA |
| 741200 | Physics II |
| 521110 | SV111 Surveying I |
| 521111 | SV121 Survey Camp I |

**Second Year Subjects**

| 662112 | EM2AS Applied Statistics |
| 662110 | EM2CO Vector Calculus and Differential Equations |
| 732900 | GE206 Computational Methods I |
| 522411 | SV213 Surveying II |
| 522405 | SV222 Survey Camp II |
| 522407 | SV232 Survey Computations I |
| 522409 | SV233 Survey Computations II |
| 522410 | SV271 Basic Regional and Urban Economics |
| 452100 | SV291 Introduction to Legal Studies |
| 452110 | SV292 Property and Survey Law |

**Third Year Subjects**

| 352200 | Geography II |
| 53333 | CE302 Civil Engineering IIS |
| 523305 | SV313 Surveying III |
| 522310 | SV214 Hydrographic Surveying |
| 522325 | SV334 Survey Computations III |
| 522328 | SV351 Geodesy I |
| 522329 | SV361 Photogrammetry I |
| 523331 | SV393 Land Bounded Definition |

**Fourth Year Subjects**

| 523108 | CE372 Transportation Engineering |
| 524124 | SV416 Surveying IV |
| 524143 | SV441 Astronomy |
| 524128 | SV452 Geodesy II |
| 524130 | SV462 Photogrammetry II |
| 524140 | SV465 Advanced Cartography |
| 524135 | SV472 Land Valuation |
| 524136 | SV473 Town Planning |
| 524141 | SV475 Survey Management and Planning |
| 524133 | SV481 Project |
| 525142 | SV582 Project |
### M.Eng.Sc. SUBJECTS

#### DEPARTMENT OF ELECTRICAL ENGINEERING

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<td>530148</td>
<td>EESI25 Microprogrammed and Microprocessor Systems</td>
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<td>EE366 Automated Theory</td>
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### INTER-DEPARTMENTAL SUBJECTS

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### DEPARTMENT OF MECHANICAL ENGINEERING

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DEGREE REGULATIONS

FACULTY POLICIES

UNDERGRADUATE COURSES

Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Industrial Engineering
Mechanical Engineering
Surveying

SUBJECT DESCRIPTIONS

Chemical Engineering (ChE)
Civil Engineering (CE)
Electrical and Computer Engineering (EE)
General Engineering (GE)
Materials Engineering (Mat)
Mechanical Engineering (ME)
Surveying (SV)
Core Subjects — Non-Engineering

ELECTIVE SUBJECT LIST

COMBINED DEGREE PROGRAMMES

SUBJECT COMPUTER NUMBERS