FACULTY OF ENGINEERING

HANDBOOK 1965

THE UNIVERSITY OF NEW SOUTH WALES

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HANDBOOK
1965

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Calendar of Dates

1965

First Term	March 1st to May 15th.
Second Term	May 31st to August 7th.
Third Term	August 30th to October 30th.
Annual Examinations (24-week courses)	September 18th to October 2nd.
Annual Examinations (30-week courses)	November 6th to 27th.

January —

Monday	25	Deferred examinations begin — all courses.
Wednesday	27	Last day for acceptance of applications to enrol by new students and students repeating First Year.

February —

Saturday	6	Deferred examinations end.
Monday	15	Enrolment week begins for new First Year students.
Monday	22	Enrolment week begins for students re-enrolling.

March —

Monday	1	First term lectures begin.
Friday	26	Conferring of Degrees — Newcastle University College.
Wednesday	31	Last day for acceptance of enrolments.

April —

Friday	2	Conferring of Degrees — Wollongong University College.
Friday Monday	16 to 19	Easter Holidays.
Monday	26	Anzac Day — Public Holiday.
Thursday	29	Conferring of Degrees — School of Mechanical Engineering.

May —

Wednesday	5	Conferring of Degrees — Faculty of Engineering (except School of Mechanical Engineering).
Saturday	15	First term ends.
Monday	31	Second term begins.

June —

Monday	14	Queen's Birthday — Public Holiday.
Wednesday	30	Last day for acceptance of applications for examinations — 24-week courses.
		Last day for acceptance of applications for readmission after exclusion under rules governing re-enrolment.

August —

Friday	6	Last day for acceptance of applications for examinations — 30-week courses.
Saturday	7	Second term ends.
Monday	30	Third term begins.

September —

Saturday	18	Annual examinations begin — 24-week courses.

October —

Saturday	2	Annual examinations end — 24-week courses.
Monday	4	Six Hour Day—Public Holiday. One- and two-week survey camps begin.
Friday	8	One-week survey camp ends.
Monday	11	Industrial training begins for students attending one-week survey camp.
Friday	15	Two-week survey camp ends.
Monday	18	Industrial training begins for students attending two-week survey camp.
Saturday	30	Third term lectures cease.

November —

Saturday	6	Annual examinations begin — 30-week courses.
Saturday	27	Annual examinations end — 30-week courses.

1966

January —

Monday Saturday	24 to 5 February	Deferred examinations (all courses).

February —

Monday	21	Enrolment week begins for new First Year students.
Monday	28	Enrolment week begins for students re-enrolling.

March —

Monday	7	First term lectures begin.

Faculty of Engineering

Dean

Professor A. H. Willis

Chairman

Professor C. H. Munro

SCHOOL OF CIVIL ENGINEERING

School of Civil Engineering Advisory Committee

Chairman

Professor A. H. WILLIS, Dean of the Faculty of Engineering.

Professor of Civil Engineering and Head of Department of Water Engineering

C. H. MUNRO, B.E. (Syd.), F.R.S.H., F.R.S.A., M.I.E.Aust., M.ASCE., M.I.W.E.

Professor of Civil Engineering and Head of Department of Structural Engineering

F. S. SHAW, B.E. (W. Aust.), B.Sc. (Oxon.), D.Eng. (Melb.), A.M.I.E.Aust.

Professor of Surveying and Head of the Department of Surveying

P. V. ANGUS-LEPPAN, B.Sc. (Eng.) (Rand), Ph.D., Dip.T.P. (Natal), M.I.L.S. (Natal), L.S.A.

Executive Assistant to the Dean: I. J. SOMERVAILLE, B.E., A.S.T.C., A.M.I.E.Aust.

Department of Water Engineering

(including Civil Engineering Practice, Public Health Engineering, Soil Mechanics, and the Water Research Laboratory)

Associate Professor

P. W. S. RYAN, M.E., A.S.T.C., D.I.C., M.I.E.Aust.

Senior Lecturers

D. N. FOSTER, B.E. (Syd.).
R. T. HATTERSLEY, M.E., A.S.T.C., A.M.I.E.Aust.
D. T. HOWELL, B.E. (Syd.), M.E.
G. C. Y. HU, B.Sc. (Canton), M.Sc., Ph.D. (Birm.), Dip.T.P. (Lond.), A.M.T.P.I., A.M.I.Mun.E.
E. M. LAURENSON, B.E., Ph.D., A.M.I.E.Aust.
J. R. LEARMONTH, B.E. (Syd.), M.E.
A. F. S. NETTLETON, B.Sc., B.E. (Syd.), M.E., D.I.C., A.M.I.E.Aust.
L. V. O'NEILL, B.E. (Syd.), A.M.I.E.Aust.
D. H. PILGRIM, B.E., A.M.I.E.Aust.
K. K. WATSON, B.E. (Syd.), M.E., A.M.I.E.Aust.
C. J. WIESNER, B.Sc. (Adel.), F.R.Met.S.
I. R. WOOD, B.E. (N.Z.), M.E.

Lecturers

J. B. CLAMPETT, B.E. (Syd.).
A. G. DOUGLAS, M.E., A.M.I.E.Aust.
C. R. DUDGEON, B.E.
T. R. FIETZ, B.E., A.M.I.E.Aust.
G. S. HARRIS, M.E. (N.Z.), A.M.N.Z.I.E.

Teaching Fellow

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Department of Structural Engineering

(including Materials and Applied Mechanics and Concrete Technology)

Associate Professor

A. S. HALL, B.Sc. (Eng.) (Lond.), D.I.C., A.M.I.E.Aust., M.ASCE.

Associate Professor

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Senior Lecturers

F. E. ARCHER, B.Sc., B.E. (Syd.), A.M.I.E.Aust.
P. S. BALINT, Dipl.Eng. (Bud.), M.E., A.M.I.E.Aust.
H. J. BRETTLE, B.E. (Syd.), Ph.D., A.S.T.C., D.I.C., M.I.E.Aust.
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E. M. KITCHEN, B.E. (Syd.).
R. F. WARNER, Ph.D. (Lehigh), M.E., A.M.I.E.Aust.
G. B. WELCH, B.E. (Syd.), M.E., A.M.I.E.Aust.
R. W. WOODHEAD, B.E. (Syd.), M.E., M.ASCE.

Lecturers

L. CRIDLAND, B.E., A.S.T.C.
L. E. EDWARDS, B.C.E. (Melb.), B.Ec. (Syd.), A.R.M.T.C., A.M.I.E.Aust.
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I. J. SOMERVAILLE, B.E., A.S.T.C., A.M.I.E.Aust.

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G. A. NARAYANA, B.E. (Mysore).
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Senior Lecturers

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L. EEKHOUT, B.Sc. (Eng.) (Rand), B.Sc.Phot.Eng. (I.T.C., Delft).
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D. J. S. MUDGE, B.Sc.(Lond.), Wh.Sc., G.M.I.Mech.E.
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Q. B. CHOU, B.E. (Shanghai).
C. T. HUEY, B.Sc. (Lond.), M.Sc. (Hong Kong).

Department of Industrial Engineering

Associate Professor of Industrial Engineering

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Senior Lecturers

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Lecturers

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R. A. WILLIAMS, B.E., A.S.T.C., A.M.I.E.Aust.

SCHOOL OF NUCLEAR ENGINEERING

Professor of Nuclear Engineering and Head of School

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Senior Lecturer

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Lecturer

O. O. C. A. BILS, Dipl.Ing. (Berl.).

Teaching Fellow

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SCHOOL OF TRAFFIC ENGINEERING

Professor of Traffic Engineering and Head of School

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Senior Lecturers

R. D. MUNRO, B.Sc. (W. Aust.), B.A. (Melb.).
H. J. A. TURNER, B.Sc. (Lond.), M.E., A.R.C.S., A.M.I.E.E.

Lecturer

J. I. TINDALL, B.E. (Qld.).

General Information

LOCATIONS OF SCHOOLS AND LABORATORIES OF THE FACULTY OF ENGINEERING

The Schools and Laboratories of the Faculty of Engineering, the servicing schools and the administrative divisions are located as follows:

(i) **Kensington**
The Schools of Electrical and Mechanical Engineering and the Department of Industrial Engineering; the School of Nuclear Engineering; the servicing Schools of Physics, Architecture, Mathematics, Mining Engineering, Applied Geology, Metallurgy, Chemistry and Biological Sciences; the Department of General Studies, which provides the Humanities and Social Science subjects for engineering students.

In addition to the teaching schools, there are at Kensington the Library, the Examinations Branch, the Admissions Office, the Union, the Students' Union, the Student Amenities Office and the Student Counselling Service.

(ii) **Broadway**
The School of Civil Engineering, including the Department of Surveying, and the Broadway branch of the library. Also located there is the Broadway branch of the Students' Amenities Office.

(iii) **Randwick**
The Schools of Highway and Traffic Engineering occupy new buildings on the site of the old Tramway Depot at King Street, Randwick.

(iv) **Manly Vale**
The Water Research Laboratory of the School of Civil Engineering.

THE ACADEMIC YEAR

The Academic Year is divided into three terms of eleven, ten and nine weeks. The first term normally commences on the first Monday in March. There is a two-week vacation between first and second terms, and a three-week vacation between second and third terms. In certain years of full-time engineering courses, lectures cease in the third week of the third term and examinations for these years are conducted in the fourth and fifth weeks of third term. Where lectures extend over the full three terms the examinations are conducted over a three-week period, which commences one week after the end of lectures.

UNDERGRADUATE COURSES

The Faculty of Engineering consists of the Schools of Civil Engineering, including the Department of Surveying, of Electrical Engineering, and Mechanical Engineering with its associated Department of Industrial Engineering, and the Schools of Highway Engineering, Nuclear Engineering, and Traffic Engineering, the three last named Schools offering graduate courses only. The Schools of Civil, Electrical and Mechanical Engineering offer full-time courses leading to the degrees of Bachelor of Engineering and Bachelor of Surveying, and part-time courses leading to the degrees of Bachelor of Science (Technology) and Bachelor of Surveying.

Full-time Courses

Full-time courses of four-years' duration are offered in Civil, Electrical, Mechanical and Industrial Engineering leading to the degree of Bachelor of Engineering (pass or honours). Candidates for honours take additional work in the third and fourth years. A four-year full-time course in Surveying is offered by the School of Civil Engineering leading to the degree of Bachelor of Surveying at pass and honours levels. Candidates for honours in Surveying take additional work in fourth year.

Common first year: There is a common first year syllabus in Physics, Mathematics, Chemistry and Engineering for all courses in the Faculty, making it possible for students to transfer from one course to another at the end of their first year without loss of standing. This first year is also equivalent to the first two stages of the part-time Engineering courses which lead to the degree of Bachelor of Science (Technology). Transfer to certain courses in the Faculties of Science and Applied Science without loss of standing is also possible at the end of the first year.

Rules relating to the operation of these common first year subjects in the Faculties of Engineering, Science, Medicine and Applied Science are set out later in this handbook.

Conditions for award of degrees of B.Sc. and B.E.: Subject to their being recommended by the Dean of the Faculty of Engineering and accepted by the Dean of the Faculty of Science, students in the Civil, Electrical, Mechanical and Industrial Engineering full-time courses may qualify for the two degrees of B.Sc. and B.E. by completing a course of five years of full-time study in accordance with the following provisions:—

A student shall have attended the prescribed course of study and satisfied the examiners in

(i) the first year of the course of the Faculty of Engineering;

(ii) the second year of the courses for the degree of Bachelor of Engineering in Civil, Electrical, Mechanical or Industrial Engineering, provided that students in Civil, Mechanical or Industrial Engineering shall have taken the Mathematics and Physics subjects prescribed for second year of the Electrical Engineering course;

(iii) two Group III Science subjects, together with the appropriate Humanities (see Science Course Regulations set out in the University Calendar);

(iv) the third and fourth years of the courses for the degree of Bachelor of Engineering in Civil, Electrical, Mechanical or Industrial Engineering.

The degree of B.Sc. may be awarded on the completion of the requirements of (i), (ii) and (iii) above.

Introduction of revised courses and consequent exemptions: The introduction of common first year subjects in 1961 led to the extensive revision of existing full-time engineering courses and the course outlines set out later in this section incorporate these revisions. In 1961 the first three years of these revised courses were introduced in the Schools of Civil and Mechanical Engineering and the first two years in the School of Electrical Engineering. All years of the new courses are now being offered in all Schools.

The following exemptions in humanities subjects apply to students who have completed part of the superseded engineering courses:

(i) Students who have completed years 1 and 2 of the superseded B.E. course, which included G10 English and G20 History, will be exempted from 50.011H English included in the second year and 51.011H History and 52.011H Philosophy included as alternatives in the third year of the new courses outlined below.

(ii) Students who have completed year 1 of the superseded B.E. course which included G10 English will be exempted from 50.011H English in the second year of the new courses set out below.

Industrial training requirements: All full-time engineering courses incorporate periods of industrial training. In all of these courses, except Electrical Engineering, the periods occupy the latter half of the third term and the long vacations between second and third years, and between third and fourth years. In the second and third years of these courses, students finish lectures at the end of the third week of the third term, take their examinations in the fourth and fifth weeks, attend the survey camp (where required) in the sixth week (surveying students in their sixth and seventh weeks) and then commence their industrial training. In Electrical

Engineering students must complete up to twenty weeks of industrial training during the long vacations, preferably by completing ten weeks at the end of second year and ten weeks at the end of third year. Students are strongly recommended to gain further industrial experience in those long vacations where such training is not already prescribed.

The staff of the University will assist students to obtain this employment either as sponsored students or as trainees employed on a temporary basis. Private students (i.e., those not already committed to an employer under the terms of a scholarship or bond) may make their own arrangements for industrial training, but the employment and training must be of a standard approved by the University.

Part-time Courses

Since 1961 the Schools of the Faculty have offered six-year part-time courses in a variety of engineering fields leading to the degree of Bachelor of Science (Technology). Courses for this degree are offered in Civil, Electrical, Industrial and Mechanical Engineering and in Naval Architecture and Aeronautical Engineering (these last two being offered by the School of Mechanical Engineering).

The award of the degree of B.Sc. (Tech.) is recognised by the Institution of Engineers, Australia, as giving complete exemption from the examinations required for admission to the grade of Associate Member.

These new courses replace the courses which the University has offered since 1951 on behalf of the Department of Technical Education leading to its A.S.T.C. diploma award. They also replace the associated part-time degree courses in Engineering which have led to the degree of Bachelor of Engineering.

Students who have elected to continue in the diploma course and subsequently complete the requirements within the period allowed (see below), or those who have been awarded the A.S.T.C. diploma, may be given advanced standing in a course leading to the B.Sc. (Tech.) or to the B.E. degree. Permission to meet the requirements of either degree by further study should be obtained from the Head of the appropriate School.

Any student continuing in a part-time B.E. or Diploma course who fails to maintain normal progress will be required to transfer to the appropriate B.Sc. (Tech.) course with advanced standing. For a student to make "normal progress" he shall have completed:

(i) all subjects up to and including Stage I by the end of 1961;

(ii) all subjects up to and including Stage II by the end of 1962;

(iii) all subjects up to and including Stage III by the end of 1963;

(iv) all subjects up to and including Stage IV by the end of 1964;

(v) all subjects up to and including Stage V by the end of 1965.

A student completing the B.Sc. (Tech.) degree course and wishing to qualify for the corresponding B.E. degree may, on the recommendation of the Head of the School, transfer to the corresponding full-time B.E. course provided he does not take out the B.Sc. (Tech.) degree. Further, provided he continues as a registered student on transfer from one course to the other, he may retain any concession granted in the B.Sc. (Tech.) degree course.

Holders of the B.Sc. (Tech.) degree are eligible to proceed to the degree of Master of Engineering or Master of Technology subject to the conditions for the award of these degrees set out in Section III of the University Calendar.

Courses leading to the B.Sc. (Tech.) award are basically part-time and require the prescribed industrial experience to be gained concurrently with the course of study (a minimum of three years of suitable engineering experience is required). Students transferring from full-time courses must, therefore, also satisfy these industrial experience requirements before being admitted to the degree of B.Sc. (Tech.).

For students who are able to combine some full-time attendance with part-time attendance, the B.Sc. (Tech.) courses are offered over five years, requiring full-time attendance in the third and fourth years.

The School of Civil Engineering offers a part-time course in Surveying of seven years' duration for the degree of Bachelor of Surveying.

FACULTY OF APPLIED SCIENCE

The Faculty of Applied Science offers courses to students desiring a career in a specialised technology with an engineering element. These courses are as follows:—

	Full-time	*Part-time*
Chemical Engineering	B.E.	B.Sc.(Tech.)
Ceramic Engineering	B.Sc.	,,
Fuel Engineering	B.E.	,,
Metallurgy	B.Sc.	,,
Mining Engineering	B.E	,, (Broken Hill)
Textile Engineering	B.Sc.	—

Entrance to these courses, which are of four years' duration full-time (pass or honours) and six years' duration part-time, is conditional upon Engineering I being taken as the elective subject in the common first year and on transference to the Faculty of Applied Science before second year. Full-time Engineering students may enter the Mining Engineering course after the second year of courses in Mechanical, Electrical or Civil Engineering without loss in standing of subjects completed.

Part-time engineering students may enter the courses offered by the Schools of Chemical Engineering, Chemical Technology and Metallurgy after the second stage part-time or the common full-time first year. They may enter the Mining Engineering course after the fourth stage. In all cases the requirements for the degree of B.Sc. (Tech.) demand three years approved concurrent industrial training.

The degrees of B.E. (pass or honours) in Chemical Engineering and Mining Engineering are recognised by the Institution of Engineers of Australia for exemption from the Associate Membership examinations.

Ceramic Engineering

Ceramics are inorganic, non-metallic materials which usually require the use of high temperatures in their processing. Products of the industry include glass, refractories, bricks, tiles, pipes, abrasives, cement, plaster, nuclear ceramics, whitewares, enamels and electric insulators, dielectrics and magnetic materials. The ceramic engineer is concerned with the relationship between the atomic and crystal structure of materials and their chemical, physical and engineering properties, as well as the methods of their manufacture and fabrication into useful shapes.

Graduates in Ceramic Engineering take positions in the fields of research and development, production control, product evaluation and technical service.

Chemical Engineering

Chemical Engineering is the application of the principles of the physical sciences, together with the principles of economics and human relations to fields in which matter undergoes a change in state, energy content or composition. The chemical engineer is generally responsible for the design, construction and operation of plant and equipment used in the chemical processing industries.

Fuel Engineering

The Department of Fuel Technology, the first of its kind in Australia, was established to meet the growing need of industrial and research establishments for personnel with specialised training in the science and technology of fuels and their utilisation.

A degree in Fuel Engineering qualifies for exemption from the examinations for admission to corporate membership of the Institute of Fuel.

Metallurgy

Metallurgy deals with the nature, production, properties and uses of metals. Its special importance today is associated with the demands for better materials for aircraft, rockets, nuclear reactors and the like.

The School of Metallurgy is located at Kensington and has departments both in Newcastle and Wollongong. It has excellent facilities for teaching and research. Emphasis in these courses is on the application of science to technological problems and in this respect there is a close relationship between metallurgy and engineering.

Information on the Metallurgy courses and on opportunities for post-graduate work for engineering graduates in the School of Metallurgy may be obtained from the University Calendar, or from Professor Hugh Muir at the School of Metallurgy.

Mining Engineering

The aim of the training is to give students a thorough foundation in Mining Engineering and so permit them to enter coal mining, metalliferous mining or the petroleum industry, and to be employed in any of the phases of these industries ranging from exploration to production.

During the undergraduate course, students will spend portion of the long vacations obtaining practical experience in mining. Mining companies prepare programmes so that the students obtain a comprehensive experience in many aspects of the profession. This experience is important and it is related to the academic training received in the School. Practical experience in mining, gained as a student, can contribute to the experience record of mining engineers when making application for a statutory certificate of competency from one of the Australian State Government Departments of Mines.

The School of Mining Engineering offers, at Broken Hill, a part-time course in Mining Engineering leading to the Degree of Bachelor of Science (Technology).

Textile Engineering

The textile industry, being a manufacturing one, depends on many types of machinery and engineering services to produce its products. In order to cope with technological problems in production, quality control and research, a competent textile engineer must have a good understanding of the fundamental sciences and extensive theoretical and practical knowledge of the applied textile and engineering sciences.

There are many challenging and lucrative positions for textile engineers in industry and research.

HIGHER DEGREES AND GRADUATE COURSES

Research Degrees

The higher degrees of Master of Engineering, Master of Surveying, and of Doctor of Philosophy are awarded on the presentation of a thesis, satisfactory to the examiners, which embodies the results of an original investigation or design. Candidates for these degrees must possess a bachelor's degree in an appropriate field and meet the conditions governing the award of these degrees. The full conditions are set out in the University Calendar and in the Handbook of the Graduate School of Engineering.

The degree of Doctor of Science is also awarded for a contribution of distinguished merit in the field of engineering.

Courses of Study for Graduate Awards

In addition to the research degrees listed above, the Faculty offers courses of instruction at the graduate level leading to the award of the degree of Master of Technology or a graduate diploma.

Courses for the Degree of Master of Technology

Structural Engineering, Water Engineering, Public Health Engineering, Engineering Construction, Surveying (offered by the School of Civil Engineering); Electrical Engineering; Traffic Engineering; Highway Engineering; Nuclear Engineering; Refrigeration and Air Conditioning, and Industrial Engineering (offered by the School of Mechanical Engineering).

Courses for Graduate Diplomas

Highway Engineering and Industrial Engineering.

Full details of all these courses are given in the section on postgraduate study in the University Calendar, in the Handbooks of the appropriate Schools, and in the Handbook of the Graduate School of Engineering.

Special Courses

Short, intensive graduate and special courses are provided throughout each year designed to keep practising engineers in touch with the latest developments in their various fields. The programmes of such courses for 1965 are published separately.

REQUIREMENTS FOR ADMISSION

Candidates may qualify for entry to undergraduate courses by complying with the matriculation requirements set out below at the Leaving Certificate Examination held by the Department of Education or the Matriculation Examination conducted by the University of Sydney.

The Leaving Certificate Examination is usually held in November, and entries must be lodged with the Department of Education during August.

The Matriculation Examination is held in February, and applications must be lodged at the University of Sydney during the first ten days of January except by candidates who have taken the Leaving Certificate Examination in the previous November. The closing date for such candidates will be announced when the Leaving Certificate results are published.

Matriculation Requirements

(To operate from 1st January, 1961)

1. (i) A candidate for any first degree of the University must satisfy the conditions for admission set out hereunder before entering upon the prescribed course for a degree. Compliance with these conditions does not in itself entitle a student to enter upon a course.

   (ii) A candidate who has satisfactorily met the conditions for admission and has been accepted by the University shall be classed as a "matriculated student" of the University after enrolment.

   (iii) A person who has satisfactorily met the conditions for admission may on the payment of the prescribed matriculation fee be provided with a statement to that effect.

2. (i) For the purpose of matriculation approved subjects* are grouped as follows:—

   A. English.

   B. Latin, Greek, French, German, Italian, Hebrew, Chinese, Japanese, Russian, Dutch, Geography, Ancient History, Modern History, Economics.

   C. Mathematics I, Mathematics II, Mathematics III.

   D. Agriculture, Applied Mathematics, General Mathematics, Biology, Botany, Chemistry, Physics, Geology, Physics and Chemistry, Physiology, Zoology.

   E. Accountancy, Art, Descriptive Geometry and Drawing, Music, Theory and Practice of Music.

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* It should be noted that certain subjects taken for the Leaving Certificate are not approved subjects for admission to the University of New South Wales.

(ii) In order to satisfy the conditions for admission to undergraduate courses leading to a degree, candidates must pass the New South Wales Leaving Certificate Examination conducted by the Department of Education, or the University of Sydney Matriculation Examination in at least five approved subjects at the one examination; provided that:—

I. either—

(a) the five subjects include English and at least one subject from each of Groups B and C, but do not include more than one subject from Group E, except that candidates may qualify for admission to the Faculty of Arts only, by passing in one subject from Group D in lieu of the subject from Group C;

or—

(b) the five subjects include English, and at least one subject from either Group B or Group C, but do not include more than one subject from Group E, and provided further that the five passes include either one first class Honours and two A's or two Honours of which one is first class;

and—

II. (a) neither Physics nor Chemistry is offered with the combined subject Physics and Chemistry;

(b) neither Botany nor Zoology is offered with Biology;

(c) neither Botany nor Zoology nor Biology is offered with Physiology;

(d) neither Mathematics I nor Mathematics II nor Mathematics III is offered with General Mathematics;

(e) neither Mathematics I nor Mathematics II is offered with Mathematics III;

(f) Mathematics I or Mathematics II may be counted as an approved subject only if the candidate presented himself for examination in both Mathematics I and Mathematics II;

(g) Theory and Practice of Music is accepted only in cases where the pass was obtained at an examination in 1946 or subsequent years;

(h) Ancient History is accepted only in cases where the pass was obtained at an examination held in 1945 or subsequent years; and, further, both Modern History and Ancient History may be offered as qualifying subjects at the examinations held at the end of 1951 and subsequent years;

(i) Agriculture is accepted only in cases where the pass was obtained at an examination held in 1945 or subsequent years;

(j) Economics is accepted only in cases where the pass was obtained at an examination held in 1947 or subsequent years;

(k) Descriptive Geometry and Drawing is accepted only in cases where the pass was obtained at an examination held in 1954 or subsequent years.

(iii) Candidates who have satisfactorily met the matriculation requirements of the University of Sydney, but who have not obtained the requisite pass in Mathematics where prescribed for entrance to the University of New South Wales, will be permitted to complete their qualifications to enter the University of New South Wales by passing only in a Mathematics subject from Group C, at a subsequent Leaving Certificate or University of Sydney Matriculation Examination.

II. Candidates who have presented themselves for the Leaving Certificate Examination or the University of Sydney Matriculation Examination in five or six subjects selected in accordance with the requirements prescribed in I and who have passed in English and a Mathematics and two other of the subjects may be granted admission provided that they have been awarded A passes or passes with Honours in at least three of these four subjects.

The other provisions set out in the new requirements above also apply.

ENROLMENT PROCEDURE FOR UNDERGRADUATE COURSES

The enrolment procedure for the different classes of undergraduate students is as follows:—

First Enrolment — Students seeking to enrol in 1965 with the University for the first time should note the following:—

1. Preliminary applications for enrolment must be made where possible in person to the Student Enrolment Bureau, 1st Floor, Building F, Kensington, as soon as the results of the Leaving Certificate Examination are published, but not later than January 27th. Country residents should write to the Registrar, P.O. Box 1, Kensington, for a form on which to make their preliminary application. This form should be returned not later than January 27th.

2. *First Year repeats:* First Year students who failed in all subjects at the 1964 Annual Examinations, who were not given any deferred examinations and who are not liable to be excluded, must attend the Student Enrolment Bureau between the date of publication of the Leaving Certificate results and January 27th if they wish to re-enrol.

3. Enrolment Week for new students begins February 15th. Each applicant will be given an appointment for a time in that week, when he will report to the Enrolment Bureau to complete his enrolment*.

4. *Late Enrolments:* In special circumstances the University may accept late enrolments made before March 31st. Late application should be made in person to the Admissions Office, Main Building, Kensington, as early in the first term as possible. Students enrolling late will normally be required to pay late fees in accordance with the details set out in the section on fees.

5. Fees should be paid on the enrolment day, as new students will not be issued with a timetable (which is their authority to attend classes) until fees have been paid.

Complete details of the enrolment requirements are contained in the booklet "Enrolment Procedure for New Students" which may be obtained at the Enrolment Bureau when making application to enrol.

Re-enrolment Procedure — Students re-enrolling in courses in the Faculty of Engineering should do so through the appropriate School. Each School will advise its students of the procedure to be followed. Re-enrolment arrangements must be completed during the prescribed enrolment week, immediately prior to the beginning of first term, in accordance with the timetable set out in the booklet "Enrolment Procedure for Students Re-enrolling". Enrolment forms for students re-enrolling will be available at the enrolment centre during enrolment week.

Conversion Course Enrolments — Enrolment in conversion courses must commence with an application to the Registrar for admission, and the applicant will be notified of the subsequent procedure.

Students who have completed the final examinations but have a thesis still outstanding are required to enrol for the period necessary to complete the thesis and to pay the requisite fees.

While course details must be completed during Enrolment Week, fees may be paid without penalty by re-enrolling students up to the end of the second week of term. For details of fee requirements, including late fee provisions, see under Fees.

No enrolments will be accepted after March 31st without the express approval of the Registrar which will be given in exceptional circumstances only.

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* Applicants who cannot keep their appointment should attend at the Enrolment Bureau on Thursday, 25th February, between 10 a.m. and noon, 2 p.m. and 5 p.m. or 6 p.m. and 8 p.m. Students enrolling on this Thursday will incur a late fee of £1.

RULES RELATING TO COMMON FIRST YEAR SUBJECTS IN THE FACULTIES OF APPLIED SCIENCE, SCIENCE, ENGINEERING AND MEDICINE

1. Each student intending to follow any course leading to the degree of Bachelor in any of the Faculties of Science, Applied Science, Medicine or Engineering must have satisfied the examiners in the subjects of 1.001 Physics I, 2.001 Chemistry I, 10.001 Mathematics I, and in a fourth subject (elective) chosen from 5.001 Engineering I, 25.511 Geology I, 12.011 Psychology I or 17.001 General Biology, before progressing further in his course, except that progression may be permitted with outstanding subjects if Faculty regulations permit.

2. Notwithstanding Faculty regulations to the contrary, full-time students will be required to complete the four subjects of Rule 1 in not more than two years' study and part-time students in not more than four years' study.

The re-enrolment of students who have not complied with this rule shall be subject to the General Regulations governing re-enrolment.

3. At enrolment, each student to whom Rule 1 applies will be required to nominate and apply for admission to the course which he desires to follow.

Although application for transfer from one course to another within these Faculties may be made at any time students are advised that such transfers are most readily effected prior to re-enrolment in the second year of full-time courses and the third stage of part-time courses.

All such transfers will be subject to the regulations of relevant Faculties and the concurrence of the Professorial Board.

RESTRICTION UPON STUDENTS RE-ENROLLING

The University Council has adopted the following rules governing re-enrolment with the object of requiring students with a record of failure to show cause why they should be allowed to re-enrol and retain valuable class places. These rules will be applied retrospectively from January, 1962. A student in the Medical course shall show cause why he should be allowed to repeat the second year of the course if he has failed more than once to qualify for entry to the third year.

(i) As from January 1st, 1962, a student shall show cause why he should be allowed to repeat a subject in which he has failed more than once. (Failure in a deferred examination as well as in the annual examination counts, for the purpose of this regulation, as one failure.) Where such subject is prescribed as a part of the student's course he shall be required to show cause why he should be allowed to continue the course.

(ii) Notwithstanding the provisions of clause (i), a student shall be required to show cause why he should be allowed to continue a course which he will not be able to complete in the time set down in the following schedule:—

Number of years in course	Total time allowed from first enrolment to completion (years)
3	5
4	6
5	8
6	9
7	11
8	12

(iii) No full-time student shall, without showing cause, be permitted to continue a course unless all subjects of the first year of his course are completed by the end of his second year of attendance. No student in the Faculty of Arts shall, without showing cause, be permitted to continue a course unless he completes four subjects, one of which must be from Group VII, by the end of his second year of attendance.

No part-time student shall, without showing cause, be permitted to continue a course unless all subjects of the first two stages of his course are completed by the end of his fourth year of attendance and all subjects of the third and fourth stages of his course by the end of his seventh year of attendance.

(iv) A student who has a record of failure in a course at another University shall be required to show cause why he should be admitted to this University. A student admitted to a course at this University following a record of failure at another University shall be required to show cause, notwithstanding any other provisions in these rules, why he should be permitted to continue in that course if he is unsuccessful in the annual examinations in his first year of attendance at this University.

(v) Any student excluded under any of the clauses (i)-(iii) may apply for re-admission after two academic years and such application shall be considered in the light of any evidence submitted by him.

(vi) A student wishing "to show cause" under these provisions shall do so in writing to the Registrar. Any such application shall be considered by the Professorial Board, which shall determine whether the cause shown is adequate to justify his being permitted to continue his course or re-enrol as the case may be.

(vii) The Vice-Chancellor may on the recommendation of the Professorial Board exclude from attendance in a course or courses any student who has been excluded from attendance in any other course under the rules governing re-enrolment and whose record at the University demonstrates, in the opinion of the Board and the Vice-Chancellor, the student's lack of fitness to pursue the course nominated.

(viii) A student who has failed, under the provisions of Clause (vi) of these rules, to show cause acceptable to the Professorial Board why he should be permitted to continue in his course, and who has subsequently been permitted to re-enrol in that course or to transfer to another course, shall also be required to show cause, notwithstanding any other provisions in these rules, why he should be permitted to continue in that course if he is unsuccessful in the annual examinations immediately following the first year of resumption or transfer of enrolment as the case may be.

(ix) A student may appeal to an Appeals Committee constituted by Council for this purpose against his exclusion by the Professorial Board from any subject or course.

FEES FOR UNDERGRADUATE COURSES*

Course Fees

Where course fees are assessed on the basis of term hours of attendance the hours for each subject for purposes of fee assessment shall be those prescribed in the Calendar, irrespective of any variation from the prescribed hours which may be necessary in conducting the subject.

For the purpose of fee determination for courses in the Faculty of Engineering assessment is on a term basis. A full-time course fee will be charged for any term where more than 15 hours' per week instruction, etc., is involved.

(i) Full-time Course Fees (more than 15 hours' attendance per week)—£48 per term. (In those years of Engineering courses which include industrial training, students will complete their formal studies in the third week of third term. The fee for this short term is £24.)

* Fees quoted are current at time of publication. The Council reserves the right to alter them at any time.

(ii) Part-time Course Fee—over 6 hours' and up to 15 hours' attendance per week—£24 per term.

(iii) Part-time Course Fee (6 hours' or less per week attendance)—£12 per term.

(iv) Thesis Fee—Students who have completed the final examinations, but have a thesis still outstanding, are required to pay £10 per annum (no term payment).

Other Fees

In addition to the above course fees, all registered undergraduates are required to pay:

Matriculation Fee — £3 — payable at the beginning of first year.

Library Fee—£5—payable yearly.

Student Activities Fees

University Union*—£6—annual subscription.
Sports Association*—£1—annual subscription.
Students' Union*—£2—annual subscription.
Miscellaneous—£2—annual fee.
Total—£11.

Graduation Fee — £3 — payable at the completion of course.

Thesis Fee—£10—payable yearly by students who have completed the final examinations but still have a thesis outstanding (no term payment).

Chemistry Kit Deposit—£4 per kit.

Special Examination Fees

Deferred examination — £2 for each subject.

Examinations conducted under special circumstances — £3 for each subject.

Review of examination results—£3 for each subject.

Completion of Enrolment

All students are required to complete enrolment during the prescribed enrolment period.** Failure to do so will incur a late fee of £1.

First year students (including students repeating first year) must complete enrolment (including fee payment) before they are issued with class timetables or permitted to attend classes.

Fees should be paid during the prescribed enrolment period but will be accepted without payment of a late fee during the first

* Life members of these bodies are exempt from the appropriate fee or fees.

** The enrolment periods for Sydney students are prescribed annually in the leaflets "Enrolment Procedure for New Students" and "Enrolment Procedure for Students Re-Enrolling".

two weeks of first term. Fees paid between the beginning of the third week of term and the 31st March are subject to a late fee of £3. *Fees will not be accepted (i.e. enrolment cannot be completed) after 31st March except with the express approval of the Registrar which will be given in exceptional circumstances only. Where this approval is given a late fee of £5 applies.*

Payment of Fees by Term

Students who are unable to pay their fees by the year may pay by the term, in which case they are required to pay first term course fees and other fees for the year within the first two weeks of first term. Students paying under this arrangement will receive accounts from the University for second and third term course fees. These fees must be paid within the first two weeks of each term: otherwise a late fee is incurred — £3 on fees paid in the third or fourth weeks of term and £5 on fees paid in the fifth or sixth weeks.

Assisted Students

Scholarship holders or Sponsored Students who have not received an enrolment voucher or appropriate letter of authority from their sponsor at the time when they are enrolling should complete their enrolment by paying their own fees. A refund of fees will be made when the enrolment voucher or letter of authority is subsequently lodged with the Cashier.

Extension of Time

Any student who is unable to pay fees by the due date may apply in writing to the Registrar for an extension of time. Such application must state year or stage, whether full-time or part-time and the course in which the applicant wishes to enrol, and must also state clearly and fully the reasons why payment cannot be made and the extension sought. This application must be lodged before the date on which a late fee becomes payable. Normally the maximum extension of time for the payment of fees is until 31st March for fees due in first term and for one month from the date on which a late fee becomes payable in second and third terms.

Failure to Pay Fees

Any student who is indebted to the University and who fails to make a satisfactory settlement of his indebtedness upon receipt of due notice ceases to be entitled to membership and privileges of the University. Such a student is not permitted to register for a further term, to attend classes or examinations, or to be granted any official credentials.

No student is eligible to attend the annual examinations in any subject where any portion of his course fees for the year is outstanding after the end of the fourth week of Third Term.

In very special cases the Registrar may grant exemption from the disqualification referred to in the two preceding paragraphs upon receipt of a written statement setting out all relevant circumstances.

Late Fees

Failure to attend enrolment centre for authorisation of course programme (see above)	£1
First Term—	
Fees paid from commencement of 3rd week of term to 31st March	£3
Fees paid after 31st March where accepted with the express approval of the Registrar (see above)	£5
Second and Third Terms—	
Fees paid in 3rd and 4th weeks of term	£3
Fees paid thereafter	£5
Late lodgment of Application for Admission to Examinations	£2
(Late applications will be accepted for three weeks only after the prescribed dates.)	

Withdrawal from Course

Students withdrawing from a course are required to notify the Registrar in writing. Fees for the course accrue until a written notification is received.

Where notice of withdrawal from a course is received by the Registrar before the first day of First Term a refund of all fees paid other than the matriculation fee will be made.

Where a student terminates for acceptable reasons a course of study before half a term has elapsed, one half of the term's fees may be refunded. Where a student terminates a course of study after half a term has elapsed, no refund may be made in respect of that term's fees.

The Library fee is an annual fee and is not refundable where notice of withdrawal is given after the commencement of First Term. On notice of withdrawal a partial refund of the Student Activities Fees is made on the following basis:—

University Union—£1 in respect of each half term.

University of New South Wales Students' Union—where notice is given prior to the end of the fifth week of first term £1, thereafter no refund.

University of New South Wales Sports Association—where notice is given prior to 30th April a full refund is made, thereafter no refund.

Miscellaneous—where notice is given prior to 30th April £1, thereafter no refund.

University Union Card

All students other than miscellaneous students are issued with a University Union membership card. *This card must be carried during attendance at the University and shown on request.*

The number appearing on the front of the card in the space at the top right-hand corner is the student registration number used in the University's records. *This number should be quoted in all correspondence.*

The card must be presented when borrowing from the University libraries, when applying for Travel Concessions and when notifying a change of address. It must also be presented when paying fees on re-enrolment each year when it will be made valid for the year and returned. Failure to present the card could result in some inconvenience in completing re-enrolment.

A student who loses a Union Card must notify the University Union as soon as possible.

New students will be issued with University Union cards by mail to their term address as soon as possible after fee payment. In the meantime, the fees receipt form should be carried during attendance at the University and shown on request. If the Union card is not received within three weeks of fee payment the Examinations Branch should be notified.

SCHOLARSHIPS AND CADETSHIPS

Students undertaking courses in the Faculty of Engineering are eligible to apply for the following scholarships or cadetships.

Commonwealth Scholarships

Benefits include payment of all tuition fees and other compulsory fees, and living allowances (these latter being subject to a means test). The closing date for applications is 30th September in the year immediately preceding that for which the scholarship is desired. Full particulars and application forms may be obtained from the Officer-in-Charge, University Branch Office, Department of Education, University Grounds, University of Sydney (Telephone: 68-2911).

University Scholarships

The University annually awards up to fifteen scholarships tenable in degree courses to students who have matriculated at the Leaving Certificate Examination; ten scholarships to students who have completed Trade Courses (Department of Technical Education); and ten scholarships to part-time students who have taken the Qualifying and Matriculation course of the Department of Technical Education. Scholarships will be awarded in order of merit on Leaving Certificate Examination results, and only to persons who do not hold another award. Holders are exempt from course fees during the currency of the scholarship. Applications must be lodged after publication of Leaving Certificate Examination results and after the announcement of the award of Commonwealth Scholarships, but not later than 31st January, 1965.

Bursaries Awarded by the Bursary Endowment Board

A number of Bursaries tenable at the University are awarded to candidates of merit at the Leaving Certificate Examination whose family income falls within certain limits prescribed by the Bursary Endowment Board. Applications should be made to the Secretary, Bursary Endowment Board, C/- Department of Education, Bridge Street, Sydney.

Joint Coal Board and Australian Coal Association (Research) Limited Scholarships

The Joint Coal Board and the Australian Coal Association (Research) Limited each offer scholarships in full-time courses in Mechanical Engineering, Electrical Engineering, Mining Engineering, Fuel Engineering and Applied Geology. The value of these scholarships ranges from £350 to £600 per annum (including allowance for books and instruments). These scholarships are awarded on the understanding that students will normally hold a Commonwealth Scholarship which covers the cost of University fees. However, applicants without Commonwealth Scholarships may be given consideration. While scholarship holders are not under bond, it is expected that they will obtain employment in coal mining or a related industry on graduation. Applications on forms obtainable from headmasters or from the Secretary, Joint Coal Board, Box 3842, G.P.O., Sydney, must be lodged with the Board's Secretary not later than seven days after the publication of Leaving Certificate results.

The John Heine Memorial Scholarship

This scholarship is awarded annually at the discretion of the Directors of the John Heine Memorial Foundation. It is designed to assist the recipient to undertake the final two years of the degree course in Mechanical, Electrical or Chemical Engineering, Applied Chemistry or Metallurgy, or to assist a student who has qualified for the A.S.T.C. diploma to complete the requirements for the B.E. or B.Sc. degree in these courses in two years of part-time study (three years in the case of Electrical Engineering) or in one year of full-time study. The applicant must be either a full-time student who has had or intends to seek employment in the metal industries, or a part-time student employed in the metal industries. The scholarship has a total maximum value of £350, a maximum of £150 being payable to any student completing the requirements for a degree in one year of part-time study only.

Application should be made not later than 31st January each year to the Secretary, The John Heine Memorial Foundation, c/- the Metal Trades Employers' Association, 101 Walker Street, North Sydney.

The A. E. Goodwin Memorial Scholarship

The Directors of A. E. Goodwin Ltd. provide a scholarship each year to students who are eligible to enrol in the second year of the Mechanical Engineering degree course. The total value of the scholarship is £180, payable in three equal amounts of £60 each at the beginning of the second, third and fourth years of the course. Applications should be lodged with the Registrar by 31st January each year.

Public Service Association Scholarship

The Public Service Association of New South Wales is offering a scholarship in 1965 to children of members of the Association who are entering the first year of any full-time course. It is valued at £100 per annum and is tenable for the normal duration of the course.

The Tyree Electrical Company Scholarship in Electrical Engineering

The Tyree Electrical Company Pty. Ltd. provides a scholarship for students enrolling in the full-time courses in Electrical

Engineering. The value of this scholarship is £250 per annum, payable as a living allowance to students. It is normally tenable for four years but may be extended to a fifth year when the holder intends to qualify for the two degrees, Bachelor of Science and Bachelor of Engineering. It may be held concurrently with any other scholarship.

Mining and Metallurgical Bursaries Fund

Mining and Metallurgical Bursaries at the University of New South Wales, valued at £50 per annum, will be awarded by the Trustees of the Mining and Metallurgical Bursaries Fund, Melbourne. Candidates must be British subjects and have completed the first year of the course for the degree of Bachelor of Engineering in Mining Engineering, Bachelor of Science in Applied Geology, or Bachelor of Science in Metallurgy, or have been awarded corresponding status in consideration of work done elsewhere. Candidates must lodge their applications with the Registrar on or before 31st December each year.

South Sydney Junior Rugby League Club Ltd. Scholarships

Two scholarships, each valued at £150, are available to male residents in the South Sydney area who wish to enrol in a full-time course at the University. The scholarships, tenable for one year only, will be awarded on the results of the Leaving Certificate Examination in the immediately preceding year and may not be held concurrently with any other scholarship award. The scholarship is intended to enable a student to undertake the first year of a course with the possibility (provided that his first-year performance warrants it) of obtaining a later year Commonwealth Scholarship. Applications must be lodged with the Registrar after the announcement of the award of the Commonwealth Scholarships, but not later than 31st January each year.

In addition to these scholarships made available by the University and other bodies, a number of industrial organisations and Government Departments sponsor students at the University. Such students generally have their University fees paid by the employers and are employed at cadet rates of pay during their course.

Outlines of Undergraduate Courses

SCHOOL OF CIVIL ENGINEERING

Civil engineering is broad in its scope, utilizing other specialised branches of engineering in planning, co-ordinating and constructing national works such as water supply and conservation projects, hydro-electric development, roads, railways, bridges, tunnels, large buildings, and irrigation, sewerage and harbour and river development. The civil engineer adapts the forces of nature for the use and convenience of mankind. His academic training must include a study of science and of engineering practice. He must combine this with experience and judgment and the knowledge and personality necessary to control large organisations of workers. This profession offers to a young man a considerable variety of types of work, ranging from specialised research and investigations, through routine design and construction work to higher positions which are often largely managerial and organisational in their nature.

The School of Civil Engineering offers two courses in civil engineering; a four-year full-time course leading to the degree of Bachelor of Engineering (pass or honours), and a six-year part-time course leading to the degree of Bachelor of Science (Technology)—B.Sc. (Tech). This course may also be completed in three years of part-time study and two years of full-time study. In addition, the School offers a full-time and a part-time course in Surveying leading to the degree of Bachelor of Surveying (pass or honours), details of which are set out below the outlines of the Civil Engineering courses.

Recent A.S.T.C. diplomates may convert to the degrees of Bachelor of Engineering or Bachelor of Science (Technology) by courses of full-time or part-time study respectively.

CIVIL ENGINEERING—FULL-TIME COURSE

FIRST YEAR

(30 weeks day course)

		Hours per week for 3 terms lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

SECOND YEAR*

(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
1.212S	Physics II(T)	2 — 2½
5.301S	Engineering Mechanics	1½— 1
5.701S	Thermodynamics	1 — 1½
8.112S	Materials and Structures	2 — 2
8.421S	Engineering Surveying**	1½— 1½
10.022S	Mathematics	4 — 1
25.531S	Geology†	2 — 1
50.011H	English *or*	3 — 0
57.011H	An Introduction to Modern Drama	
		17 —10½

THIRD YEAR*

(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.501S	Fluid Mechanics	1 — 1½
6.801S	Electrical Engineering	1½— 2½
8.122S	Structures	3 — 3
8.221S	Engineering Materials	3½— 2½
8.423S	Engineering Surveying**	1½— 1½
8.611S	Civil Engineering	2½— 0
51.011HS	History *or*	
52.011HS	Philosophy ‡	1½— 0
	Social Science Elective§	1½— 0
		15½—10½

FOURTH YEAR*—PASS COURSE

(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
8.132S	Structures	2 — 3
8.142S	Engineering Computations	1 — 1
8.223S	Engineering Materials	3 — 2½
8.522S	Hydraulics	1½— 1½
8.613S	Civil Engineering	4½— 0
8.011S	Minor Thesis	3 — 0
	Humanities, Advanced Elective§	3 — 0
		18 — 8

* Lectures cease at end of 3rd week of third term.

** A one-week survey camp must be attended in sixth week of third term.

† Two one-day Geology excursions are an essential part of the course.

‡ Terms 1 and 2 only.

FOURTH YEAR—HONOURS COURSE

(30 weeks day course)

		Hours per week for 24 weeks* lec. lab./tut.
8.132S	Structures	2 — 3
8.142S	Engineering Computations	1 — 1
8.522S	Hydraulics	1½— 1½
8.613S	Civil Engineering	4½— 0
8.223S	Engineering Materials	3 — 2½
8.021	Thesis	– — –
10.371S	Statistics	2 — 0
	Humanities, Advanced Elective **	3 — 0
	Three Honours subjects are to be chosen from 8.134 Structures, 8.224 Materials, 8.424 Surveying, 8.524 Hydraulics	3 — 0
		20— 8

DOUBLE DEGREE OF B.SC., B.E. IN CIVIL ENGINEERING

Full-time students in Civil Engineering may qualify for the double degree of Bachelor of Science, Bachelor of Engineering by completing the following course of study over five years.

First Year — Normal first year programme for full-time Civil Engineering as set out above.

Second Year — As set out below.

		Terms 1 & 2	Term 3 Weeks 1-3	Term 3 Weeks 4-9
1.112	Physics	8	8	8
5.301	Engineering Mechanics	2	2	2
5.701	Thermodynamics	2	2	2
8.112	Materials and Structures	3	3	3
8.421S	Engineering Surveying	3	3	0
10.111	Pure Mathematics II†	5	5	5
25.531S	Geology‡	3	3	0
50.011H / 57.011H	English *or* An Introduction to Modern Drama	3	0	0
		29	26	20

Third Year — Two appropriate third year Science subjects (see Science course regulations in the University Calendar) plus 51.011H History or 52.011H Philosophy and a Social Science Elective. In the long vacation following this year students are required to undertake a nine-week period of industrial training.

Fourth Year — Normal third year of the Civil Engineering course (less the Humanities taken in the special third year).

Fifth Year — Normal fourth year of the Civil Engineering course.

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* In the last 6 weeks of third term 18 hours per week will be devoted to work on the thesis. In addition students will be required to attend for nine hours per week such course work as may be prescribed.

** Terms 1 and 2 only.

† 10.211 Applied Mathematics II may be substituted (7 hours per week for three terms).

‡ Two one-day Geology excursions are an essential part of the course.

CIVIL ENGINEERING—PART-TIME COURSE

FIRST STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.001/1	Physics I, Part I	1½— 1½
2.001/1	Chemistry I, Part I	1½— 1½
5.001/1	Engineering I, Part I	1 — 2*
10.001/1	Mathematics I, Part I	2 — 1
		6 — 6

SECOND STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.001/2	Physics I, Part II	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
5.001/2	Engineering I, Part II	2 — 1
10.001/2	Mathematics I, Part II	2 — 1
		7 — 5

THIRD STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.212	Physics II(T)	1½— 1½
5.301	Engineering Mechanics	1½— ½
8.112	Materials and Structures	1½— 1½
10.022/1	Mathematics II, Part I	1 — 1
50.011H/1	English	1 — 0
		6½— 4½

FOURTH STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
5.501	Fluid Mechanics	1 — 1
5.701	Thermodynamics	1 — 1
8.121	Structures	1½— 1½
8.421	Engineering Surveying‡	1 — 0
25.531	Geology†	1½— ½
50.011H/2	English	1 — 0
		7 — 4

* Terms 1 and 2 only: Term 3 — 3 hours per week of lab./tut.

† Two one-day Geology excursions are an essential part of the course.

‡ Saturday fieldwork additional. Also, a one-week survey camp must be attended in sixth week of third term.

FIFTH STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
6.801	Electrical Engineering	1½— 1½
8.221	Engineering Materials	3 — 2
8.422	Engineering Surveying*	1 — ½
8.521	Hydraulics	1 — 1
51.011H / 52.011H	History *or* / Philosophy	1 — 0
		7½— 5

SIXTH STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
8.131	Structures	2 — 2
8.141	Engineering Computations	1 — 0
8.222	Engineering Materials	1 — 1
8.611	Civil Engineering	2 — 0
8.612	Civil Engineering	2 — 0
	Social Science Elective	1 — 0
		9 — 3

CIVIL ENGINEERING — COMBINED FULL-TIME/PART-TIME COURSE

The Civil Engineering course leading to the degree of Bachelor of Science (Technology) may be completed in three years of part-time study and two years of full-time study as follows:

Stage 1 — Part-time (as for the Stage 1 of the B.Sc. (Tech.) course in Civil Engineering).

Stage 2 — Part-time (as for Stage 2 of the B.Sc. (Tech.) course in Civil Engineering).

Stage 3A — Full-time (as for Second Year of the full-time course in Civil Engineering).

Stage 4A — Full-time (as for Third Year of the full-time course in Civil Engineering).

* Saturday fieldwork additional. Also, a one-week survey camp must be attended in sixth week of third term.

Stage 5A — Part-time (as set out below).

STAGE 5A
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
8.131	Structures	2 — 2
8.141	Engineering Computations	1 — 0
8.222	Engineering Materials	1 — 1
8.521	Hydraulics	1 — 1
8.612	Civil Engineering	1 — 0
		6 — 4

CIVIL ENGINEERING—CONVERSION COURSE

(A.S.T.C. Diploma to B.Sc. (Tech.) Degree)

Recent A.S.T.C. diploma holders in Civil Engineering may qualify for the degree of Bachelor of Science (Technology) by completing the following course of study. The programme outlined is what will be required of recent diplomates. Diplomates of many years standing may be required to take additional subjects.

FIRST STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/2	Physics I, Part 2	1½— 1½
2.001/2	Chemistry I, Part 2	1½— 1½
5.301	Engineering Mechanics	1¼— ¾
10.022/2	Mathematics	1½— ½
	Social Science Elective	1 — 0
		6¾— 4¼

SECOND STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.212	Physics II(T)	1½— 1½
8.131	Structures	2 — 2
8.141	Engineering Computations	1 — 0
8.222	Engineering Materials (Soil Mechanics)*	2 — 0
8.521	Hydraulics	1 — 1
		7½— 4½

* First term only.

A.S.T.C. diplomates who completed their course in Civil Engineering in 1961 or later years and who wish to qualify for the degree of Bachelor of Engineering by full-time study may do so by completing the subjects of Stages 6 and 7 of the existing part-time Bachelor of Engineering degree course, or their equivalent, in one year.

Department of Surveying

The Department of Surveying of the School of Civil Engineering offers a full-time course, a part-time course and a special six-year trainee course leading to the degree of Bachelor of Surveying (pass and honours). Suitably qualified candidates may also register for the degree of Master of Surveying. Since 1961 the University Degree in Surveying has been the only route by which the registration of the Surveyors Registration Board of N.S.W. may be obtained. Students who are registered surveyors are granted certain exemptions, particulars of which are given below.

SURVEYING—FULL-TIME COURSE

FIRST YEAR
(30 weeks day course)

		Hours per week for 30 weeks lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

SECOND YEAR*
(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
1.212S	Physics II(T)	2 — 2½
8.421S	Engineering Surveying**	1½— 1½
8.811S	Surveying**	1 — 1
8.841S	Surveying Computations	1 — 1
8.861S	Cartography	1 — 1½
8.871S	Land Utilisation	1½— ½
10.022S	Mathematics	4 — 1
10.361S	Statistics	1½— 0
25.531S	Geology†	2 — 1
50.011H 57.011H	English *or* An Introduction to Modern Drama ‡	3 — 0
		18½—10

* Lectures cease at end of 3rd week of 3rd term.
** A two-week survey camp must be attended in third term.
† Two one-day Geology excursions are an essential part of the course.
‡ Terms 1 and 2 only.

THIRD YEAR*

(24 weeks day course)

		Hours per week for— 10 weeks lec. lab./tut.	14 weeks lec. lab./tut.
5.501S	Fluid Mechanics	1 — 1½	1 — 1½
8.812S	Surveying	1 — 2	1 — 0
8.241S	Soil Mechanics	1 — 1¼	1 — 1¼
8.821S	Geodesy**	2 — 3	1 — 3
8.831S	Astronomy**	2 — 0	2 — 2
8.842S	Surveying Computations	1½— 1½	1 — 0
8.851S	Photogrammetry	1 — 1½	2 — 3
8.611S	Civil Engineering	3 — 0	3 — 0
8.891S	Theory of Instruments	1 — 0	1 — 0
51.011HS 52.011HS	History *or* Philosophy †	1½— 0	1½— 0
	Social Science Elective†	1½— 0	1½— 0
		16½—10¾	16 —10¾

FOURTH YEAR*—PASS COURSE

(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
8.613S	Civil Engineering	4½— 0
8.822S	Geodesy	1 — 1
8.832S	Astronomy	1¼— ¾
8.852S	Photogrammetry	1 — 1½
8.862S	Cartography	2 — 0
8.872S	Land Valuation	1 — 0
8.881S	Survey Laws and Regulations	1½— 0
11.411	Town Planning†	1 — 1
8.011S	Minor Thesis	3 — 0
25.533	Geophysics‡	2½— 0
	Humanities, Advanced Elective†	3 — 0
		21¾— 4¼

* Lectures cease in Third Year at end of 4th week of 3rd term, and in Fourth Year at end of 3rd week of 3rd term.
** A two-week survey camp must be attended in third term.
† Terms 1 and 2 only.
‡ Four short Geophysical excursions are an essential part of the course.

FOURTH YEAR—HONOURS COURSE

(30 weeks day course)

		Hours per week for 24 weeks* lec. — lab./tut.
8.613S	Civil Engineering	4½ — 0
8.822S	Geodesy	1 — 1
8.832S	Astronomy	1¼ — ¾
8.852S	Photogrammetry	1 — 1½
8.862S	Cartography	2 — 0
8.872S	Land Valuation	1 — 0
8.881S	Survey Laws and Regulations	1½ — 0
11.411	Town Planning†	1 — 1
25.533	Geophysics**	2½ — 0
	Humanities, Advanced Elective†	3 — 0
8.021	Thesis	2 — 0
	Two Honours subjects are to be selected from: 8.424 Surveying, 8.823 Geodesy, 8.853 Photogrammetry	3 — 0
		23¾ — 4¼

SURVEYING—PART-TIME COURSE

FIRST STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. — lab./tut.
1.001/1	Physics I, Part I	1½ — 1½
2.001/1	Chemistry I, Part I	1½ — 1½
5.001/1	Engineering I, Part I	1½ — 1½
10.001/1	Mathematics I, Part I	2 — 1
		6½ — 5½

SECOND STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. — lab./tut.
1.001/2	Physics I, Part II	1½ — 1½
2.001/2	Chemistry I, Part II	1½ — 1½
5.001/2	Engineering I, Part II	1½ — 1½
10.001/2	Mathematics I, Part II	2 — 1
		6½ — 5½

* In the last 6 weeks of third term 18 hours per week will be devoted to work on the thesis. In addition students will be required to spend nine hours per week on such course work as may be prescribed.

** Four short Geophysical excursions are an essential part of the course.

† Terms 1 and 2 only.

THIRD STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.212	Physics II(T)	1½— 1½
8.421	Engineering Surveying*	¾— ¾
8.841	Surveying Computations	¾— ¾
8.861	Cartography	⅔— 1⅓
10.022/1	Mathematics II, Part I	1½— ½
50.011H/1	English	1 — 0
		5⅙— 4⅚

FOURTH STAGE

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
5.501	Fluid Mechanics	1 — 1
8.811	Surveying†	¾— ¾
8.871	Land Utilisation	1 — ½
10.022/2	Mathematics II, Part II	1½— 1
10.361	Statistics	1 — 0
25.531	Geology‡	1¼— ¾
50.011H/2	English	1 — 0
51.011H 52.011H	History *or* Philosophy	1 — 0
		8½— 4

FIFTH STAGE

(30 weeks part-time course)

		Hours per week for— 20 weeks lec. lab./tut.	10 weeks lec. lab./tut.
8.241	Soil Mechanics	1 — 1	1 — 1
8.821	Geodesy	1¼— 2¼	1¼— 2¼
8.842	Surveying Computations†	1 — ½	1 — ½
8.862	Cartography	2 — 0	1 — 0
8.891	Theory of Instruments	1 — 0	0 — 0
	Social Science Elective	1 — 0	1 — 0
		7¼— 3¾	5¼— 3¾

* Saturday fieldwork additional. A survey camp of one week must be attended in the third term.

† A Survey camp of one week must be attended in third term.

‡ Two one-day Geology excursions are an essential part of the course.

SIXTH STAGE

(30 weeks part-time course)

		Hours per week for— 20 weeks lec. lab./tut.	10 weeks lec. lab./tut.
8.611	Civil Engineering	2 — 0	2 — 0
8.812	Surveying*	1 — 1	1 — 0
8.831	Astronomy	1½— ½	1½— 1½
8.851	Photogrammetry	1¼— 1¾	1¼— 1¾
25.533	Geophysics	2 — 0	2 — 0
	Humanities—Advanced Elective	2 — 0	2 — 0
		9¾— 3¼	9¾— 3¼

SEVENTH STAGE

(30 weeks part-time course)

		Hours per week for— 20 weeks lec. lab./tut.	10 weeks lec. lab./tut.
8.613	Civil Engineering	3½— 0	3½— 0
8.822	Geodesy	1½— 0	1½— 0
8.832	Astronomy	1½— ½	0 — 1½
8.852	Photogrammetry	1 — 1	½— 1½
8.872	Land Valuation	1 — 0	0 — 0
8.881	Survey Laws and Regulations	1 — 0	2 — 0
11.411	Town Planning	2 — 0**	0 — 0
		11½— 1½	7½— 3

Note.—Part-time students are not required to complete a thesis since their professional experience is taken into consideration.

Honours are not awarded in the part-time course. To qualify for honours a part-time student must transfer to the full-time course and complete, at his first attempt, the fourth year of the full-time Honours course.

TRAINEE SURVEYING DEGREE COURSE

(6 years with day release)

The first two years of this course are identical with the first two years of the part-time Surveying Degree Course. In later years individual timetables must be arranged at the time of enrolment, to accord with timetables for subjects offered in the full-time and part-time courses.

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* A survey camp of one week must be attended in third term.

** One term of lectures and one term of studio work.

FIRST YEAR
(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.001/1	Physics I, Part I	1½— 1½
2.001/1	Chemistry I, Part I	1½— 1½
5.001/1	Engineering I, Part I	1½— 1½
10.001/1	Mathematics I, Part I	2 — 1
		6½— 5½

SECOND YEAR
(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.001/2	Physics I, Part II	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
5.001/2	Engineering I, Part II	1½— 1½
10.001/2	Mathematics I, Part II	2 — 1
		6½— 5½

THIRD YEAR
(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
1.212	Physics II(T)	1½— 1½
8.421	Engineering Surveying*	¾— ¾
8.841	Surveying Computations	¾— ¾
8.861	Cartography	⅔— 1⅓
10.022/1	Mathematics II, Part I	1 — 1
10.361	Statistics	1 — 0
50.011H/1	English	1 — 0
		6⅔— 5⅓

FOURTH YEAR
(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
5.501	Fluid Mechanics	1 — 1
8.811	Surveying*	¾— ¾
8.842	Surveying Computations	1 — ½
8.862	Cartography	1½— 0
8.871	Land Utilisation	1 — ½
10.022/2	Mathematics II, Part II	1 — 1
25.531	Geology	1¼— ¾
50.011H/2	English	1 — 0
51.011H / 52.011H	History *or* Philosophy	1 — 0
		9½— 4½

* Saturday fieldwork additional. A survey camp of one week must be attended in the third term.

FIFTH YEAR

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
8.241	Soil Mechanics	1 — 1
8.611	Civil Engineering	2 — 0
8.812	Surveying*	1½— 0
8.821	Geodesy	1½— 2½
8.831	Astronomy	2 — ½
8.851	Photogrammetry	1½— 1½
8.891	Theory of Instruments	½— 0
	Social Science Elective	1 — 0
		10½— 5½

SIXTH YEAR

(30 weeks part-time course)

		Hours per week for 30 weeks lec. lab./tut.
8.613	Civil Engineering	3½— 0
8.822	Geodesy	1½— 0
8.832	Astronomy	1½— ½
8.852	Photogrammetry	1 — 1
8.872	Land Valuation	½— 0
8.881	Survey Laws and Regulations	1½— 0
11.411	Town Planning	1½— 0
25.533	Geophysics	2 — 0
	Advanced Elective	2 — 0
		14½— 1½

Note—Trainee students are not required to complete a thesis since their professional experience is taken into consideration.

For an Honours degree, a part-time student must transfer to and complete the 4th Year of the full-time course.

EXEMPTIONS

The following exemptions are granted to registered surveyors and persons who have completed subjects in the Surveying Certificate Course of the N.S.W. Department of Technical Education, viz:—

(a) Exemptions for Licensed Surveyors.

(i) The following exemptions in the Surveying Degree Course will be granted to Registered Surveyors who have passed the examination of the Surveyors' Registration Board.

	Subject	*Equivalent Subject Passed*
8.421	Engineering Surveying	Engineering Surveying A
8.841	Surveying Computations	Computations A
8.861	Cartography	Field Practice
8.881	Survey Laws and Regulations	Laws and Regulations affecting Surveys

* A survey camp of two weeks must be attended in the third term.

(ii) Registered Surveyors who have passed the examinations of the Surveyors' Registration Board will be granted admission to examinations in the following subjects of the Surveying Degree Course without attendance at classes.

	Subject	*Registration Board Subject Passed*
8.811	Surveying	Engineering Surveying A and B
8.821	Geodesy	Geodesy
8.831	Astronomy	Astronomy
8.871	Land Utilisation	Land Classification and Utilisation
8.872	Land Valuation	Principles and Practice of Land Valuation

(b) Persons who have completed individual subjects, etc.

The following exemptions in the Surveying Degree Course will be granted to persons who have passed the following equivalent individual subjects in the Surveying Certificate Course:—

	Subject Exempt	*Surveying Certificate Equivalent*
8.411	Engineering Surveying	Engineering Surveying I
8.841	Surveying Computations	Surveying Computation II
8.861	Cartography	Plotting and Plan Drawing
8.871	Land Utilisation	Land Classification and Utilisation
8.872	Land Valuation	Land Surveying II (Land Valuation)
	Town Planning	Town Planning

SCHOOL OF ELECTRICAL ENGINEERING

In preparation for a career in any branch of electrical engineering the student must acquire a knowledge of the basic sciences of mathematics and physics. Students should realise that electrical engineering, perhaps more than most other branches of engineering, is closely linked with the pure sciences, and requires a scientific outlook and approach for a proper understanding of its problems.

The School offers a full-time course of four years' duration leading to the degree of Bachelor of Engineering (pass or honours), and a six-year part-time course for the degree of Bachelor of Science (Technology). This course may also be completed in three years of part-time and two years of full-time study. Special conversion courses are provided for holders of the A.S.T.C. diploma in Electrical or Radio Engineering.

In the early years of the electrical engineering courses students will concentrate on the basic sciences, mathematics, physics and chemistry, and as well will receive an introduction to engineering. In the final year students will elect, with the approval of the Head of the School, to study in one of the specialised fields of electrical engineering (referred to as options), at the same time taking the common subjects in electrical engineering.

In 1965 a revised fourth year will be introduced in the full-time B.E. course (pass and honours) which will provide for specialisation in one or other of the following options:

(a) Power and control systems and apparatus — concerned with the generation, distribution and control of electrical energy, and

(b) Communications — concerned with radio line communications, radar and other navigational aids, and television.

In the past the content of these two fields has been offered in three options, *viz.* power apparatus and systems, utilization and control, and communications. These three options will be offered for the last time in 1964 to full-time students, and in 1965 to part-time students. Beginning in 1966 the same options will be offered in both the full-time and the part-time course. Details of the revised fourth year to be introduced in 1965 are given in the course outlined below.

Each student in the full-time course is required to work on a project under the guidance of members of the lecturing staff. Generally, the project will involve the design and construction of experimental apparatus together with laboratory tests. Where possible the projects will be related to the research programme of the School and will be designed to develop the student's initiative. Each student will be required to deliver a seminar paper and to prepare a thesis based on the results of the project work.

Provision is made in the full-time course for students to undertake additional work in their third and fourth years towards the award of an honours degree.

ELECTRICAL ENGINEERING—FULL-TIME COURSE

The full-time course is of four years duration and leads to the degree of Bachelor of Engineering (pass or honours). The four years of the course each require full-time day attendance at the University for thirty weeks. Practical experience in industry is to be obtained up to a total of 20 weeks, preferably at the end of the second and third years for a period of 10 weeks per year.

FIRST YEAR

(30 weeks day course)

		Hours per week for 3 Terms lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

SECOND YEAR*

(30 weeks day course)

		Hours per week for 3 Terms lec. lab./tut.
1.112	Physics	4 — 4
4.921	Materials Science	1 — ½
5.301	Engineering Mechanics	1 — 1
5.701	Thermodynamics	1 — 1
6.101	Electric Circuit Theory	1 — 2
8.112	Materials and Structures	1½— 1½
10.111	Pure Mathematics II	3 — 2
50.011H 57.011H	English *or* An Introduction to Modern Drama	2 — 0
		14½—12

THIRD YEAR—PASS COURSE

(30 weeks day course)

		Hours per week for 30 weeks lec. lab./tut
5.304S	Theory of Machines†	1 — 1
5.501	Fluid Mechanics *or*	1 — 1
10.351	Statistics	1 — ½
6.102	Electric Circuit Theory	3 — 3
6.201	Electric Power Engineering	2 — 3
6.301	Electronics	3 — 3
10.033	Mathematics‡	2 — 0
51.011HS 52.011HS	History *or* Philosophy §	1½— 0
	Social Science Elective§	1½— 0
		15 —10½/11

* This year also meets the requirements of the Second Year of the Science course for the degree of Bachelor of Science.

† Lectures cease at the end of the 3rd week of third term.

‡ Students who have taken the subjects Physics III and Mathematics III in the Science Course are exempt from this subject.

§ Terms 1 and 2 (21 weeks) only.

FOURTH YEAR*—PASS COURSE

(30 weeks day course)

		Hours per week for 21 weeks lec. lab./tut.
6.001S	Electrical Engineering	4 — 1
6.322S	Electronics	2 — 3
6.911	Thesis**	0 — 2
	Advanced Elective, Humanities	3 — 0
	Plus one of the following options:—	
Option I—		
	Power and Control Apparatus and Systems—	
6.202S	Power Systems	2 — 2
6.212S	Electrical Machines	2 — 2
6.401S	Control Systems	2 — 2
	or	
Option II—		
	Communications—	
6.302S	Communications	2 — 2
6.312S	Communications	2 — 2
6.332S	Communications	2 — 2
		15 —12

Optional Subjects

Students in doubt concerning optional subjects in the third and fourth years should consult the Head of the School.

Third Term of Fourth Year

In the fourth year the formal lecture work extends over twenty-one weeks (the first two terms). This is followed by a study vacation of three weeks and examinations are held during the first three weeks of the third term. The balance of this term is mainly devoted to directed laboratory and research work on an approved subject, with special reading and study associated with the preparation of a thesis; seminar work is also carried out. The thesis must be submitted by 30th November.

A course of specialist lectures, including engineering economics, is given by senior engineers from government departments and industry on problems met in practice. These are designed to acquaint the student with current projects and practical problems in industry and essential electrical services.

Additional for Honours

A full-time honours course in electrical engineering is offered, involving additional work in third and fourth years. Candidates

* Lectures cease at the end of second term.
** Full-time in third term.

for honours must obtain the permission of the Head of the School to enter the course.

Candidates for honours will complete the syllabus for the third and fourth years of the pass course as outlined above with the addition of:

Third Year

6.501 Electrical Engineering Honours — two hours of lectures per week for thirty weeks.

Fourth Year

6.502S Electrical Engineering Honours — three hours of lectures per week for twenty-one weeks.

6.921 Honours Thesis — two hours per week for twenty-one weeks; then full-time in third term.

DOUBLE DEGREE OF B.SC., B.E. IN ELECTRICAL ENGINEERING

Full-time students in Electrical Engineering may qualify for the double degree of Bachelor of Science, Bachelor of Engineering in five years of full-time study. Having completed first and second years of the Electrical Engineering course students will take a special third year consisting of two Group III Science subjects (see the Science course regulations in the University Calendar) plus 51.011H History or 52.011H Philosophy plus a Social Science Elective. In their fourth year students in the combined course will take the normal third year of the Electrical Engineering course, less the Humanities subjects taken in the special third year. In their fifth year they will complete the normal fourth year of the Electrical Engineering course.

Approval to enrol in the double degree course is granted on the recommendation of the Head of the School and requires the approval of the Dean of the Faculty of Engineering and the Dean of the Faculty of Science.

ELECTRICAL ENGINEERING—PART-TIME COURSE

The six-year part-time course in Electrical Engineering leads to the degree of Bachelor of Science (Technology).

FIRST STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut
1.001/1	Physics I, Part I	1½— 1½
2.001/1	Chemistry I, Part I	1½— 1½
5.001/1	Engineering I, Part I	1*— 2*
10.001/1	Mathematics I, Part I	2 — 1
		6 — 6

SECOND STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut
1.001/2	Physics I, Part II	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
5.001/2	Engineering I, Part II	2 — 1
10.001/2	Mathematics I, Part II	2 — 1
		7 — 5

THIRD STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.112/1	Physics II, Part I	2 — 2
4.921	Materials Science	1 — ½
6.101	Electric Circuit Theory	1 — 2
10.111/1	Pure Mathematics II, Part I	2 — ½
50.011H/1	English	1 — 0
		7 — 5

FOURTH STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.112/2	Physics II, Part II	2 — 2
4.921	Materials Science	2 — 2
6.152	Electric Circuit Theory	1½— ½
10.111/2	Pure Mathematics II, Part II	2 — ½
50.011H/2	English	1 — 0
		8½— 5

FIFTH STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.301	Engineering Mechanics	1¼— ¾
6.251	Electric Power Engineering	1½— 2
6.357	Electronics	1½— 2
8.112	Materials and Structures†	1 — 2
51.011H / 52.011H	History *or* Philosophy	1 — 0
		6¼— 6¾

* Hours for Terms 1 and 2 only; in Term 3, the three hours per week are devoted to drawing office work in Engineering Drawing.

† See footnote to sixth stage.

SIXTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.701	Thermodynamics*	2 — 0
6.052	Electrical Engineering	1 — 0
	Social Science Elective	1 — 0
Plus one of the following options:—		
Option I—		
	Power and Control—	
6.262	Electrical Machines	2 — 2
6.454	Power and Control Systems	2 — 2
Option II—		
	Communications—	
6.352	Communications	1½— 2½
6.362	Communications	1½— 2½
		8/7—4/5

* 8.112 Materials and Structures and 5.701 Thermodynamics do not appear in the programme for 1965, which is a transition period.

ELECTRICAL ENGINEERING — COMBINED FULL-TIME/PART-TIME COURSE

The Electrical Engineering course leading to the degree of Bachelor of Science (Technology) may be completed in three years of part-time study and two years of full-time study as follows:

Stage 1 — Part-time (as for the Stage 1 of the B.Sc. (Tech.) course in Electrical Engineering).

Stage 2 — Part-time (as for Stage 2 of the B.Sc. (Tech.) course in Electrical Engineering).

Stage 3A — Full-time (as for Second Year of the full-time course in Electrical Engineering).

Stage 4A — Full-time (as for Third Year of the full-time course in Electrical Engineering).

Stage 5A — Part-time (as set out below).

STAGE 5A

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
6.052	Electrical Engineering	1 — 0
Plus one of the following options:—		
Option I—		
	Power and Control—	
6.262	Electrical Machines	2 — 2
6.454	Power and Control Systems	2 — 2
Option II—		
	Communications—	
6.352	Communications	1½— 2½
6.362	Communications	1½— 2½
		5/4—4/5

CONVERSION COURSES—ELECTRICAL ENGINEERING

(From A.S.T.C. Diploma in Electrical or Radio Engineering to B.E or B.Sc. (Tech.) Degrees)

The programmes of study to be followed by A.S.T.C. diplomates from the School of Electrical Engineering who wish to qualify for the degree of Bachelor of Engineering or Bachelor of Science (Technology) depend on the content of the courses which have been completed for the diploma.

The subjects required to complete the degree may be obtained on application in writing to the Head of the School of Electrical Engineering.

Additional for Honours

Conversion students who wish to be considered for the degree of Bachelor of Engineering with honours will be required to do additional work as outlined for full-time students. A credit or honours diploma is the normal prerequisite for entrance to the honours course and students who wish to study for honours should apply to the Head of the School at least two years before they expect to complete the course.

SCHOOL OF MECHANICAL ENGINEERING

The courses in this School are planned to provide the appropriate academic training for the professional engineer in the fields of aeronautical, industrial and mechanical engineering, and for the naval architect.

In the early years of all these courses the emphasis is placed on the study of the basic sciences—mathematics, physics and chemistry. This is followed by the study of the engineering sciences—thermodynamics, fluid mechanics, theory of machines, materials, and structures, and their application in the field of design. In the courses in industrial engineering, the more advanced sections of thermodynamics and fluid mechanics are replaced by industrial engineering subjects. Humanities subjects form a regular part of all courses, four being included in full-time and three in part-time courses.

Industrial experience is an integral part of the course; full-time students must complete two five-month periods of approved industrial training, one period in an engineering workshop between the second and third years and the other, between third and fourth years, in a drawing office or assisting a professional engineer.

Each student is required to prepare a short paper and deliver it in the seminar period, and each full-time student is also required to present a thesis at the end of his final year.

The full-time course in mechanical engineering of four years' duration leads to the degree of Bachelor of Engineering (pass or honours), with additional work being taken in the third and fourth years for the honours degree.

Part-time courses of six years duration leading to the degree of Bachelor of Science (Technology) are offered in mechanical engineering, aeronautical engineering, and naval architecture. The Department of Industrial Engineering also offers a full-time and a part-time course, details of which are given below. The part-time courses may also be completed by a combination of three years of part-time and two years of full-time study.

Within the School of Mechanical Engineering a student who has successfully completed the first two stages of any of the Bachelor of Science (Technology) courses mentioned above may transfer to second year of the full-time mechanical or industrial engineering B.E. courses.

A student who has successfully completed the first four stages of the part-time B.Sc. (Tech.) courses in industrial or mechanical engineering may transfer to third year of the corresponding full-time B.E. courses.

Recent A.S.T.C. diplomates may convert to the degrees of Bachelor of Engineering or Bachelor of Science (Technology) by courses of full-time or part-time study respectively.

MECHANICAL ENGINEERING—FULL-TIME COURSE

FIRST YEAR

(30 weeks day course)

		Hours per week for 3 terms lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

SECOND YEAR*

(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
1.212S	Physics II	2 — 2½
4.911S	Materials Science	1¼— 1¼
5.202S	Mechanical Technology	2 — 0
5.301S	Engineering Mechanics	1½— 1
5.501S	Fluid Mechanics	1 — 1½
5.701S	Thermodynamics	1 — 1½
8.112S	Materials and Structures	2 — 2
10.022S	Mathematics	4 — 1
50.011H 57.011H	English *or* An Introduction to Modern Drama **	3 — 0
		17¾—10¾

* Lectures cease at the end of the 3rd week of third term.
** Terms 1 and 2 only.

THIRD YEAR* — PASS COURSE
(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.101S	Mechanical Engineering Design	0 — 5
5.204S	Mechanical Technology	2 — 0
5.302S	Theory of Machines	1¾— 1¼
5.401S	Numerical Analysis	1 — ½
5.502S	Fluid Mechanics	1¼— 1¾
5.702S	Thermodynamics	1 — 2
6.801S	Electrical Engineering	1½— 2½
8.113S	Materials and Structures	1½— 1½
51.011HS 52.011HS	History *or* Philosophy **	1½— 0
	Social Science Elective**	1½— 0
		13 —14½

FOURTH YEAR* — PASS COURSE
(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.103S	Mechanical Engineering Design	1½— 1½
5.321S	Automatic Control Engineering	1 — ½
5.304S	Theory of Machines	1 — 1
5.503S	Fluid Mechanics	1 — 1
5.703S	Thermodynamics	1 — 1
6.802S	Electrical Engineering	1½— 1½
18.121S	Engineering Administration	3 — 0
5.021S	Seminar	0 — 1½
5.031S	Minor Thesis	0 — 4
	Humanities — Advanced Elective**	3 — 0
		13 —12

ADDITIONAL FOR HONOURS
THIRD YEAR* — HONOURS COURSE
(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.101S	Mechanical Engineering Design	0 — 5
5.204S	Mechanical Technology	2 — 0
5.302S	Theory of Machines	1¾— 1¼
5.401S	Numerical Analysis	1 — ½
5.502S	Fluid Mechanics	1¼— 1¾
5.702S	Thermodynamics	1 — 2
6.801S	Electrical Engineering	1½— 2½
8.113S	Materials and Structures	1½— 1½
10.023S	Engineering Mathematics	1 — ½
51.011HS 52.011HS	History *or* Philosophy **	1½— 0
	Social Science Elective**	1½— 0
		14 —15

* Lectures cease at the end of the 3rd week of third term.
** Terms 1 and 2 only.

FOURTH YEAR—HONOURS COURSE

(30 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.103S	Mechanical Engineering Design	0 — 3
5.322S	Automatic Control Engineering	2¼ — ¾
5.305S	Theory of Machines	1¾ — 1¼
5.601S	Mechanical Engineering	4½ — 1½
6.802S	Electrical Engineering	1½ — 1½
10.371S	Statistics	1 — 1
5.021S	Seminar	0 — 1½
5.041	Thesis*	0 — 4
	Humanities — Advanced Elective**	3 — 0
		14 — 14½

DOUBLE DEGREE OF B.SC., B.E. IN MECHANICAL ENGINEERING

Full-time students in Mechanical Engineering may qualify for the double degree of Bachelor of Science, Bachelor of Engineering by completing the following course of study over five years.

First Year—Normal First Year programme for full-time Mechanical Engineering as set out above.

Second Year—As set out below.

		Terms 1 & 2	Term 3 Weeks 1-3	Term 3 Weeks 6-9
1.112	Physics II	8	8	8
4.911S	Materials Science	2½	2½	0
5.202S	Mechanical Technology	2	2	0
5.301	Engineering Mechanics	2	2	2
5.501	Fluid Mechanics	2	2	2
5.701	Thermodynamics	2	2	2
8.112	Materials and Structures	3	3	3
10.111	Pure Mathematics II†	5	5	5
50.111H / 57.011H	English *or* An Introduction to Modern Drama	3	0	0
		29½	26½	22

Third Year — Two appropriate Third Year Science subjects (see Science course regulations in the University Calendar), plus 51.011H History or 52.011H Philosophy and a Social Science Elective. In the long vacation following this year, students are required to undertake a nine-week period of industrial training.

* 28 hours per week for the final six weeks of third term are occupied in work for Thesis.

** Terms 1 and 2 only.

† 10.211 Applied Mathematics II may be substituted by selected students (7 hours per week for three terms).

Fourth Year — Normal Third Year of the Mechanical Engineering course less the Humanities taken in the special Third Year.

Fifth Year — Normal Fourth Year of the Mechanical Engineering course.

MECHANICAL ENGINEERING—PART-TIME COURSE

This course is of six years' duration, and leads to the degree of Bachelor of Science (Technology).

FIRST STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/1	Physics I, Part I	1½— 1½
2.001/1	Chemistry I, Part I	1½— 1½
5.001/1	Engineering I, Part I	1*— 2*
10.001/1	Mathematics I, Part I	2 — 1
		6 — 6

SECOND STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut
1.001/2	Physics I, Part II	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
5.001/2	Engineering I, Part II	2 — 1
10.001/2	Mathematics I, Part II	2 — 1
		7 — 5

THIRD STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.212	Physics II	1½— 1½
5.201	Mechanical Technology	1 — 0
5.301	Engineering Mechanics	1¼— ¾
8.112	Materials and Structures	1½— 1½
10.022/1	Mathematics	1½— ½
50.011H/1	English	1 — 0
		7¾— 4¼

* Hours for Terms 1 and 2 only; in Term 3 the three hours per week are devoted to drawing office work in Engineering Drawing.

FOURTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
4.911	Materials Science	1 — 1
5.101/1	Mechanical Engineering Design	0 — 2
5.203	Mechanical Technology	1 — 0
5.501	Fluid Mechanics	¾— 1¼
5.701	Thermodynamics	¾— 1¼
10.022/2	Mathematics	1½— ½
50.011H/2	English	1 — 0
		6 — 6

FIFTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.101/2	Mechanical Engineering Design	0 — 2
5.302	Theory of Machines	1½— 1
5.303	Mechanical Vibrations*	1½— 0
6.801	Electrical Engineering	1 — 2
8.133	Structures	1 — 1
5.023	Seminar**	0 — 1½
51.011H 52.011H	History *or* Philosophy	1 — 0
		6 — 7½

SIXTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.102	Mechanical Engineering Design	1 — 2
5.321	Automatic Control Engineering	1 — 0
5.502	Fluid Mechanics	1 — 1½
5.702	Thermodynamics	1 — 1½
6.802	Electrical Engineering	1 — 1
	Social Science Elective	1 — 0
		6 — 6

MECHANICAL ENGINEERING— COMBINED FULL-TIME/PART-TIME COURSE

The Mechanical Engineering course leading to the degree of Bachelor of Science (Technology) may be completed in three years of part-time study and two years of full-time study as follows.

Stage 1 — Part-time (as for the Stage 1 of the B.Sc. (Tech.) course in Mechanical Engineering).

* Term 1 only.

**Terms 2 and 3 only.

Stage 2 — Part-time (as for Stage 2 of the B.Sc. (Tech.) course in Mechanical Engineering).
Stage 3A — Full-time (as for Second Year of the full-time course in Mechanical Engineering).
Stage 4A — Full-time (as for Third Year of the full-time course in Mechanical Engineering).
Stage 5A — Part-time (as set out below).

STAGE 5A
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.102	Mechanical Engineering Design	1 — 2
5.303	Mechanical Vibrations*	1½— 0
5.321	Automatic Control Engineering	1 — 0
6.802	Electrical Engineering	1 — 1
		4½— 3

MECHANICAL ENGINEERING—CONVERSION COURSE
(A.S.T.C. Diploma to B.Sc. (Tech.) Degree)

Recent A.S.T.C. diploma holders in Mechanical Engineering may qualify for the degree of Bachelor of Science (Technology) by completing the following course of study. The programme outlined is what will be required of recent diplomates. Diplomates of many years' standing may be required to take additional subjects.

FIRST STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/2	Physics I, Part II	1½— 1½
1.212	Physics II(T)	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
10.022/2	Mathematics	2 — 0
52.011/H	Philosophy	1 — 0
		7½— 4½

SECOND STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.304	Theory of Machines**	1 — 1
5.503	Fluid Mechanics**	1 — 1
5.321	Automatic Control Engineering	1 — 0
	Social Science Elective	1 — 0
		4 — 2

* Term 1 only.
** 24 weeks only.

AERONAUTICAL ENGINEERING—PART-TIME COURSE

This course is of six years duration, and leads to the degree of Bachelor of Science (Technology). For outlines of the first two stages, see the Mechanical Engineering part-time course.

THIRD STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.212	Physics II	1½— 1½
4.911	Materials Science	1 — 1
5.301	Engineering Mechanics	1¼— ¾
8.112	Materials and Structures	1½— 1½
10.022/1	Mathematics	1½— ½
		6¾— 5¼

FOURTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.501	Fluid Mechanics	¾— 1¼
5.701	Thermodynamics	¾— 1¼
5.821	Aircraft Strength of Materials	1¼— ¾
6.801	Electrical Engineering	1 — 2
10.022/2	Mathematics	1½— ½
50.011H/1	English	1 — 0
		6¼— 5¾

FIFTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.302	Theory of Machines	1½— 1
5.702	Thermodynamics	1 — 1½
5.811	Aerodynamics	2 — 1
5.822	Aircraft Strength of Materials	1¼— ¾
50.011H/2	English	1 — 0
51.011H 52.011H	History *or* Philosophy	1 — 0
		7¾— 4¼

SIXTH STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.812	Aerodynamics*	2½— 1½
5.823	Aircraft Materials and Structures	2 — 1
5.831	Aircraft Propulsion	2 — 0
	Social Science Elective	1 — 0
		7½— 2½

AERONAUTICAL ENGINEERING— COMBINED FULL-TIME/PART-TIME COURSE

The Aeronautical Engineering course leading to the degree of Bachelor of Science (Technology) may be completed in three years of part-time study and two years of full-time study as outlined below.

STAGE 1(A)

(30 weeks full-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

STAGE 2(A)**

(24 weeks full-time course)

		Hours per week for 24 weeks lec. lab./tut.
1.212S	Physics	2 — 2½
4.911S	Materials Science	1¼— 1¼
5.202S	Mechanical Technology	2 — 0
5.301S	Engineering Mechanics	1½— 1
5.501S	Fluid Mechanics	1 — 1½
5.701S	Thermodynamics	1 — 1½
8.112S	Materials & Structures	2 — 2
10.022S	Mathematics	4 — 1
50.011H 57.011H	English *or* An Introduction to Modern Drama	3 — 0
		17¾—10¾

* Terms 1 and 2 only.

** Stage 2(A) is the same as the second year of the full-time Mechanical Engineering course.

STAGE 3(A)

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.302	Theory of Machines	1½— 1
5.702	Thermodynamics	1 — 1½
5.821	Aircraft Strength of Materials	1¼— ¾
6.801	Electrical Engineering	1 — 2
		4¾— 5¼

STAGE 4(A)

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.304S	Theory of Machines*	1 — 1
5.811	Aerodynamics	2 — 1
5.822	Aircraft Strength of Materials	1¼— ¾
51.011H 52.011H	History *or* Philosophy	1 — 0
	Social Science Elective	1 — 0
		6¼— 2¾

STAGE 5(A)

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.812	Aerodynamics†	2½— 1½
5.823	Aircraft Materials & Structures	2 — 1
5.831	Aircraft Propulsion	2 — 0
		6½— 2½

AERONAUTICAL ENGINEERING—CONVERSION COURSE

(A.S.T.C. Diploma to B.Sc. (Tech.) Degree)

Recent A.S.T.C. diploma holders in Aeronautical Engineering may qualify for the degree of Bachelor of Science (Technology) by completing the following course of study. The programme outlined is what will be required of recent diplomates. Diplomates of many years' standing may be required to take additional subjects.

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* 24 weeks only.

† Terms 1 and 2 only. (2½—4½ hours per week for third term.)

FIRST STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/2	Physics I, Part II	1½— 1½
1.212	Physics II(T)	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
	Social Science Elective	1 — 0
		5½— 4½

SECOND STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.702	Thermodynamics	1 — 1½
	Aerodynamics (Special)	1½— 1½
	Aircraft Structures (Special)*	1½— 1½
		4 — 4½

NAVAL ARCHITECTURE—PART-TIME COURSE

This course is of six years duration, and leads to the degree of Bachelor of Science (Technology). For outlines of the first two stages, see the Mechanical Engineering part-time course.

THIRD STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.212	Physics II	1½— 1½
5.901	Naval Architecture	2 — 2
8.112	Materials and Structures	1½— 1½
10.022/1	Mathematics	1½— ½
		6½— 5½

FOURTH STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
4.911	Materials Science	1 — 1
5.501	Fluid Mechanics	½— 1½
5.902	Naval Architecture	2½— 2½
10.022/2	Mathematics	1½— ½
50.011H/1	English	1 — 0
		6½— 5½

* 4 hours per week in third term.

FIFTH STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.502	Fluid Mechanics	1 — 1½
5.701	Thermodynamics	¾— 1¼
5.903	Naval Architecture	3 — 3
50.011H/2	English	1 — 0
51.011H 52.011H	History *or* Philosophy	1 — 0
		6¾— 5¾

SIXTH STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.904	Naval Architecture	3 — 5
6.801	Electrical Engineering	1 — 2
	Social Science Elective	1 — 0
		5 — 7

NAVAL ARCHITECTURE—
COMBINED FULL-TIME/PART-TIME COURSE

The Naval Architecture course leading to the degree of Bachelor of Science (Technology) may be completed in three years of part-time study and two years of full-time study as outlined below.

STAGE 1(A)

(30 weeks full-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

STAGE 2(A)

(24 weeks full-time course)

		Hours per week for 24 weeks lec. lab./tut.
1.212S	Physics II	2 — 2½
4.911S	Materials Science	1½— 1½
5.301S	Engineering Mechanics	1½— 1
5.501S	Fluid Mechanics	1 — 1½
5.901	Naval Architecture*	2 — 2
8.112S	Materials and Structures	2 — 2
10.022S	Mathematics	4 — 1
50.011H 57.011H	English *or* An Introduction to Modern Drama **	3 — 0
		16½—11½

STAGE 3(A)

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.502	Fluid Mechanics	1 — 1½
5.701	Thermodynamics	¾— 1½
5.902	Naval Architecture	2½— 2½
51.011H 52.011H	History *or* Philosophy	1 — 0
		5¼— 5½

STAGE 4(A)

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.903	Naval Architecture	3 — 3
6.801	Electrical Engineering	1 — 2
		4 — 5

STAGE 5(A)

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
5.904	Naval Architecture	3 — 5
	Social Science Elective	1 — 0
		4 — 5

* 30 weeks course.
** Terms 1 and 2 only.

NAVAL ARCHITECTURE—CONVERSION COURSE

(A.S.T.C. Diploma to B.Sc. (Tech.) Degree)

Recent A.S.T.C. diploma holders in Naval Architecture may qualify for the degree of Bachelor of Science (Technology) by completing the following course of study. The programme outlined is what will be required of recent diplomates. Diplomates of many years standing may be required to take additional subjects.

FIRST STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/2	Physics I, Part II	1½— 1½
1.212	Physics II(T)	1½— 1½
2.001/1	Chemistry I, Part I	1½— 1½
2.001/2	Chemistry I, Part II	1½— 1½
		6 — 6

SECOND STAGE
(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
4.911	Materials Science	1 — 1
5.021	Mechanical Technology	1 — 0
10.022/1	Mathematics	1 — 1
10.022/2	Mathematics	1½— ½
	Social Science Elective	1 — 0
		5½— 2½

Department of Industrial Engineering

The Department of Industrial Engineering offers a full-time and a part-time course in industrial engineering leading to the degree of Bachelor of Engineering and Bachelor of Science (Technology) respectively. These courses are designed for students with engineering ability whose interests lie in the planning, developing and control of manufacturing operations. Completion of either of these courses gives full exemption from associate membership examinations of the Institution of Engineers, Australia, and the Institution of Production Engineers. Completion of the full-time course is accepted by the Institution of Mechanical Engineers, London, in lieu of all examinations required for associate membership.

The first two years of the full-time course and the first four years of the part-time course provide the student with a sound foundation in the basic science and engineering subjects, and this knowledge is used and extended in the later years in the study of the industrial subjects. Finally, the problems associated with the practical economics of manufacturing operations are studied. These three fields of study provide the student with the training necessary to carry out an industrial job and to examine it critically in the light of economic efficiency.

Traditional engineering courses do not embrace the problems which are characteristic of industrial engineering. These problems include the analysis of a product to ensure satisfactory functioning with regard to methods and sequence of manufacturing operations; the disposition of buildings and of equipment in relation to buildings to permit efficient handling of materials; the avoidance or elimination of bottlenecks; the related problems of quality and cost control, testing and inspection; labour and personnel relations; and finally, the problem of distribution and sales.

The financial and economic aspects are studied as the problem in manufacturing has not been solved until the final translation of the product into money has been accomplished successfully. While it is not intended to develop an expert in accounting practice or economics it is intended to produce an engineer with an appreciation of the problems of cost and one who can apply considerations of ultimate economy to all industrial problems.

The full-time student gains practical experience in industry during the recess periods in the first, second and third years of the course.

Two-year courses leading to the degree of Master of Technology and a graduate diploma are also offered to graduates in engineering and related sciences. Details of these courses can be found in Section III of the University Calendar.

The work of the Industrial Engineer

The industrial engineer may initially be employed in any of the four major areas of industrial activity:—

a) Industrial Economic Analysis

One of the principal functions of industrial engineering is to analyse a product, project or process from the economic point of view to ensure that an adequate profit can be obtained from it. A general working knowledge of economics and management skill has to be directed towards the making of decisions on how to operate an enterprise most efficiently. The basis for such decisions is furnished largely by the application of mathematics and statistics to operations research, industrial marketing and other fields affecting all phases of operation of industry.

b) Planning and Control of Production

Manufacturing processes and operations must be planned in detail throughout an enterprise to ensure that they proceed smoothly and economically. Functions in this field include the establishment of production standards, the setting of production targets and, finally, control of quality.

The ultimate responsibility of those in charge of the planning and control of production is to ensure that the goods, as originally specified, perform satisfactorily and are produced when required at an optimum cost.

c) Product and Process Design

The design interest of the industrial engineer goes beyond normal mechanical design to develop a product that will not only function effectively but also have a pleasing appearance.

Further, the product has to be adapted to suit existing manufacturing equipment, or a manufacturing process has to be developed by means of which an existing product can be manufactured at the right price and at the right quality. The design work of the industrial engineer incorporates also problems of equipment selection and application for both economy and performance.

d) Methods Engineering

Methods engineering is particularly concerned with the co-ordination of men, materials and machines, so that an enterprise will run at maximum efficiency. A considerable knowledge of engineering in general, as well as an understanding of human factors and materials science, is necessary for methods engineering work. Time and motion study is part of methods engineering. In many cases the methods engineer works in close co-operation with the design department and executives engaged in industrial economic analysis.

Employment in any of the fields mentioned may lead to specialisation in the more mathematical aspects of industrial engineering, such as operations research and systems engineering or it may lead, according to the preference of the student, to a position of responsibility in industrial management.

INDUSTRIAL ENGINEERING—FULL-TIME COURSE

FIRST YEAR

(30 weeks day course)

		Hours per week for 3 terms lec. lab./tut.
1.001	Physics I	3 — 3
2.001	Chemistry I	3 — 3
5.001	Engineering I	3 — 3
10.001	Mathematics I	4 — 2
		13 —11

SECOND YEAR*
(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
1.212S	Physics	2 — 2½
4.911S	Materials Science	1½— 1½
5.202S	Mechanical Technology	2 — 0
5.301S	Engineering Mechanics	1½— 1
5.501S	Fluid Mechanics	1 — 1½
5.701S	Thermodynamics	1 — 1½
8.112S	Materials and Structures	2 — 2
10.022S	Mathematics	2½— 2½
50.011H / 57.011H	English *or* An Introduction to Modern Drama †	3 — 0
		16½—12½

THIRD YEAR*—PASS COURSE
(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.101A	Mechanical Engineering Design	0 — 3
5.302S	Theory of Machines	1¾— 1¼
6.801S	Electrical Engineering	1½— 2½
10.381S	Statistics	1 — 1
18.111S	Industrial Administration	1 — 0
18.211S	Production Control	2½— 1
18.311S	Methods Engineering	3 — 1
18.411S	Design for Production I	3 — 1
51.011HS / 52.011HS	History *or* Philosophy †	1½— 0
	Social Science Elective†	1½— 0
		16¾—10¾

FOURTH YEAR*—PASS COURSE
(24 weeks dav course)

		Hours per week for 24 weeks lec. lab./tut.
5.304S	Theory of Machines	1 — 1
5.321S	Automatic Control Engineering	1 — ½
6.802S	Electrical Engineering	1½— 1½
14.061	Accounting	1 — 0
14.062	Accounting for Engineers	3 — 0
14.041	Industrial and Commercial Law	1 — 0
18.412S	Design for Production II	2 — 2
18.511S	Industrial Marketing	1 — 1
18.611S	Engineering Economic Analysis	1 — 1
18.031S	Minor Thesis	0 — 3
	Humanities — Advanced Elective†	3 — 0
		15½—10

* Lectures cease at the end of the 3rd week of third term.
† Terms 1 and 2 only.

ADDITIONAL FOR HONOURS

THIRD YEAR*—HONOURS COURSE

(24 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.101A	Mechanical Engineering Design	0 — 3
5.302S	Theory of Machines	1¾— 1¼
6.801S	Electrical Engineering	1½— 2½
10.381S	Statistics	1 — 1
12.121S	Psychology	3 — 0
18.111S	Industrial Administration	1 — 0
18.211S	Production Control	2½— 1
18.311S	Methods Engineering	3 — 1
18.411S	Design for Production I	3 — 1
51.011HS 52.011HS	History *or* Philosophy **	1½— 0
	Social Science Elective**	1½— 0
		19¾—10¾

FOURTH YEAR†—HONOURS COURSE

(30 weeks day course)

		Hours per week for 24 weeks lec. lab./tut.
5.304S	Theory of Machines	1 — 1
5.322S	Automatic Control Engineering	2¼— ¾
6.802S	Electrical Engineering	1½— 1½
14.061	Accounting	1 — 0
14.062	Accounting for Engineers	3 — 0
14.041	Industrial and Commercial Law	1 — 0
18.412S	Design for Production II	2 — 2
18.511S	Industrial Marketing	1 — 1
18.611S	Engineering Economic Analysis	1 — 1
18.291S	Professional Elective	3 — 0
18.041	Thesis and Project†	0 — 1
	Humanities—Advanced Elective**	3 — 0
		19¾— 8¼

DOUBLE DEGREE OF B.SC., B.E. IN INDUSTRIAL ENGINEERING

Full-time students in industrial engineering may qualify for the double degree of Bachelor of Science, Bachelor of Engineering by completing the following course of study over five years.

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* Lectures cease at end of 3rd week of third term.

** Terms 1 and 2 only.

† 28 hours per week for the final 6 weeks of third term are occupied in work on a thesis and a project.

First Year — Normal first year programme for full-time Industrial Engineering as set out above.

Second Year — As set out below.

		Terms 1 & 2	Term 3 Weeks 1-3	Term 3 Weeks 4-9
1.112	Physics II	8	8	8
4.911S	Materials Science	2½	2½	0
5.202S	Mechanical Technology	2	2	0
5.301	Engineering Mechanics	2	2	2
5.501	Fluid Mechanics	2	2	2
5.701	Thermodynamics	2	2	2
8.112	Materials and Structures	3	3	3
10.111	Pure Mathematics II*	5	5	5
50.011H / 57.011H	English *or* An Introduction to Modern Drama	3	0	0
		29½	26½	22

Third Year — Two appropriate third year Science subjects (see Science course regulations in the University Calendar), plus 51.011H History or 52.011H Philosophy and a Social Science Elective. In the long vacation following this year students are required to undertake a nine-week period of industrial training.

Fourth Year — Normal third year of the Industrial Engineering course less the Humanities taken in the special third year.

Fifth Year — Normal fourth year of the Industrial Engineering course.

INDUSTRIAL ENGINEERING—PART-TIME COURSE

This course is of six years' duration, and leads to the degree of Bachelor of Science (Technology).

FIRST STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/1	Physics I, Part I	1½— 1½
2.001/1	Chemistry I, Part I	1½— 1½
5.001/1	Engineering I, Part I†	1 — 2
10.001/1	Mathematics I, Part I	2 — 1
		6 — 6

* 10.211 Applied Mathematics II may be substituted (7 hours per week for three terms).

† Hours for Terms 1 and 2 only; in Term 3 the three hours per week are devoted to drawing office work in Engineering Drawing.

SECOND STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.001/2	Physics I, Part II	1½ — 1½
2.001/2	Chemistry I, Part II	1½ — 1½
5.001/2	Engineering I, Part II	2 — 1
10.001/2	Mathematics I, Part II	2 — 1
		7 — 5

THIRD STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
1.212	Physics	1½ — 1½
5.301	Engineering Mechanics	1¼ — ¾
8.112	Materials and Structures	1½ — 1½
10.022/1	Mathematics	1½ — ½
18.111/1	Industrial Administration, Part I	1 — 0
50.011H/1	English	1 — 0
		7¾ — 4¼

FOURTH STAGE

(30 weeks part-time course)

		Hours per week for 3 terms lec. lab./tut.
4.911	Materials Science	1 — 1
5.101/1	Mechanical Engineering Design	0 — 2
5.501	Fluid Mechanics	¾ — 1¼
5.701	Thermodynamics	¾ — 1¼
10.022/2	Mathematics	1½ — ½
18.111/2	Industrial Administration, Part II	1 — 0
50.011H/2	English	1 — 0
		6 — 6

FIFTH STAGE

(30 weeks part-time course)

		Hours per week for— Terms 1 & 2 lec. lab./tut.	Term 3 lec. lab./tut.
5.302	Theory of Machines	1½ — 1	1½ — 1
6.801	Electrical Engineering	1 — 2	1 — 2
10.381S	Statistics*	2 — 0	2 — 0
18.221	Production Control	1½ — 0	2 — 1
18.421	Design for Production I	1 — 1	2 — 1
51.011H 52.011H	History *or* Philosophy	1 — 0	1 — 0
		8 — 4	9½ — 5

* 24 weeks only.

SIXTH STAGE

(30 weeks part-time course)

		Hours per week for— Term 1 lec. lab./tut.	Terms 2 & 3 lec. lab./tut.
5.321	Automatic Control Engineering	1 — 0	1 — 0
6.802	Electrical Engineering	1 — 1	1 — 1
18.321	Methods Engineering	1 — 1	1 — 1
18.422	Design for Production II	1 — 1	2 — 1
18.521	Industrial Marketing	1 — 0	1 — 0
18.621	Engineering Economics	2 — 1	1 — 1
	Social Science Elective	1 — 0	1 — 0
		8 — 4	8 — 4

INDUSTRIAL ENGINEERING—

COMBINED FULL-TIME/PART-TIME COURSE

The Industrial Engineering course leading to the degree of Bachelor of Science (Technology) may be completed in three years of part-time study and two years of full-time study as follows:

Stage 1 — Part-time (as for Stage 1 of the B.Sc. (Tech.) course in Industrial Engineering).

Stage 2 — Part-time (as for Stage 2 of the B.Sc. (Tech.) course in Industrial Engineering).

Stage 3A — Full-time (as for Second Year of the full-time course in Industrial Engineering).

Stage 4A — Full-time (as for Third Year of the full-time course in Industrial Engineering).

Stage 5A — Part-time (as set out below).

STAGE 5A

(30 weeks part-time course)

		Hours per week for— Term 1 lec. lab./tut.	Terms 2 & 3 lec. lab./tut.
5.321	Automatic Control Engineering	1 — 0	1 — 0
6.802	Electrical Engineering	1 — 1	1 — 1
18.422	Design for Production II	1 — 1	2 — 1
18.521	Industrial Marketing	1 — 0	1 — 0
18.621	Engineering Economics	2 — 1	1 — 1
		6 — 3	6 — 3

SCHOOL OF CIVIL ENGINEERING

Civil Engineering Undergraduate Subjects

8.011S Minor Thesis

For pass students in the full-time courses in Civil Engineering and Surveying.

8.021 Major Thesis

For honours students in the full-time courses in Civil Engineering and Surveying.

8.111 Engineering Mechanics

The syllabus of this subject constitutes part (*c*) of 5.001 Engineering I taken by students in the Common First Year.

8.112 and 8.112S Materials and Structures

96 hours, comprising 48 hours' lectures, 48 hours' tutorial and laboratory

Theory of Structures

Moduli of elasticity, simple stress and strain. Stresses in non-uniform bars, compound bars, temperature stresses. Thin shells.

Principal stresses. Mohr's circle of stress. Strain at a point. Poisson's ratio. Relationship between moduli of elasticity.

Axial force, shear force, bending moment and torque. Expression as function of position. Graphical representations. Relationship between load, shear force and bending moment. Moments of inertia, parallel axis theorem, principal moments of inertia.

Stresses due to axial force, bending moment (brief treatment of non-uniplanar bending), shear force, and torsion (circular sections only).

Deformation due to axial force, shear force (brief mention), bending moment and torsion. Relationship between bending moment, slope and deflection. Differential equations of simple beam theory. Area moment theorems. Fixed ended beams.

Strain energy due to axial force, shear force, bending moment and torsion. Deflections at a single load. Shock loads, helical and flat leaf springs.

Theory of centrally loaded column (Euler's formula) and eccentrically loaded columns (recent formula).

Properties of Materials

Principles of engineering laboratory practice, types of testing machine, precision of measurement, theory of errors. Load-deformation behaviour of engineering materials under tension, compression, shear. Impact, hardness, fatigue, creep.

Laboratory work including tension, compression, hardness and impact tests with metals, experiments in flexure and torsion.

8.113S Materials and Structures

Syllabus as for 8.133 Structures (page 79).

8.121 Structures

90 hours, comprising 45 hours' lectures, 45 hours' tutorials

Relation between design, analysis and proportioning. Brief review of design principles—dead and live loads; equivalent uniform loads, factors of safety; load factors. Structural hazards—excessive deflection, instability, fire resistance, corrosion, decay.

Factors affecting design—erection and transport, availability of materials and plant.

Design procedure—specification, drawings. Design of riveted joints. Design of welded joints. Design of columns and struts, plated I-section columns. Brief mention of Perry-Robertson and straight line formulae. Design of beams, plated beams and plate web girders. Design of roof trusses. Reinforced concrete design applied to statically determinate structures. Simple beams and slabs, tee-beams, doubly reinforced beams, concentrically and eccentrically loaded columns. Column footings.

8.122S Structures

144 hours, comprising 72 hours' lectures, 72 hours' tutorials

Relation between design, analysis and proportioning. Brief review of design principles—dead and live loads, equivalent uniform loads, factors of safety; load factors.

Structural hazards—factors affecting design. Design procedure—specifications, drawings. Design of riveted and welded joints.

Design of columns and struts, plated I-section columns. Brief mention of Perry-Robertson and straight line formulae.

Design of steel beams—plated beams, plate web girders. Design of roof trusses.

Reinforced concrete design applied to statically determinate structures. Simple beams and slabs, tee-beams, doubly reinforced beams, concentrically and eccentrically loaded columns. Column footings.

Influence lines for statically determinate structures. Three-moment equations applied to beams with non-deflecting supports (brief treatment). Moment—distribution. Stiffness and carry-over, solution of continuous beams.

Introduction to three-dimensional statics. Composition and resolution of forces, moment of an oblique force about any axis, equations of equilibrium.

Strain energy methods for the solution of one-fold statically indeterminate rigid frame and pin-jointed truss problems. Determination of deflections using unit load method; Castigliano's theorems. Williot-Mohr diagrams.

8.131 Structures

120 hours, comprising 60 hours of lectures, 60 hours of tutorials

Influence lines for statically determinate structures. Strain energy theory, application to solution of statically indeterminate structures, rigid frames and pin-jointed truss problems. Deflections by unit load method. Williot-Mohr diagram for deflections of trusses. Solution of rigid frames by slope deflection and moment distribution, including the problem of sidesway. Analysis of arches, three pinned, two pinned and fixed ended arches.

Timber design, special characteristics of timber. Joints in timber: bolted joints, timber connectors. Beams and columns. Timber structures.

Retaining walls and small dams.

Design of continuous structures in reinforced concrete. Continuous beams and slabs, simple continuous frame.

Introduction to prestressed concrete. Pre-tensioning and post-tensioning. Design of simple beams and columns.

8.132S Structures

120 hours, comprising 48 hours of lectures, 72 hours of tutorials

Analysis of rigid frames by slope deflection and moment distribution. Treatment of sidesway.

Analysis of arches.

Timber design, special characteristics of timber. Joints in timber: bolted joints, timber connectors. Beams and columns. Timber structures.

Space frames, analysis by tension coefficients. Non-uniplanar bending. Shear centre. Torsion of non-circular sections.

Retaining walls and small dams.

Design of continuous structures in reinforced concrete.

Continuous beams and slabs, simple continuous frame.

Introduction to ultimate load method in reinforced concrete design.

Plastic analysis of simple steel structures.

Introduction to model analysis. Müller-Breslau principle, spline models. Begg's apparatus.

8.133 Structures

(Mechanical Engineering and Mining Engineering)

72 hours, comprising 36 hours' lectures and 36 hours' tutorials

Relation between design, analysis and proportioning. Dead loads, live loads, equivalent uniform loads, factors of safety, load factors. Structural hazards—factors affecting design. Codes of practice. Design procedures, specifications and drawings. Design of riveted and welded joints. Design of columns and struts, plated I-section columns. Brief mention of Perry-Robertson and straight line formulae. Roof trusses. Design of various members and connections. Approximate analysis of knee-braced bent. Influence lines for statically determinate structures. Theorem of three-moments (brief treatment). Beams and girders—design of plated girders, plate web girders. Crane runway girders.

8.134 Structures

(An elective course for honours students in Civil Engineering)

8.141 Engineering Computations

30 hours, comprising 20 hours of lectures, 10 hours of tutorials

Construction of intercept charts for three or more variables.

Construction of nomograms.

Solution of algebraic and transcendental equations by simple iteration methods—horizontal iteration, Newton Raphson method.

Introduction to finite differences. Theorems and proofs in difference calculus to be given only if essential for application. Solution of differential and partial differential equations by using differences. Application to instability problems.

Relaxation methods applied to solution of problems involving differential equations such as Poisson's equation using the previous work.

8.142S Engineering Computations

48 hours, comprising 24 hours of lectures, 24 hours of tutorials

Construction of intercept charts for three or more variables.

Construction of nomographic charts by use of determinants.

Solution of algebraic and transcendental equations by simple iteration methods—horizontal iteration, Newton Raphson method.

Brief introduction to matrices—multiplication, inversion. Solution of linear simultaneous equations—(*a*) by Cholesky (Crout) method, and (*b*) by relaxation.

Introduction to finite differences. Theorems and proofs in difference calculus to be given only if essential for application. The difference equation. Solution of differential and partial differential equations by using differences. Application to instability problems.

Relaxation methods applied to solution of problems involving differential equations such as Poisson's equation, using the previous work.

8.211 Materials for Architects

(A materials technology course for students in Architecture comprising the syllabus for Building Science IIB)

Section 1. General Materials Technology

A course comprising 15 hours' lectures, 15 hours' laboratory work

An introductory course on the mechanics of materials. The load-deformation behaviour of engineering materials is considered with reference to the use of materials in structures, and to materials laboratory practice. Special emphasis is made of the need for efficient utilisation of materials with reference to strength, durability, appearance and economy.

Section 2. Concrete Technology

This section consists of 10 hours of lectures and 20 hours of laboratory work serving as an introduction to Concrete Technology, as follows:—

Principal types of cements, their properties and simple testing; cement handling and storage. Concrete aggregates, characteristics, grading and testing. Admixtures. Factors affecting concrete properties. Basic concrete mix requirements and mix design methods. The manufacture of concrete and job control.

Laboratory work includes the testing of cement, aggregate and concrete, and the examination of concrete mix design techniques, workability, yield, and air entrainment.

8.221 and 8.221S Engineering Materials

Total hours: 132 (approximately)

(a) Concrete Technology (48 hours, comprising 24 hours' lectures, 24 hours' laboratory). Materials used in modern concretes, physical and chemical properties of cements; production, testing and selection of aggregates; pozzolans, admixtures. Workability, strength and other properties of concrete and factors affecting these. Target strengths and the design and proportioning of mixes.

Laboratory work—Cement and aggregate tests; examination of factors influencing workability and strength properties of concrete; mix design procedure.

(b) Soil Mechanics (48 hours, comprising 24 hours' lectures, 24 hours' laboratory). Physical and mechanical properties affecting capillarity and compressibility and their application in practical problems relative to seepage, uplift and the settlement of buildings located above buried compressible soil strata; shearing strength, bearing capacity and earth pressure, and their application to engineering problems, including retaining walls.

Laboratory work—Soil identification and testing of physical properties.

(c) Metallurgy (36 hours, comprising 30 hours' lectures, 6 hours' demonstrations). The atomic structure of metals. The grain structure of metals; origin; effects of manufacturing processes. Structure of alloys—theory. Structure, properties and heat treatment of commercially important alloys, based on aluminium, copper and iron in particular. The selection and properties of structural steels. Corrosion.

Laboratory work—Experiments and demonstrations illustrating the lecture course.

8.222 Engineering Materials

Total hours: 60

(a) Concrete Technology (30 hours, comprising 20 hours' lectures, 10 hours" laboratory). Significance and measurement of permeability, durability, elastic modulus, creep and other concrete properties; factors affecting these and concrete volume changes. Design and proportioning of concrete mixes by different basic approaches; design and characteristics of special lightweight concrete. Manufacture and field control.

Laboratory work—Design of special concretes and examination of properties.

(b) Soil Mechanics (30 hours of lectures). Studies of theoretical

and applied sections of soil mechanics relating to foundations and earth dams. Treatment of modern soil technology studies and stabilisation work.

8.223S Engineering Materials

Total hours: 132

(a) Concrete Technology, etc. (44 hours, comprising 24 hours' lectures, 20 hours' laboratory). Significance and measurement of permeability, durability, elastic modulus, creep and other concrete properties; factors affecting these and concrete volume change. Effect of creep and drying shrinkage on stress distribution of structural concrete; thermal effects. Design and proportioning of concrete mixes by different basic approaches. Design and characteristics of special concretes for high strength, mass and lightweight. Manufacture and field control.

Laboratory work—Design of special concretes and examination of properties. Design, manufacture and testing of reinforced concrete beams to meet particular requirements.

(b) Soil Mechanics (44 hours, comprising 24 hours' lectures, 20 hours' laboratory). Advanced studies of theoretical and applied sections of soil mechanics, including foundations, mass soil behaviour, tunnels and arching, stability of slopes, earth dams, soil technology and stabilisation work.

Laboratory and design office work—Shear testing and other advanced soil investigations; stability of earth dams and other soil retaining structures.

(c) Properties of Materials (44 hours, comprising 24 hours' lectures, 20 hours' laboratory). Elastic and inelastic behaviour of materials; theories of failure; design factors. Non-destructive test procedures. Experimental stress analysis methods.

Wood technology and miscellaneous materials. Structure and mechanical properties of timber. Fungus and termite attack and methods of preservation. Fire resistances. Properties of laminated sections. Properties and use of structural aluminium alloys, plastic materials and some clay products.

Laboratory work includes tests on timbers and wires, creep experiments and work with wire resistance strain gauges.

8.241 and 8.241S Soil Mechanics

(A course for students in Surveying)

8.242S Soil Mechanics for Building

Determination of simple soil properties—void ratio, porosity, unit weight, degree of saturation. Formation and classification of soils, classification tests. Fundamental characteristics of soils—clay mineralogy. Compaction—standard laboratory tests, field control. Permeability—Darcy's Law, laboratory determination of permeability, stratification. Pore pressure and effective stress, seepage pressure, critical hydraulic gradient. Compression of soils—laboratory methods, simple settlement analysis. Retaining walls

—outline of classical theories, simple examples. Introductory foundation analysis. Principles of shear strength and application to slope stability.

Laboratory Work

Determination of combined consistency limits. Mechanical analysis using sieves and hydrometer. Standard compaction test. One-dimensional consolidation test. Direct shear test.

8.251 Properties of Materials

(A course for students in Industrial Arts comprising 24 hours' lectures, 36 hours' laboratory work)

Introductory mechanics and strength of materials. The theoretical and practical investigation of the mechanical properties of metals and metallic structures. An introduction to laboratory techniques, theory of errors, and non-destructive test methods.

8.411 Surveying

(A course of 30 hours' lectures and field work for Architecture students)

Introduction, chaining, methods of measurement, corrections, chain surveys. Level, differential levelling, booking. Contours, volumes of earthworks. Theodolite, methods of reading angles, applications in building. Traversing, setting out.

8.421 Engineering Surveying

(A course for part-time students in Civil Engineering)

8.421S Engineering Surveying

72 hours, comprising 36 hours of lectures and 36 hours of field work

History and development of surveying; types of survey; introduction to errors. Linear measurement, chaining and chainage corrections; accuracy. Chain surveys. Surveying instruments. The level, differential levelling; errors. Grading; volumes of earthworks; prismoidal and mean end area formulae. Contouring; use of mass diagram. Traversing; the compass; the theodolite. Misclose, adjustment of traverses. Calculation of areas. Setting out; horizontal circular curves. Tacheometry; stadia theory and formulae. The plane table. Nature, causes and classes of errors of measurement, linear and angular.

A survey camp of one week in Third Term is part of this course.

8.422 Engineering Surveying

30 hours of lectures and 15 hours of field work

Geodetic surveying; implications and instruments used. Adjustments. Control surveys, horizontal control by triangulation, by baseline measurement or by traversing. Vertical control by differential levelling, trigonometric or barometric levelling. Spherical trigonometry. Elementary astronomy. Setting out of engineering works; curves; transition curves. Elements of map projection. Outline of photogrammetry. Survey laws and regulations.

A survey camp of one week in Third Term is part of this course.

8.423S Engineering Surveying

72 hours, comprising 36 hours of lectures and 36 hours of field work

Geodetic surveying; implications and instruments used. Adjustments. Control surveys, horizontal control by triangulation, by baseline measurement or by traversing. Vertical control by differential levelling; trigonometric or barometric levelling. Spherical trigonometry. Elementary astronomy; solar and stellar observations; latitude, time and azimuth. Setting out of engineering works; curves; transition curves. Introduction of the theory of map projection.

Elements of photogrammetry; photo-interpretation.

Engineering computations; centre point quadrilateral, strength of figures, adjustment of networks, baselines.

Outline of survey laws and regulations.

A survey camp of one week in Third Term is part of this course.

8.424 Engineering Surveying

(An elective course for honours students in Civil Engineering or Surveying)

8.521 Hydraulics

60 hours, comprising 30 hours' lectures, 30 hours' tutorial and laboratory

Dimensional analysis, hydraulic model theory, surface resistance in flow in pipes and channels.

Pipe networks, waterhammer. Channel flow, steady non-uniform flow. Flow measurement.

Hydraulic machinery, characteristic curves.

Graphical flow nets, percolation.

8.522S Hydraulics

72 hours, comprising 36 hours' lectures, 36 hours' tutorial and laboratory

Dimensional analysis, hydraulic model theory, scale effect, distorted models. Fluid turbulence, velocity distribution, surface resistance, in flow past plane boundaries and in pipes and channels.

Pipe flow, pipe networks, waterhammer. Channel flow, steady non-uniform flow, backwater curves, hydraulic jump, unsteady flow, waves, flood routing. Flow measurement.

Hydraulic machinery, radial and axial flow, characteristic curves, cavitation.

Potential flow, flow nets, percolation.

8.524 Hydraulics

(An elective course for honours students in Civil Engineering)

8.611 and 8.611S Civil Engineering

Total hours: 60

(a) Public Health Engineering (24 hours of lectures). Processes of decomposition and decay; chemical and biochemical measurement of degree of pollution; B.O.D.; rates of biochemical oxidation; basic principles of the treatment of polluted waters.

Water supply schemes; collection and distribution of water; principles and practice of water treatment; sewerage systems; construction of sewers; pumping stations; sewage treatment and disposal; swimming pools; refuse disposal.

(b) Engineering Hydrology (36 hours of lectures). A basic course in Engineering Hydrology dealing with principles and modern techniques. Topics covered are:—Meteorology, climatology, evaporation, analysis of hydrologic data, stream gauging, the runoff process, infiltration, design storm synthesis, unitgraphs, synthetic unitgraphs, flood frequency studies, rational method, urban drainage design, streamflow routing, water balance, water losses, rainfall runoff relationships, stream flow correlations, storage determination, groundwater.

8.612 Civil Engineering

Total hours: 60

(a) Road Engineering (20 hours of lectures). Road location and surveys under urban and rural conditions, road design standards, geometrical design, road alignment, design of curves and intersections: types and functions of pavements. Concrete, bituminous and stabilised construction: culverts, road plant. Pavement thickness. Road maintenance. Urban stormwater drainage. Economic analysis of routes and schemes.

(b) Engineering Construction and Administration (35 hours of lectures). Construction plant and equipment; compressed air, drilling and tunnel equipment, earthmoving plant, hoisting and conveying equipment, pumping and pile-driving, plant, workshop plant. Construction methods; earthworks foundations, cofferdams, caissons, piling, steel, timber, and concrete construction. Prestressed concrete, bridges, wharves, dams, pipelines and multistoreyed buildings.

Engineering administration; contracts, tenders, contract documents, estimates, quantities, specifications, costing, financial comparison of projects, personnel, management and organisation.

(c) Irrigation Engineering (5 hours of lectures). Natural and artificial irrigation; sources of water, water requirements, methods

of application to land. Soil deterioration. Investigation and design of irrigation systems, water metering. Maintenance and operation of irrigation systems.

8.613 and 8.613S Civil Engineering

Total hours: 108

(a) Roads and Railway Engineering (30 hours of lectures). Road location and surveys under urban and rural conditions. Road design standards, geometrical design, road alignment design of curves and intersections; types and functions of pavements. Concrete bituminous and stabilised construction; culverts, road plant. Pavement thickness. Road maintenance. Urban stormwater drainage. Economic analysis of routes and schemes.

Railway engineering: Permanent way. Track ballasting, points and crossings. Signalling, special structures, rolling stock, general.

(b) Irrigation, Hydro-electric, and Harbours and Rivers Engineering (20 hours of lectures). Natural and artificial irrigation; sources of water, water requirements, methods of application to land. Soil deterioration. Investigation and design of irrigation systems, water metering. Maintenance and operation of irrigation systems.

Hydro-electric power schemes, combined thermal and hydro systems. Hydro-electric potential, determination of storage requirements and plant capacity.

Natural and artificial harbours, training of river estuaries, tides and wave action, docks, wharves, slipways; sea-bed exploration, hydrographic surveying.

(c) Engineering Construction and Administration (58 hours of lectures). Construction plant and equipment; compressed air drilling and tunnel equipment, earthmoving plant, hoisting and conveying equipment, pumping and pile-driving plant. Construction methods; earthworks, foundations, coffer-dams, caissons, piling, steel, timber and concrete construction. Bridges, wharves, dams, pipelines and multi-storeyed buildings.

Engineering administration; contracts, tenders, contract documents, estimates, quantities, specifications, costing financial comparison of projects, management and organisation.

Surveying Undergraduate Subjects

8.811 and 8.811S Surveying

48 hours, comprising 24 hours of lectures and 24 hours of field work

Barometric levelling. Plane tabling. Transition curves. Underground surveys. Transferring azimuth and levels from surface to underground. Elementary theory of tides; hydrographic surveys. Surveys for engineering projects. Torrens title and Old System title surveys. Identification surveys. A survey camp of two weeks in Third Term is part of this course.

8.812 and 8.812S Surveying

48 hours, comprising 24 hours' lectures and 24 hours' tutorial

Topics to be selected from the following:—

Techniques in field surveying; topographical surveys. Modern developments in field equipment; distance measurement by optical means, rangefinders, tacheometers with horizontal staffs, electronic distance measurement.

Problems in the setting out of engineering works; use of the phototheodolite for surface and sub-surface observations. Measurement of the movement of large engineering structures such as dams and bridges. Special problems connected with geophysical and magnetic investigations.

8.821 and 8.821S Geodesy

108 hours, comprising 36 hours of lectures, 72 hours of tutorial and field work

Historical outline. Figure of the earth and its mathematical representation. Special topics of differential geometry. Numerical and graphical aids for geodetic computations. Theory of adjustments; rigorous and approximate methods, accuracy of adjusted observations and co-ordinates.

Legendre's theorem; reduction to sea level; plumbline deviation and Laplace's equation. General introduction. Major control surveys. Triangulation; baseline measurements; trigonometrical levelling. Introduction of special conditions of adjustment. Adjustment in phases. A survey camp of two weeks' duration is to be attended in Third Term.

8.822 and 8.822S Geodesy

48 hours, comprising 24 hours of lectures and 24 hours of tutorial

Trilateration, instruments, precise traversing, precise levelling, orthometric and dynamic corrections. Adjustments. Calculation of latitude, longitude, reversed azimuth and allied problems. Setting out of parallels, meridians, and oblique arcs, magnetic surveys.

8.823 Geodesy

(An elective course for honours students in Surveying)

8.831 and 8.831S Astronomy

72 hours, comprising 48 hours of lectures and 24 hours of tutorial

Spherical trigonometry; explanation of terms used in astronomy. The solar system. Elementary differential spherical trigonometry. Effects of instrumental misadjustments. The star almanac for land surveyors. Determination of latitude, longitude and azimuth. Elementary study of position lines. A survey camp of two weeks' duration is to be attended in Third Term.

8.832 and 8.832S Astronomy

48 hours, comprising 30 hours of lectures and 18 hours of tutorial

Reduction of mean to apparent place. Precession of the equinoxes. Annual and diurnal aberration; curvature. Detailed study of precise observations for the determination of latitude, longitude and azimuth.

Radio time signals; reception and recording. Position lines and the astrolabe. The Laplace equation.

8.841 and 8.841S Survey Computations

48 hours, comprising 24 hours of lectures and 24 hours of tutorial

Revision of trigonometry. Reference to closes and missing lines. Calculations in connection with areas and dimensions of plane figures having rectilinear or curved boundaries; cutting-off areas. Problems involving roads of different widths; re-fixing old corners; typical field calculations including curve problems. Urban subdivisions and calculations associated with such subdivisions.

8.842 and 8.842S Survey Computations

48 hours, comprising 30 hours of lectures and 18 hours of tutorial

Use of calculation machines and forms; various methods of computation of co-ordinates in traverses, resections, intersections. Adjustments of minor control surveys; calculation of standard ellipses, satellite stations, use of planimeters, transformations.

8.851 and 8.851S Photogrammetry

90 hours, comprising 36 hours of lectures and 54 hours of tutorial and laboratory

Introduction to optics and photography, definition of terms; perspective geometry; vision, stereoscopy, binocular vision, artificial stereoscopic vision, stereoscopes; anaglyphs; stereoscopic measurements, floating marks.

Restitution of photographs; co-ordinate systems, relative orientation. Relation between vertical parallax and elements of orientation; model deformations; approximate plotting instruments.

8.852 and 8.852S Photogrammetry

60 hours, comprising 24 hours of lectures and 36 hours of tutorial and laboratory

Cameras, phototheodolites and aerial cameras; principles of camera calibration, definitions, determination of optical performance; aerial photography, flight planning, technical specifications; camera orientation in flight.

Photogrammetric triangulation, radial triangulation, triangulation in space; stereoplotting instruments; ground control surveys.

Application of photogrammetry to map making.

8.853 Photogrammetry

(An elective course for honours students in Surveying)

8.861 and 8.861S Cartography

72 hours, comprising 24 hours of lectures and 48 hours of tutorial

Use and care of equipment; conventional signs; line work and lettering; size of type of different plans; plotting from field notes; tinting and colouring. Levels; plotting longitudinal and cross sections; grading; mechanical methods of enlargement and reduction of plans; plotting notes of a tacheometer survey; contouring; technical description of boundaries; plotting from descriptions; preparation of plans for lodging at Land Titles Office and Lands Department; use of planimeter; map reading; searching, obtaining survey information.

8.862 and 8.862S Cartography

48 hours of lectures

Map compilation. Purpose and scope. Theory of photolithographic process; map characteristics; production planning; drafting; assessment of basic data for compilation; copy correction; colour separation; process photography; negative corrections and layouts; plate graining; plate processing; cameras; offset printing.

Map projections. General introduction. Theory and construction. The common projections. Conversion of grid co-ordinates to geographical co-ordinates and vice versa. Computations on the projections.

8.871 and 8.871S Land Utilisation

48 hours, comprising 36 hours of lectures and 12 hours of tutorial

Climate; climate and vegetation; types and properties of soil and their relation to physiographical facts and effect on land use; soil erosion; administrative approach to soil conservation; methods of combating erosion; farm products in relation to soil; grass lands; economics of land subdivision (rural); forestry in relation to land use; principles of afforestation; timbered lands in New South Wales; distribution of the principal timber species in New South Wales; identification of native trees; uses of timber.

8.872 and 8.872S Land Valuation

24 hours of lectures

General principles. Rural valuations; carrying and yielding capacity; cost of development; unimproved capital value and improved capital value; valuation of leasehold and freehold land. Urban valuations; sub-divisional value of land; Acts and Regulations affecting land values; depreciation and obsolescence; court procedure and court decisions.

8.881 and 8.881S Survey Laws and Regulations

36 hours of lectures

Outline and history of law. Systems of tenure; law relating to boundaries and easements. Common Law, Statute Law, Equity, Case Law; Acts and Regulations relating to land; searching and obtaining survey information; court decisions; survey practice law; surveyor's rights, powers and duties.

8.891 and 8.891S Theory of Instruments

Theory of optical instruments. Stops—photometry aberrations (chromatic, spherical, and off-axis).

Design of simple optical instruments.

Theory of making lenses, flats and prisms. Manufacture and test. Optical components.

SCHOOL OF ELECTRICAL ENGINEERING

Electrical Engineering Undergraduate Subjects

6.001S Electrical Engineering

80 hours' lectures

(A course of lectures for both pass and honours Electrical Engineering students)

A course of lectures together with appropriate laboratory work covering advanced circuit theory, analysis and synthesis, electrical measurements, and electric and magnetic field theory.

The laboratory work in Electrical Measurements is part of the co-ordinated laboratory/tutorial course arranged to serve this subject and the subject 6.322S Electronics.

6.051 Electrical Engineering

90 hours' lectures

A course of lectures for students in the B.Sc.(Tech.) course which includes a study of measurements, electron physics and servo-mechanisms.

6.101 Electric Circuit Theory

30 hours' lectures and 60 hours' laboratory

The first course of lectures and laboratory work in the basic principles in electrical engineering and their application to the solution of circuits.

The rationalised MKS system of units. Solution of DC networks under steady state conditions. Characteristics of two-terminal linear and non-linear components. Electrostatics. Single transients in electric circuits. Alternating voltages and currents. Components. Series RL and RC circuits. Power. Resonance.

6.102 Circuit Theory

90 hours' lectures and 90 hours' laboratory/tutorial

(A course for full-time Electrical Engineering students)

General network theory. Mesh and nodal equations. Steady state and transient analysis of lumped-parameter systems. Three-phase circuits under balanced and unbalanced conditions. Feedback theory. Stability. Nyquist criterion. Elementary compensation techniques. Fourier-series analysis. Fourier integral. Laplace transformation. Transmission lines.

6.152 Electric Circuit Theory

60 hours' lectures and 60 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. Syllabus for 6.102 above.

6.201 Electric Power Engineering

60 hours' lectures and 90 hours' laboratory

(A course for students in full-time Electrical Engineering)

This subject is an introduction to the principles of operation of transformer and rotating machines used for the conversion of mechanical to electrical energy and vice versa.

The emphasis will be on the principles involved in the steady state operation of the equipment.

Generalised machines. DC machines. Metadynes. Control. Transformers. Three-phase and single-phase, synchronous and induction machines.

6.202S Power Systems

40 hours' lectures, 40 hours' laboratory/tutorial

(A course of lectures for both pass and honours students in the Power and Control Option of the Electrical Engineering Course)

A course of lectures and laboratory work relating to the performance of power systems under steady load and fault conditions. Transformers. Transmission line parameters. Steady state and unbalanced loads and faults. Voltage surges. System stability. System protection.

The laboratory work in Power Systems is part of the co-ordinated laboratory/tutorial course arranged to serve this subject and the subjects 6.401S Control Systems and 6.212S Machines.

6.212S Machines

40 hours' lectures, 40 hours' laboratory/tutorial

(A course of lectures for both pass and honours students in the Power and Control Option of the Electrical Engineering Course)

Aspects of machine operation will be developed from the basic treatment of 6.201 (which is limited to individual operation under steady state conditions), to include cross-field machines, parallel operation of synchronous machines, developments on induction machines, both individually and in combination with a.c. commutator machines for power factor and speed control. Transient operation, saturation, harmonics, saliency, and unbalanced conditions will be considered.

The laboratory work in Machines is part of the co-ordinated laboratory/tutorial course arranged to serve this subject and the subjects 6.401S Control Systems and 6.202S Power Systems.

6.251 Electric Power Engineering

45 hours' lectures and 60 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. The subject-matter is the same as for 6.201.

6.252 Power Systems

45 hours' lectures and 75 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. The subject-matter is the same as for 6.202S.

6.262 Electrical Machines

45 hours' lectures and 75 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. The subject-matter is the same as for 6.212S.

8.301 Electronics

90 hours' lectures and 90 hours' laboratory

(A course for students in full-time Electrical Engineering)

An introduction to the physical basis of electronics and electronic circuits for all electrical engineering students. Topics include solid state, vacuum and gas filled devices, rectifiers, amplifiers, oscillators and an introduction to radio communication.

6.302S Communications A

40 hours' lectures, with tutorial and laboratory

(A course of lectures for both pass and honours students in the Communications Option of the Electrical Engineering Course)

A course in the theory and practice of certain aspects of communications engineering. Topics generally include modulation theory, demodulation, calculation, use and measurement of noise factor, oscillators, tuned amplifiers, transmitters and receivers.

An integrated laboratory and tutorial course of 126 hours' duration is provided to serve the three subjects 6.302S Communications A, 6.312S Communications B and 6.332S Communications C.

6.312S Communications B

40 hours' lectures, with tutorial and laboratory

(A course of lectures for both pass and honours students in the Communications Option of the Electrical Engineering Course)

A course in the theory and practice of certain aspects of communications engineering. Topics generally include guided propagation, information theory and noise, lines for communications, telephone networks, line communication equipment.

An integrated laboratory and tutorial course of 126 hours' duration is provided to serve the three subjects 6.302S Communications A, 6.312S Communications B and 6.332S Communications C.

6.322S Electronics

40 hours' lectures and 60 hours' laboratory/tutorial

(A course of lectures for both pass and honours Electrical Engineering students)

A course in electronics for all fourth year full-time students in electrical engineering giving a co-ordinated presentation of the theory and practice of semi-conductors and thermionic devices. Topics include rectification and inversion, amplification, modulation, demodulation, switching circuits and square loop magnetics.

6.332S Communications C

40 hours' lectures, with tutorial and laboratory

(A course of lectures for both pass and honours students in the Communications Option of the Electrical Engineering Course)

A course in the theory and practice of certain aspects of communication engineering. Topics generally include propagation, radiation, aerials, radar, navigational aids, radio astronomy, acoustics, sound transducers, vision, TV systems and equipment.

An integrated laboratory and tutorial course of 126 hours' duration is provided to serve the three subjects 6302S Communications A, 6.312S Communications B and 6.332S Communications C.

6.351 Electronics

45 hours' lectures and 60 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. The subject-matter is the same as for 6.301.

6.352 Communications

45 hours' lectures and 75 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. Syllabus as for 6.302S above.

6.362 Communications

45 hours' lectures and 75 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. Syllabus as for 6.312S above.

6.372 Applied Electronics

45 hours' lectures and 75 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. Syllabus as for 6.322S above.

6.401S Control

40 hours' lectures and 40 hours' laboratory/tutorial

(A course of lectures for both pass and honours students in the Power and Control Option of the Electrical Engineering Course)

A study of the stability and performance, including compensation, of linear control system using frequency response and root locus techniques. Use of analogue computers. Process control. Control system components.

The laboratory work in Control Systems is part of the co-ordinated laboratory/tutorial course arranged to serve this subject and the subjects 6.202S Power Systems and 6.212S Machines.

6.451 Utilisation and Control of Electrical Plant

45 hours' lectures and 75 hours' laboratory

A course for B.Sc.(Tech.) students in Electrical Engineering. Syllabus as for 6.401S above.

6.501 Electrical Engineering (Honours)

60 hours' lectures

Material will be selected from the following topics:—

Engineering differential equations; Laplace and Fourier transforms; complex variable; generalised feedback theory; stability criteria; statistical methods of analysis; analogous system simulation; signal flow and matrix methods in electrical engineering.

6.502S Electrical Engineering (Honours)

63 hours' lectures

Material will be selected from the following topics:—

Machine matrix equations; the primitive electrical machine; root locus applications; pulse techniques; sampled data; analysis of linear and non-linear systems containing noise; information theory; circuit synthesis; applications of electro-magnetic theory; combinational and sequential switching theory.

6.801S Electrical Engineering

36 hours' lectures and 60 hours' laboratory

(A course for full-time students in courses other than Electrical Engineering)

A special course for metallurgists and for engineers not intending to follow electrical engineering as a profession. Presentation of the fundamental principles of electric and magnetic circuits and vacuum tubes and the application of these principles to the theory, performance of and control of electrical equipment.

6.801 Electrical Engineering

30 hours' lectures and 60 hours' laboratory

A course for B.Sc.(Tech.) students in metallurgy and engineering who do not intend to follow Electrical Engineering as a profession. The subject-matter is the same as for 6.801S.

6.802S Electrical Engineering

36 hours' lectures and 36 hours' laboratory

(A course for full-time students in courses other than Electrical Engineering)

More advanced work following on 6.801 with emphasis on applications of electronic equipment and the theory of control systems.

6.802 Electrical Engineering

30 hours' lectures and 30 hours' laboratory

A course for B.Sc.(Tech.) students in metallurgy and engineering who do not intend to follow Electrical Engineering as a profession. The subject-matter is the same as for 6.802S.

6.901S Seminar

(For students in the fourth year of the full-time course in Electrical Engineering)

6.911 Thesis

(Full-time students in Electrical Engineering—pass degree)

6.921 Thesis

(Full-time students in Electrical Engineering—honours degree)

SCHOOL OF MECHANICAL ENGINEERING

Mechanical Engineering Undergraduate Subjects

5.001 Engineering I

For courses in the Faculties of Engineering, Applied Science and Science.

A. *Descriptive Geometry* (20 hours' lectures, 40 hours' tutorials over 2 terms)

Fundamental concepts of descriptive geometry, including reference systems, representation of point, line and plane; fundamental problems of position and of measurement.

Construction of the ellipse. Various surfaces and solids, their sections, developments and intersections in solid geometry.

Application of descriptive geometry to certain problems arising in engineering practice. Special emphasis on ability to visualise problems and processes involved in their solution.

B. *Engineering Drawing* (30 hours' drawing office over 1 term)

Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning.

Orthographic and isometric projections.

In the drawing office the student will be required to sketch and to make accurate detail drawings and/or assembly drawings of a number of the following machine parts and elements: bracket, lever, bearing, coupling, pump, piston, valve, connecting rod.

C. *Engineering Mechanics* (30 hours' lectures, 30 hours' tutorials over 3 terms)

Statics: Two-dimensional force systems. Laws of equilibrium. Concurrent and non-concurrent forces, funicular polygon. Statics applied to rigid bars. Concepts of shear force, axial force and bending moment. Statics of pin-jointed frames, analytical and graphical treatment. Three-dimensional statics. Composition and resolution of forces. General laws of equilibrium.

Graphs: Construction of graphs, line charts. Linearisation, logarithmic graphs. Graphical differentiation and integration.

D. *Workshop Technology* (30 hours' lectures over 3 terms)

Introduction: Materials and processes. Definitions. Materials: Ferrous metals. Non-ferrous metals; timber; plastic; rubber. Semi-finishing: Casting; rolling; extruding; wire-drawing. Marking off; elementary machining processes. Simple machine tools: Drilling machine; lathe; shaper. Component Check: Fits and limits; I.S.A. system metrology. Fastenings: Detachable joints; bolts; screw threads; non-detachable joints; soldering; brazing; welding.

5.001/1 and 5.001/2 Engineering I—Parts 1 and 2

Part-time students in the Faculty of Engineering will take 5.001 Engineering I in two parts over two years.

Part 1 consists of the sections on Descriptive Geometry and Engineering Drawing.

Part 2 consists of the sections on Engineering Mechanics and Workshop Technology.

5.011 Engineering I

For students in Applied Geology.

This subject consists of the Descriptive Geometry and the Engineering Mechanics sections of 5.001.

5.021S Seminar

For students in the full-time course in Mechanical Engineering.

5.023 Seminar

For students in the B.Sc.(Tech.) course in Mechanical Engineering.

5.031S Minor Thesis

For pass students in the full-time course in Mechanical Engineering.

5.041 Major Thesis

For honours students in the full-time course in Mechanical Engineering.

5.101S Mechanical Engineering Design

120 hours' drawing office work

(A course for full-time students in Mechanical Engineering)

A. Design procedures, loadings and factors of safety standards. Stresses in bolts. Discussion of problems involving simple stresses. Design of shafts and bearings, belt drives, friction clutches, springs and screws for power applications.

B. Design of spur gear drives in accordance with BSS 436, introduction of worm gear design in accordance with BSS 721. Design of band brakes and shoe brakes. Crane design.

5.101/1 and 5.101/2 Mechanical Engineering Design—Parts 1 and 2

Each of 60 hours' drawing office work

Students in the Bachelor of Science (Technology) course in Mechanical Engineering will take 5.101S in two parts. 5.101/1 consists of the work set out under A and 5.101/2 consists of the work set out under B.

5.101A Mechanical Engineering Design

This subject is taken by full-time Industrial Engineering students, and consists of the subject-matter of 5.101/1. The course extends over 23 weeks and the examination is held in the September period.

5.102 Mechanical Engineering Design

20 hours' lectures, 70 hours' drawing office

(A course for B.Sc.(Tech.) students in Mechanical Engineering)

(a) Lectures

Advanced application of strength of materials with respect to the design of reciprocating machinery.

Balancing of rotating and reciprocating masses. Flywheel determination. Governors.

(b) Drawing Office

Design of elements encountered in reciprocating machinery. Crankshafts, connecting rods, pistons, cams, governors, etc.

5.103S Mechanical Engineering Design

36 hours' lectures, 36 hours' drawing office

(A course for full-time students in Mechanical Engineering)

(a) Lectures

Advanced application of strength of materials with respect to various design problems.

(b) Drawing Office

Major design project and relevant engineering investigations.

5.201 Mechanical Technology

1 hour per week for 30 weeks

(A course for B.Sc.(Tech.) students in Mechanical Engineering)

General principles. Geometry of machine parts. Kinematics of machine tools. Action of metal-cutting tools. Mechanisms used in machine tools. Machine tool components. Actual machine tools. Centre lathes. Drilling and tapping. Milling. Lathes retaining tool settings. Semi and fully automatic lathes. Boring, boring mills. Horizontal boring machines. Jig-boring. Reciprocating machine tools. Planer, shaper, slotter. Broaching.

5.202S Mechanical Technology

2 hours per week for 24 weeks

(A course for full-time students in Mechanical Engineering and Industrial Engineering)

Part 1

General principles. Geometry of machine parts. Kinematics of machine tools. Action of metal-cutting tools. Mechanisms used in machine tools. Machine tool components. Actual machine tools. Centre lathe. Drilling and tapping. Milling.

Part 2

A brief analysis of the principles and practices used in the development of an organisation so that it can attain an industrial objective.

5.203 Mechanical Technology

1 hour per week for 30 weeks

(A course for B.Sc.(Tech.) students in Mechanical Engineering)

Gear cutting. Grinding. Complex surfaces, profiling, automated machines. Dimensional accuracy, surface finish. Finishing processes, lapping, honing, superfinishing, gear-shaving. Plastic yielding of metals. Blanking and shearing. Bending. Hollow-ware. Forging. Casting. Rolling. Welding.

5.204S Mechanical Technology

2 hours per week for 24 weeks

(A course for full-time students in Mechanical Engineering)

Lathes retaining tool settings. Semi and fully automatic lathes. Boring, boring mills. Horizontal boring machines. Jig-boring, fine-boring. Reciprocating machine tools. Planer, shaper, slotter. Broaching. Gear-cutting. Grinding. Complex surfaces, profiling, automated machines. Dimensional accuracy, surface finish. Finishing processes, lapping, honing, superfinishing, gear-shaving. Plastic yielding of metals. Blanking and shearing. Bending. Hollow-ware. Forging. Casting. Rolling. Welding.

5.301S and 5.301 Engineering Mechanics

40 hours' lectures, 20 hours' tutorials

Fundamentals of vector algebra. Kinematics of the plane motion of a particle. Dynamics of the plane motion of a particle; artificial satellites. Unconstrained motion of a particle. Constrained motion of a particle. Systems of connected particles. Kinematics of the plane motion of a rigid body. Dynamics of the plane motion of a rigid body. Kinematics and dynamics of the relative motion; Coriolis effects. The gyroscope.

5.302S and 5.302 Theory of Machines

42 hours' lectures, 30 hours' tutorials

Kinematics of simple mechanisms. Dynamics of simple mechanisms; Principle of virtual work. Kinematics of cams (analysis, synthesis). Dynamics of cams (springs). Kinematics of toothed gearing (involutometry, non-standard gears, cutter-setting corrections). Gear trains (simple, compound, epicyclic).

5.303 Mechanical Vibrations

15 hours' lectures, including some demonstrations

Periodic motions; Fourier analysis; simple harmonic motion. One-degree-of-freedom system (free undamped, free damped, forced undamped, forced damped). Some vibration-measuring instruments. Vibration isolation. Whirling speeds of shafts (Rayleigh's method, Dunkerley's formula). Free torsional vibrations of shafts (two and three rotors only).

5.304S Theory of Machines

24 hours' lectures, 24 hours' tutorials

Balancing of rotating and reciprocating masses. Flywheels (presses, engines).

Mechanical vibrations—as for 5.303, plus the following:—Two-degree-of-freedom system (undamped-vibration absorbers). Free torsional vibrations of multi-rotor systems.

5.305S Theory of Machines

42 hours' lectures, 30 hours' tutorials

Kinematic analysis of complex mechanisms. Dynamic acceleration analysis. Advanced kinematics of the rigid body (Euler-Savary equation, Inflection circle). Flywheels (presses, engines, Wittenbauer's analysis).

Mechanical vibrations—as for 5.303 plus the following:—Two-degree-of-freedom system (undamped tuned and self-tuning vibration absorbers; frequency response). Free torsional vibrations of multi-rotor system. Forced torsional vibrations of crankshafts. Higher modes of transverse vibrations. Effects of disk deviation.

5.321S and 5.321 Automatic Control Engineering

5.321S 36 hours' lectures and demonstrations

5.321 30 hours' lectures and demonstrations

Block diagrams and Laplace transform methods for system analysis. Transfer functions. Response functions. The general criterion for stability. Routh's criterion. Types of controller action and their effects on system response. Analysis of some pneumatic control system components including one or two types of pneumatic controller.

5.322S Automatic Control Engineering

72 hours' lectures, tutorial and laboratory

Block diagrams and Laplace transform methods for system analysis. Transfer functions. Response functions. The general criterion for stability. Routh's criterion. Electronic Analogue Computer and its use in system simulation. Nyquist criterion and Nyquist diagrams. Bode diagrams and frequency response analysis. Types of controller action and their effects on system response. Optimum settings, ultimate period method and maximum gain method. Analysis of several types of pneumatic controllers and other control system components. Application of automatic control to typical mechanical systems.

5.401S Numerical Analysis

24 hours' lectures, 12 hours' tutorials

Calculus of Finite Differences—Difference tables; interpolation; numerical differentiation and integration.

Solution of Equations—Ordinary equations; successive approximation; iteration; simultaneous equations. Differential equations: numerical methods for ordinary differential equations; difference equations for partial differential equations; relaxation methods.

Empirical Equations—Rectification of curves; method of least squares; polynomial approximations; harmonic analysis.

Nomography—Construction of addition and logarithmic types of alignment charts.

Analogue Methods—Membrane analogy; conducting-sheet analogy; hydraulic analogy.

Computers—Simultaneous-equation solvers; mechanical differential analyser; basic principles of high speed digital computers.

5.501S and 5.501 Fluid Mechanics

24 hours' lectures, 36 hours' laboratory/tutorial

Fluid properties: statics of liquids and gases; statics of moving systems; forces on surfaces.

One-dimensional flow of inviscid incompressible fluid: streamlines: continuity, Euler and Bernouilli equations: energy equation.

Introduction to dimensional analysis. Physical concept of boundary layer. Laminar and turbulent motion. Flow in pipes and conduits. Fluid measurements. Elementary study of unsteady flows. Linear and angular momentum theorems and elementary applications to turbo-machines.

5.502S and 5.502 Fluid Mechanics

5.502S 30 hours' lectures, 42 hours' laboratory/tutorial

5.502 30 hours' lectures, 45 hours' laboratory/tutorial

Dimensional analysis. Theory of models. Boundary layer theory on flat plates. Resistance of bodies. One-dimensional gas dynamics; isentropic, adiabatic flows. Flow of gases and vapours in nozzles. Theory of centrifugal pumps, axial flow pumps and turbines: similitude laws: cavitation.

5.503S and 5.503 Fluid Mechanics

24 hours' lectures, 24 hours' laboratory/tutorial

Elements of fluid dynamics: Euler equations: momentum theorems: rotational motion: potential flows: simple stream and potential functions: elementary wing theory. Turbulent flow in boundary layers and in closed conduits. Hydraulic turbines: characteristic proportions: selection of type and speed for a new plant. Surges and water hammer. Centrifugal and axial flow compressors. One-dimensional gas dynamics—isothermal, diabatic and frictional flows. Normal shock waves.

(Course to consist of three of the above six topics plus experimental projects.)

5.601S Mechanical Engineering

(An integrated course in thermodynamics and fluid mechanics for honours candidates in Mechanical Engineering)

5.701S and 5.701 Thermodynamics

24 hours' lectures, 36 hours' laboratory/tutorial

Fundamental thermodynamic concepts. First and second laws and corollaries. Reversibility. General thermodynamic relations. Properties of a perfect gas, liquids and vapours. Non-flow and flow processes. Multi-stream steady flow processes. Carnot cycle. Rankine cycle, reheat and regenerative feed heating.

Boilers and boiler auxiliaries. Otto, Diesel, and mixed cycles. Cycles having Carnot efficiency.

5.702S and 5.702 Thermodynamics

5.702S 30 hours' lectures, 42 hours' laboratory/tutorial

5.702 30 hours' lectures, 45 hours' laboratory/tutorial

Heat pump and refrigeration cycles.

Vapour compression, absorption and compressed air systems. Properties of non-reactive mixtures of gases and vapours. Gibbs-Dalton law. Psychrometry. Hygrometric chart. Thermodynamic charts.

Reciprocating engines and compressors, criteria of performance.

Axial and radial flow, turbines and compressors. Gas turbine cycles with heat exchange, intercooling and reheat. Steady heat conduction through composite wall cylinders. Three-dimensional steady heat conduction in homogeneous materials.

Relaxation processes. Unsteady one-dimensional heat conduction. Electrical analogy. Heat transfer by free and forced convection. Similarity parameters. Heat exchangers. Radiation heat exchange between black and non-black surfaces. Radiation geometric factors. Reciprocity theorem. Radiation from gases and flames.

5.703S and 5.703 Thermodynamics

24 hours' lectures, 24 hours' laboratory/tutorial

Gibbs and Helmholtz functions. Maxwell relations. Equation of state for real gases. Van der Waals' and Chapeyron's equations.

Momentum and energy transport in fluids. Laminar and turbulent thermal boundary layers. Reynolds' analogy. Combustion processes. Thermodynamic analysis of fluid flow in compressors, turbines. Cascades. Surging in compressors. Matching gas turbine components. Jet propulsion. Rocket motors and ramjets.

Binary vapour and super-critical power plants. Nuclear power systems. Air conditioning and air distribution systems.

5.811 Aerodynamics

60 hours' lectures, 30 hours' tutorials

Flow of an ideal fluid. Stream function and velocity potential. Classical inviscid fluid dynamics. Euler's equations of motion.

Flow of a real fluid. Navier-Stokes' equations of motion. Elementary boundary layer theory. Laminar and turbulent flow. Drag in two-dimensional flow.

Wings of finite span. Lifting line theory. Drag in three-dimensional flow. Wing characteristics.

Dimensional analysis and model theory. Scale effect. Standard atmosphere. Aeroplane performance calculations.

Propeller theory: momentum and blade element theories. Propeller characteristics and performance.

5.812 Aerodynamics

75 hours' lectures, 75 hours' laboratory/tutorial

Thin aerofoil theory; Complex potential; Conformal transformation; Joukowski transformation. Surfaces of discontinuity and vortex streets.

Longitudinal stability and dynamics of the aeroplane: stick-fixed and stick-free cases. Longitudinal control. Phugoid and other modes of motion.

Advanced performance calculations: Non-dimensional and other methods. Performance predictions of jet aeroplanes.

High speed aerodynamics: Isentropic flow. Normal and oblique shock waves; expansion waves. Supersonic wing theory.

Aerodynamic design of an aeroplane to a given specification.

5.821 Aircraft Strength of Materials

37½ hours' lectures, 22½ hours' tutorials

Physical properties of aircraft materials. Inertia loads in accelerated flight; Load factor. Direction cosines; tension coefficients. Simply-staff frames. Tangent modulus. Euler's, Robertson's and Johnson's formulae and curves for struts. Beam theory; continuous beams. Propped cantilever. Thin web beams. Torsion theory; Round bars and tubes; Bredt-Batho theory of torsion of thin walled tubes. Combined stresses. Stress calculations for various types of joints and fittings; Elementary treatment of distributing concentrated loads into thin webs.

5.822 Aircraft Strength of Materials

37½ hours' lectures, 22½ hours' tutorials

More advanced treatment of work in aircraft structures relating to beams and struts. Polar bending moment diagrams. Strain energy; application of energy methods to the solution of statically indeterminate structures. Hardy-Cross moment distribution method. Williot-Mohr deflection diagram. Flexural centre of closed and open sections; Warping of thin-walled sections. Torsional instability; analogy with flexural instability. Shear flow in a multi-cell structure. Springs.

5.823 Aircraft Materials and Structures

60 hours' lectures, 30 hours' tutorials

Theory of elasticity. Conditions of compatibility. Airy's stress function and application to simple two-dimensional problems such as stress distribution beams loaded at one end, stress concentration around a circular hole, stresses due to pressure in thick cylinders, thermal stresses in a disc. Bending and buckling of plates. St. Venant Torsion theory, Membrane Analogy. Further work on struts including Rayleigh's energy solution, and the inelastic buckling of struts. Flexural and torsional stiffness. Flexural failure of stringers in panels under compression. Shear lag and axial constraint stresses. Stresses in rings. Practical stressing of wing and fuselage sections. Compound beams. Plastic penetration (bending, torsion). Aircraft structural design requirements. Main stressing cases. Structural testing. Fatigue. Vibrations. Introduction to aero-elastic problems.

5.831 Aircraft Propulsion

60 hours' lectures

Aircraft power plant and propulsion systems.

Power plant thermodynamics. Fuels and combustion.

Internal aerodynamics: Compressors and turbines, sub-sonic and supersonic intake diffusers, nozzles.

Design and performance of aircraft reciprocating internal combustion engine and gas turbine systems.

Ramjets. Rockets.

5.901 Naval Architecture

60 hours' lectures, 60 hours' tutorial and drawing office

Areas, volumes, centroids and moments of inertia. Tons per inch displacement and centre of buoyancy. Coefficients of form. Wetted surface. Permeability and sinkage. Initial stability, inclining experiment, free surface and suspended weights. Trim. Grounding. Hydrostatic curves. Ship types. Arrangements and equipment. Building berths, shipyard equipment. Materials of construction. Ships' bottom structure, midship section, riveted and welded connections. Construction of small wooden vessels. Mould loft, fairing lines, bevels, moulds and scrieve board. Expansion of shell plating, longitudinals and margin plates. Intersections and developments.

5.902 Naval Architecture

75 hours' lectures, 75 hours' tutorials and drawing office

Stability at large angles. Curves of stability. Dynamic stability. Stability after flooding. Theory of waves. Rolling, heaving and pitching. Launching arrangements, procedure, calculations and curves. Effects of tide, camber, friction, inclination, pressures, dynamics. Observations, analysis and design. Details of framing, shell, bulkheads, beams, pillars and girders. Fore and after ends. Casing and minor bulkheads. Decks and hatchways. Seatings. Shell expansion and half block model. Rudder details. Preparation of midship section, profile and deck plans to requirements of a classification society. Strength of bulkheads, beams, pillars, and connections. Arrangement and strength of rigging and lifting appliances.

5.903 Naval Architecture

90 hours' lectures, 90 hours' tutorials

Longitudinal strength, transverse strength. Strength of plating. Vibration. Ship resistance and propulsion. Trials and analysis. Steering and rudders. Prime movers and auxiliary machinery. Elements of hull design. Refrigeration. Ventilation. Pumping, flooding and draining.

5.904 Naval Architecture

90 hours' lectures, 150 hours' tutorials and drawing office

Modern shipbuilding methods, prefabrication. Freeboard, tonnage and subdivision. Design, data and methods. Arrangements, equipment and specifications.

Design of a vessel from a brief specification—to determine dimensions, lines, hydrostatic curves, midship section and structural profile, estimate of stability and trim, freeboard, tonnage power of prime mover, propeller design and general arrangement.

DEPARTMENT OF INDUSTRIAL ENGINEERING

Industrial Engineering Undergraduate Subjects

18.031S Minor Thesis

(For pass students in the full-time course in Industrial Engineering)

18.041 Major Thesis

(For honours students in the full-time course in Industrial Engineering)

18.111S Industrial Administration

A course for full-time students in Industrial Engineering to follow on and to complement section (b) of 5.202S Mechanical Technology.

The completion of the organisation with job specifications. The use of operation instructions.

Further analysis of the subsidiary functions to general management; their location in the organisation and the use of common industrial techniques in their performance.

Plant location, building design, equipment selection and design, production design, layout, materials handling, stores and inventory control, purchasing quality control, maintenance, marketing, development, systems of production, work simplification, production control, engineering economics.

Problem cases relating to the subsidiary functions are analysed and solved.

18.111/1 and 18.111/2 Industrial Administration Parts I and II

A course for students in the B.Sc.(Tech.) course in Industrial Engineering.

An examination of the principles and practices used in the development of an organisation so that it can attain an industrial objective. The completion of the organisation with job specifications. The use of operation instructions.

An analysis of the principal functions of general management, production, engineering, sales, finance and personnel, followed by that of the subsidiary functions, their location in the organisation and the use of common industrial techniques in the performance.

Plant location, building design, equipment selection and design, production design, layout, materials handling, production planning and control, stores and inventory control, costing and accounting, purchasing, quality control, maintenance, salvage, methods, marketing, development, personnel.

Problem cases relating to the subsidiary functions are analysed and solved.

18.121S Engineering Administration

Introduction to scientific management.

Economic efficiency in the use of resources and facilities in manufacturing operations.

Value engineering.

Organisation and the control function. Introduction to the use of mathematical techniques in the planning of production, in quality control, and batch control.

The control of men in production and distribution. Fitting the workplace to the man. The use of incentives.

Some aspects of industrial legislation. Arbitration and conciliation. Contracts and awards.

18.211S Production Control

A course for full-time students in the Bachelor of Engineering course.

The first part of the course covers the detailed mechanics of production control systems applied firstly to order control of job lot production in a metal working factory, with variations in this basic system to cover repetitive batch production, and then continuous line production with flow control. These systems are then extended to manufacturing activity of other types.

The treatment covers in detail the basic functions of each section of the manufacturing organisation, and the information flow and relationships between these sections, and also information flow to costing. Cost considerations are highlighted, and the implications of different policies are stressed.

The application of fluid duplicator and punched card systems to production and inventory control is discussed.

The requirements of automation are considered.

The second part of this course covers the setting up, analysis and manipulation of mathematical models of industrial and production situations to give decision rules, including the following:

Linear programming applications with the simplex method of solution (including a demonstration of a solution using the University digital computer, UTECOM). The transportation method of solution.

Total value and incremental analysis, and inventory models under conditions of certainty and uncertainty.

Some applied statistical procedures; sampling and control charts.

18.221 Production Control

A course for students in the B.Sc.(Tech.) course in Industrial Engineering. The subject-matter is similar to that of 18.211S Production Control.

18.291S Production Control

(A course for honours students in Industrial Engineering)

18.311S Methods Engineering

(A course for full-time students in Industrial Engineering)

Commencing with an analysis of the physical requirements for manufacture, this course will progress through the study of problems arising from the need for skilful co-ordination of manufacturing facilities to a final stage dealing with the integration of machinery, materials and men for the efficient operation of industry.

Planning and installation of manufacturing plants; location and site analysis; buildings and facilities; process and equipment selection; plant layout; maintenance problems.

Ergonomics; work and effort; the dimensions of the workplace; workplace layout; the working environment and performance efficiency; fitting the job to the worker.

Work measurement; motion and time study; recording and charting; work sampling; estimates for pre-determined motion times.

Process analysis for production efficiency; characteristics of efficient and inefficient processes.

Incentives: Characteristics and design of basic incentive systems, preservation of quality; psychological and economic effects of incentives.

Developments and installation of better methods; work simplification; the improvement of individual operations raising the performance level of a running plant as a whole, application of select operations research techniques.

Laboratory Work—Application of the laws of motion economy; workplace layout; the sequencing of manufacturing operations, time study; operation analysis and charting; the normal range of human movements and application to design of machine controls. Parameters and manifestations of physical fatigue.

18.321 Methods Engineering

A course for B.Sc.(Tech.) students in Industrial Engineering. The subject-matter is similar to that of 18.311S Methods Engineering.

18.411S Design for Production I (Materials and Processes)

(A course for full-time students in Industrial Engineering)

This course is divided into two sections:—

(i) *Theory*—A study of those economic and manufacturing factors which influence product design.

(ii) *Laboratory*—Practical work associated with (i).

Theory—General. Growth of mass production and its influence on product design. Classification of manufactured products. Sales considerations. Economic considerations. Product and process development.

Materials and processes. Materials—broad consideration in selecting materials. Processes—casting and moulding processes, hot and cold working of metals, metal removal, welding, fasteners, finishes and finishing, assembly processes.

Laboratory—Model making, product evaluation. A study of some of the fundamentals of metal removal, tool life, chip formation, and press tool design and its application.

18.421 Design for Production I

A course for students in the B.Sc.(Tech.) course in Industrial Engineering. The subject-matter is similar to 18.411S Design for Production I.

18.412S Design for Production II (Interchangeable Manufacture)

(A course for full-time students in Industrial Engineering)

Theory—The economics of interchangeable manufacture; manufacturing, assembly and servicing costs; advantages and disadvantages of pursuing interchangeable principle. The function of the prototype and development and uses of the production model. The use of standards: factors to be considered when using national basic standards. Tolerancing and the determination of accumulated tolerances: probability theory and its application. Design for interchangeable or unit assembly: design, dimensioning and tolerancing to fulfil functioning and manufacturing and inspection requirements. Gauges and gauge wear: gauging principles, effect of gauge tolerance and wear, gauge design. Design of jigs, fixtures and tools. Functional, manufacturing and inspection requirements: methods of inspection, process inspection, finished parts inspection, quality control and sampling inspection. Metrology: basic principles of precision measurement, metrological practice in measurement, principles of construction, care and use of measuring equipment.

Drawing Office—Analysis of a design to fulfil functioning requirements, preparation of component drawings, preparation of operation drawings, design of associated gauges, tools and fixtures.

Laboratory—Metrology: assignments associated with gauging and tooling. Surface finish, inspection: non-destructive testing, quality control and sampling inspection.

18.422 Design for Production II (Interchangeable Manufacture)

A course for students in the B.Sc.(Tech.) course in Industrial Engineering. The subject-matter is similar to that of 18.412S Design for Production II.

18.511S Industrial Marketing

(A course for full-time students in Industrial Engineering)

Marketing in the Economy—The basic tasks of marketing. The economic environment of the market. Considerations of demand and supply.

Nature and Organisation of Buying and Selling—Buying and selling processes. The sales practices and problems of manufacturers and distributors. Standardisation, differentiation and non-price competition.

Specialisation and Integration in Marketing—Channels of distribution. Collection, sorting and distribution. Transfer of ownership between manufacturers, wholesalers, and retailers. Agents and distributors. Stability and change in marketing channels.

Pricing and Product Policy—Overall product policy, new product policy in the long and short run. Mechanism of pricing. Pricing problems and policies. Price structure and the price system.

Marketing and Efficiency and Control—Objectives and form of control. Market research. Budgeting and accounting control. Measures of efficiency and performance in marketing. Sales aids. Selection and training of personnel. Government regulations of marketing. The determinants and characteristics of regional markets. Planning of marketing areas. Changes in regional markets and transportation economics.

18.521 Industrial Marketing

A course for students in the B.Sc.(Tech.) course in Industrial Engineering. The subject-matter is similar to that of 18.511S Industrial Marketing.

18.611S Engineering Economic Analysis

(A course for full-time students in Industrial Engineering)

The Australian Economic Structure

The National Income—Definition, variations, real and money terms. Distribution of national income.

The Australian Labour Structure—Conciliation and arbitration, industrial disputes, the Commonwealth basic wage, margins.

International Trade—Reasons for international trade. The balance of trade and the balance of payments. The terms of trade. Tariffs.

The Role of Government—The planned, semi-planned and free economies. Taxation and subsidies.

Economics of Industrial Organisations

Competition—Types of competitive situations. Market structure and competitive behaviour. Monopoly and oligopoly.

Profits—Nature of profits. Profit measurement. Current versus historical costs. Capital gains and losses. Profit maximisation.

Demand and Cost Analysis—The theory of demand, price and income relations. Alternative cost. Cost and rate of output; cost and the size of plant; costs of multiple products. Marginal costing.

Price—Pricing under various types of competitive situation. Non-price competition. Price leadership. Cost-plus pricing. Price rigidity.

The Theory of Investment

Interest—Time value of capital. Simple interest, compound interest, present worth, annuities, sinking funds.

Depreciation—Causes of depreciation. Capital recovery. The economic life of capital equipment. Replacement policies.

Choice between Alternatives—The determination of the relative worth of several competitive items of capital equipment. Economic lot size.

18.621 Engineering Economics

(A course for students in the B.Sc.(Tech.) course in Industrial Engineering)

The course will consist of a study of the applications of economics to industrial operations and engineering projects. An introduction to accounting and accounting controls will also be given.

Text and Reference Books, 1965

SCHOOL OF CIVIL ENGINEERING

5.001 Engineering I

Parts A, B and C

See School of Mechanical Engineering.

D. Engineering Mechanics

Text Books

Hall: *Construction of Graphs and Charts.*
Hall and Archer: *Engineering Mechanics Lecture Notes.*

Reference Books

Rule and Watts: *Engineering Mechanics.*
Timoshenko and Young: *Engineering Mechanics.*

8.112 Materials and Structures

Reference Books

Timoshenko & MacCulloch: *Elements of Strength of Materials.*
Shanley: *Strength of Materials.*
Timoshenko: *Strength of Materials.* Vol. I.
Davis, Troxell and Wiskocil: *Testing and Inspection of Engineering Materials.*
Salmon: *Materials and Structures.* Vol. I.
Stanford: *The Creep of Metals and Alloys.*
Jastrzeleski: *Nature and Properties of Engineering Materials.*
Marin: *Mechanical Behaviour of Engineering Materials.*

8.113 Materials and Structures for Mechanical and Mining Engineers

Timoshenko: *Strength of Materials.* Vol. II.
Timoshenko and Goodier: *Theory of Elasticity.*
Timoshenko and Young: *Theory of Structures.*
Hoff: *The Analysis of Structures.*

8.121 and 8.122 Structures

Text Books

S.A.A. Interim Code Nos. 350, 351, 352.
S.A.A. Code CA2—1958.

Reference Books

Stewart: *Practical Design of Simple Steel Structures.* Vols. I and II.
Grinter: *Design of Modern Steel Structures.*
Grinter: *Elementary Structural Analysis & Design.*
Gray & Others: *Steel Designer's Manual.*
Wilbur & Norris: *Elementary Structural Analysis*

Pippard & Baker: *Analysis of Engineering Structures.*
Sutherland & Rees: *Introduction to Reinforced Concrete Design.*
Peabody: *The Design of Reinforced Concrete Structures.*
Fisher-Cassie: *Structural Analysis.*
Ferguson: *Reinforced Concrete Fundamentals.*

8.123 Structures

Text Books

S.A.A. Interim Code Nos. 350, 351, 352.

Reference Books

Stewart: *Practical Design of Simple Steel Structures.* Vols. I and II.
Grinter: *Design of Modern Steel Structures.*
Grinter: *Elementary Structural Analysis & Design.*
Gray & Others: *Steel Designer's Manual.*
Wilbur & Norris: *Elementary Structural Analysis.*

8.131 and 8.132 Structures

Reference Books

Hoff: *The Analysis of Structures.*
Lin: *Design of Pre-Stressed Concrete Structures.*
Pearson & Others: *Timber Engineering Design Handbook.*
Timoshenko & Young: *Theory of Structures.*
Parcel & Norman: *Analysis of Statically Indeterminate Structures.*
Ferguson: *Reinforced Concrete Fundamentals.*

8.141 and 8.142 Engineering Computations

Reference Books

Salvadori & Baron: *Numerical Methods in Engineering.*
Hall: *Construction of Graphs and Charts.*
Hartree: *Numerical Analysis.*
Shaw: *Relaxation Methods.*

8.211 Materials for Architects

Text Book

A.C.I. Manual of Concrete Inspection.

Reference Books

Davis, Troxell & Wiskocil: *Testing and Inspection of Engineering Materials.*
Withey and Washa: *Materials of Construction.*
British Standards Handbook No. 2846: *Reduction Presentation of Experimental Results.*
U.S. Bureau of Reclamation: *Concrete Manual.*
Murdock: *Concrete Materials and Practice.*
Jastrzeleski: *Nature and Properties of Engineering Materials.*

8.221 Engineering Materials

Text Books

Troxell and Davis: *Composition and Properties of Concrete;* and
Scott: *Principles of Soil Mechanics, or*
Terzaghi and Peck: *Soil Mechanics in Engineering Practice.*

Reference Books

Terzaghi: *Theoretical Soil Mechanics.*
U.S. Bureau of Reclamation: *Concrete Manual.*
Murdock: *Concrete Materials and Practice.*

Lea: *The Chemistry of Cement and Concrete.*
H.M.S.O. Publication: *Soil Mechanics for Road Engineers.*
Bishop & Henkel: *Triaxial Testing of Soils.*
Ackroyd: *Concrete, Properties and Manufacture.*
Fulton: *Concrete Technology.*

8.222 and 8.223 Engineering Materials

Text Books

Troxell & Davis: *Composition & Properties of Concrete.*
Terzaghi and Peck: *Soil Mechanics in Engineering Practice.*

Reference Books

U.S. Bureau of Reclamation: *Concrete Manual.*
Houwink: *Elasticity, Plasticity and Structure of Matter.*
Terzaghi: *Theoretical Soil Mechanics.*
Murdock: *Concrete Materials and Practice.*
H.M.S.O. Publication: *Soil Mechanics for Road Engineers.*
Bishop & Henkel: *Triaxial Testing of Soils.*
U.S. Bureau of Reclamation: *Earth Manual,* 1960.
Hetenyi: *Handbook of Experimental Stress Analysis.*
Jessop & Harris: *Photo-Elasticity—Principles and Practice.*
Charlton: *Model Analysis of Structures.*
Mills, Haywood & Radar: *Materials of Construction.*
Wallis: *Australian Timber Handbook.*
Ford: *Advanced Strength of Materials.*
Scott: *Principles of Soil Mechanics.*
Ackroyd: *Concrete, Properties and Manufacture.*
Fulton: *Concrete Technology.*

8.224 Materials—Honours

Hill: *Mathematical Theory of Plasticity.*
Marin: *Mechanical Behaviour of Engineering Materials.*
Pipes: *Matrix Methods for Engineering.*
Scott: *Principles of Soil Mechanics.*

8.241 and 8.242 Soil Mechanics

Text Books

Taylor: *Fundamentals of Soil Mechanics, or*
Terzaghi and Peck: *Soil Mechanics in Engineering Practice.*

Reference Books

Terzaghi: *Theoretical Soil Mechanics.*
H.M.S.O. Publication: *Soil Mechanics for Road Engineers.*
Bishop & Henkel: *Triaxial Testing of Soils.*

8.251 Properties of Materials

Reference Books

Salmon: *Materials and Structures.* Vol. I.
Beaumont: *Mechanical Testing of Metallic Materials*
Williams: *Hardness and Hardness Measurements.*
Gilkey, Murphy & Bergman: *Materials Testing.*
Stanford: *The Creep of Metals and Alloys.*
Jastrzeleski: *Nature and Properties of Engineering Materials.*

8.411 Surveying

Text Book

Glendenning: *Principles of Surveying.*

Reference Books

Clark: *Plane and Geodetic Surveying.* Vol. I.
Bannister & Raymond: *Surveying.*

8.421 Surveying

Text Books

Clark: *Plane and Geodetic Surveying.* Vol. I.
Chambers: *7-figure Natural and Logarithmic Tables.*

Reference Books

Kissam: *Surveying for Civil Engineers.*
Bannister & Raymond: *Surveying.*

8.422 and 8.423 Surveying

Text Books

Clark: *Plane and Geodetic Surveying.* Vols. I & II.
Crane: *Elementary Photogrammetry.*

Reference Books

Bannister and Raymond: *Surveying.*
Sandover: *Plane Surveying.*
Kissam: *Surveying for Civil Engineers.*
Schwidefsky: *Outline of Photogrammetry.*
Mackie: *Astronomy for Surveyors.*

8.521 and 8.522 Hydraulics

Text Books

Rouse: *Elementary Mechanics of Fluids.*
Vennard: *Elementary Fluid Mechanics*

Reference Books

Rouse: *Engineering Hydraulics.*
Addison: *Hydraulic Measurements.*
Barna: *Fluid Mechanics for Engineers.*
Vallentine: *Applied Hydro-Dynamics.*
Streeter: *Fluid Dynamics.*
Davis: *Handbook of Applied Hydraulics.*
Streeter: *Handbook of Fluid Dynamics.*

8.611 Civil Engineering

Text Books

Fair & Geyer: *Water Supply and Waste-Water Disposal; and*
Linsley, Kohler and Paulhus: *Hydrology for Engineers; or*
Wisler and Brater: *Hydrology.*

Reference Books

Steel: *Water Supply & Sewerage.*
Babbitt and Doland: *Water Supply Engineering.*
Phelps: *Public Health Engineering.*
Imhoff & Fair: *Sewage Treatment.*
Imhoff, Muller & Thistlethwaite: *Disposal of Sewage and Other Water Borne Wastes.*
Francis: *Sewage Treatment.*
Phelps: *Stream Sanitation.*
Timm: *An Introduction to Chemistry.*
Linsley, Kohler & Paulhus: *Applied Hydrology.*
Linsley, Kohler & Paulhus: *Hydrology for Engineers.*
Wisler & Brater: *Hydrology.*
Patterson: *Meteorology.*
Haurwitz: *Meteorology.*
Haurwitz: *Climatology.*
Griffith Taylor: *Australia.*

Johnstone & Cross: *Elements of Applied Hydrology.*
Butler: *Engineering Hydrology.*
Commonwealth Bureau of Meteorology—Bulletin No. 1:—*The Climate and Meteorology of Australia.*
Commonwealth Dept. of Civil Aviation: *Manual of Meteorology.*
American Society of Civil Engineers: *Hydrology Handbook.*

8.612 and 8.613 Civil Engineering

Text Books

Antill & Ryan: *Civil Engineering Construction.*
Ryan: *Engineering Administration.*

Reference Books

Creager, Justin & Hynes: *Engineering for Dams.*
Ackerman & Locker: *Construction Planning and Equipment.*
Houk: *Irrigation Engineering.*
Goldman: *Financial Engineering.*

8.613S Civil Engineering

Text Books

Antill & Ryan: *Civil Engineering Construction.*
Ryan: *Engineering Administration.*

Reference Books

Du Platt Taylor: *Docks, Wharves and Piers.*
Webb: *Railroad Constructions.*
Houk: *Irrigation Engineering.*
Creager, Justin & Hynes: *Engineering for Dams.*
Ackerman & Locker: *Construction Planning and Equipment.*
Fair & Geyer: *Water Supply and Waste-Water Disposal.*
Guthrie-Brown: *Hydro-Electric Engineering Practice.*

8.63A and 8.66A Engineering Construction

Text Book

Antill & Ryan: *Civil Engineering Construction.*

Reference Books

Ryan: *Engineering Administration.*
Ackerman & Locker: *Construction Planning and Equipment.*
Creager, Justin & Hynes: *Engineering for Dams.*

8.63B Hydrology

Reference Books

Linsley, Kohler & Paulhus: *Applied Hydrology.*
Linsley, Kohler & Paulhus: *Hydrology for Engineers.*
Wisler & Brater: *Hydrology.*
Johnstone & Cross: *Elements of Applied Hydrology.*
Butler: *Engineering Hydrology.*
Commonwealth Bureau of Meteorology—Bulletin No. 1:—*The Climate and Meteorology of Australia.*
Commonwealth Dept. of Civil Aviation: *Manual of Meteorology.*

8.66B Engineering Administration

Text Book

Ryan: *Engineering Administration.*

Reference Books

Goldman: *Financial Engineering.*
Antill & Ryan: *Civil Engineering Construction.*

8.811 and 8.812 Surveying

Text Book

Clark: *Plane and Geodetic Surveying.* Vols. I and II.

8.821 and 8.822 Geodesy

Text Books

Bomford: *Geodesy.*
Clark: *Plane and Geodetic Surveying.* Vol. II.
Rainsford: *Survey Adjustments and Least Squares.*

Reference Books

Tienstra: *Theory of Adjustment of Normally Distributed Observations.*
Weatherburn: *Differential Geometry.* Vols. I and II, *or*
Struik: *Differential Geometry.*
Whittaker & Robinson: *Calculus of Observations.*

8.831 Astronomy

Text Books

H.M.S.O. War Office: *Textbook of Field Astronomy.*
H.M.S.O.: *Star Almanac for Land Surveyors* (current edition).
Shortrede: *Tables of Logarithms of Sines and Tangents.*

Reference Books

Mackie: *Astronomy for Land Surveyors.*
Clark: *Plane and Geodetic Surveying.* Vol. II.

8.832 Astronomy

Text Books

H.M.S.O. War Office: *Textbook of Field Astronomy.*
H.M.S.O.: *Star Almanac for Land Surveyors* (current edition).

Reference Books

Clark rev. Glendinning: *Plane and Geodetic Surveying.* Vol. II.
Bomford: *Geodesy.*
Roelofs: *Astronomy Applied to Land Surveying.*

8.841 and 8.842 Surveying Computations

Six-figure natural trigonometric functions for every 10 seconds of arc—Peter's or D.M.R.
Shortrede: *Tables of Logarithms of Sines and Tangents.*
Chambers: *Seven-Figure Tables.*
Rainsford: *Survey Adjustments and Least Squares.*

8.851 Photogrammetry

Text Books

Crane: *Elementary Photogrammetry.*
Hallert: *Photogrammetry.*

8.852 Photogrammetry

Text Book

Hallert: *Photogrammetry.*

Reference Books

American Society of Photogrammetry: *Manual of Photogrammetry.*
Schwidefsky: *Photogrammetry.*

8.862 Cartography

Reference Books

Robinson: *Elements of Cartography.*
Raisy: *General Cartography.*
Kilford: *Elementary Air Survey* (Chapters on Map Reproduction).
Steers: *Introduction to Map Projections.*

8.872 Land Valuation

Text Book

Murray: *Principles and Practice of Land Valuation.*

Reference Books

Comm. Inst. of Valuers: *Court Decisions for Examination Study.*
Murray: *Problems and Answers Involving Valuation Practice.*

8.881 Survey Laws and Regulations

Text Book

Willis: *Survey Investigations.*

Reference Books

Helmore: *Millard's Law of Real Property in N.S.W.*
Baalman & Wells: *Land Titles Office Practice.*

SCHOOL OF ELECTRICAL ENGINEERING

6.001S and 6.051 Electrical Engineering

CIRCUIT THEORY SECTION:—

Text Book

Guillemin: *Synthesis of Passive Networks* (Wiley).

Reference Books

Van Valkenburg: *Introduction to Modern Network Synthesis* (Wiley).
Truxal: *Control System Synthesis* (McGraw-Hill).
Tuttle: *Network Synthesis* (Wiley).

CONTROL SYSTEMS SECTION (6.051 only)

Reference Books

Bower and Schultheiss: *Introduction to the Design of Servomechanisms* (Wiley).
Chestnut and Mayer: *Servomechanisms and Regulating System Design.* Vol. I (Wiley).
Brown and Campbell: *Principles of Servomechanisms* (Wiley).
West: *Servomechanisms* (E.U.P.).
Raven: *Automatic Control* (McGraw-Hill).
Stockdale: *Servomechanisms* (Pitman).

PHYSICAL ELECTRONICS SECTION (6.051 only)

Text Book

Van Der Ziel: *Solid State Physical Electronics* (Prentice Hall).

Reference Books

Valdes: *Physical Theory of Transistors* (McGraw-Hill).
Ridenour: *Modern Physics for the Engineer* (McGraw-Hill).
Dunlap: *An Introduction to Semiconductors* (Wiley).
Middlebrook: *An Introduction to Junction Transistor Theory* (Wiley).
Hunter: *Handbook of Semiconductor Electronics* (McGraw-Hill, 1962).
Blakemore: *Semiconductor Statistics* (Pergamon).
Nussbaum: *Semiconductor Device Physics* (Prentice Hall).

MEASUREMENTS SECTION:—

Text Book

Stout: *Basic Electrical Measurements* (2nd ed. Prentice Hall).

Reference Books

Terman and Pettit: *Electronic Measurements* (McGraw-Hill).
Harris: *Electrical Measurements* (Wiley).
Golding: *Electrical Measurements and Measuring Instruments* (Pitman).

FIELD THEORY:—

Reference Book

Reitz and Milford: *Foundations of Electromagnetic Theory* (Wiley).

6.001A Electrical Engineering

As for 6.001S (Degree Course)—Electronics and Physical Electronics Sections only.

6.001B Electrical Engineering

As for 6.001S (Degree Course)—Measurements Section only.

6.001C Electrical Engineering

As for 6.451 (Control Section)—Control Systems and Circuit Theory Sections only.

6.101 Electric Circuit Theory

Text Books

Timbie and Bush: *Principles of Electrical Engineering* (4th ed. Wiley)
C.R.C. Standard Mathematical Tables (Chemical Rubber Publishing Company); *or*
Mathematical Tables and Formulas. Compiled by H. S. Burington (McGraw-Hill).

Reference Books

Frank: *Electrical Measurement Analysis* (McGraw-Hill).
Scott: *Linear Circuits Part I—Time Domain Analysis* (Addison Wesley).
Middendorf: *Analysis of Electric Circuits* (Wiley).
McGreevy: *The M.K.S. System of Units* (Pitman).
M.I.T.: *Electric Circuits* (Wiley).
Corcoran and Reed: *Introducing Electrical Engineering* (Wiley).
Winch: *Electricity and Magnetism* (Prentice Hall).
Clement and Johnson: *Electrical Engineering Science* (McGraw-Hill).

6.102 Electric Circuit Theory

Text Books

Ley, Lutz and Rehberg: *Linear Circuit Analysis* (McGraw-Hill).
Moore: *Travelling-Wave Engineering* (McGraw-Hill).

Reference Books

Kuo: *Automatic Control Systems* (Prentice-Hall).
Kerchner and Corcoran: *Alternating Current Circuits* (4th ed. Wiley).
Prensky: *Electronic Instrumentation* (Prentice-Hall).
Bohn: *The Transform Analysis of Linear Systems* (Addison Wesley).

6.152 Electric Circuit Theory

Text Book

Lepage and Seely: *General Network Analysis* (McGraw-Hill).

Reference Books

Cheng: *Analysis of Linear Systems* (Addison Wesley).
Scott: *Linear Circuits.* Parts I and II (Addison Wesley).
Fich and Potter: *Theory of A.C. Circuits* (Prentice Hall).
Rogers: *The Theory of Networks* (Macdonald).
Bohn: *The Transform Analysis of Linear Systems* (Addison Wesley).
Moore: *Travelling Wave Engineering* (McGraw-Hill).
Johnson: *Transmission Lines and Networks* (McGraw-Hill).

6.201 and 6.251 Electric Power Engineering

Reference Books

Fitzgerald and Kingsley: *Electric Machinery* (McGraw-Hill).
Draper: *Electrical Machines* (Longmans).
Clayton: *Design and Performance of D.C. Machines* (Pitman).
Say: *Design and Performance of A.C. Machines* (Pitman).
M.I.T.: *Magnetic Circuits and Transformers* (Wiley).

6.202S and 6.252 Power Systems

Text Books

Stevenson: *Elements of Power System Analysis* (2nd ed. McGraw-Hill, 1962).
M.I.T.: *Magnetic Circuits and Transformers* (Wiley).

Reference Books

Westinghouse Electric Corp.: *Electrical Transmission and Distribution Reference Book.*
Kimbark: *Power System Stability.* Vols. I, II and III (Wiley).

6.212S and 6.262 Electrical Machines

Text Book

Fitzgerald and Kingsley: *Electric Machinery* (McGraw-Hill).

Reference Books

Draper: *Electrical Machines* (Longmans).
Wood: *Theory of Electrical Machines* (Butterworth).
Clayton: *Performance and Design of D.C. Machines* (Pitman).
Say: *Performance and Design of A.C. Machines* (Pitman).
Taylor: *Performance and Design of A.C. Commutator Motors* (Pitman)
Atkins: *The General Theory of Electrical Machines* (Chapman and Hall).
White and Woodson: *Electromechanical Energy Conversion* (Wiley).
Tustin: *Direct Current Machines for Control Systems* (Sporn).
Veinott: *Theory and Design of Small Induction Motors.*

6.255 Power Systems

As for 6.202S and 6.252 (Degree Course) with the following additions:

Reference Books

Say: *Magnetic Amplifiers and Saturable Reactors* (Pitman).
Tustin: *D.C. Machines for Control Systems* (Sporn).
Blume: *Transformer Engineering* (Wiley)

6.265 Electric Machines

As for 6.212S and 6.262.

6.301 Electronics

Text Books

Alley and Attwood: *Electronic Engineering* (Wiley).
Van der Ziel: *Solid State Physical Electronics* (Prentice Hall).

Reference Books

Joyce and Clarke: *Transistor Circuit Analysis* (Addison Wesley).
Terman: *Electronic and Radio Engineering* (4th ed. McGraw-Hill).
RCA Electron Tube Handbook HB.3.
RCA Semiconductor Products Handbook HB 10
Hunter: *Handbook of Semiconductor Electronics* (2nd ed. McGraw-Hill).
Mullard: *Reference Manual of Transistor Circuits.*
Nussbaum: *Semiconductor Device Physics* (Prentice Hall).
Hume-Rothery: *Atomic Theory for Students of Metallurgy* (Institute of Metals).
Ridenour: *Modern Physics for the Engineer* (1st ed. McGraw-Hill).
Bleaney and Bleaney: *Electricity and Magnetism* (Oxford).
Valdes: *Physical Theory of Transistors* (McGraw-Hill).
Dunlap: *An Introduction to Semiconductors* (Wiley).
Middlebrook: *An Introduction to Junction Transistor Theory* (Wiley).
Ryder: *Electronic Fundamentals and Applications* (2nd ed. McGraw-Hill).
Mullard: *Technical Handbook.*

6.302S Communications A
6.312S Communications B
6.332S Communications C

The Text Book and Reference Lists for these three subjects combined is the same as the combined list for the two subjects 6.352 and 6.362.

6.322S Electronics

Text Book

Joyce and Clarke: *Transistor Circuit Analysis* (Addison Wesley).

Reference Books

Millman and Taub: *Pulse and Digital Circuits* (McGraw-Hill).
Arguimbau: *Vacuum Tube Circuits and Transistors* (Wiley).
Landee, Davis and Albrecht: *Electronic Designer's Handbook* (McGraw-Hill).
Hunter: *Handbook of Semiconductor Electronics* (2nd ed. McGraw-Hill).
Strauss: *Wave Generation and Shaping* (McGraw-Hill).
Kretzmann: *Industrial Electronics Handbook* (Philips Technical Library).
Motorola: *Switching Transistor Handbook.*
Motorola: *Power Transistor Handbook.*
Motorola: *Silicon Zener Diodes and Rectifiers.*
General Electric: *Silicon Controlled Rectifier Manual.*

6.352 Communications A

Text Books

Joyce and Clarke: *Transistor Circuit Analysis* (Addison Wesley).
Terman: *Electronic and Radio Engineering* (4th Ed. McGraw-Hill).

Reference Books

Radiotron Designers Handbook (A.W.V. Co.).
Schwartz: *Information Transmision, Modulation and Noise* (McGraw-Hill).
Sturley: *Radio Receiver Design* (Chapman Hall).
R.C.A. Receiving and Transmitting Tube Handbook.
Terman: *Radio Engineer's Handbook* (McGraw-Hill).
Fraser: *Telecommunications* (Macdonald).
Strauss: *Wave Generation and Shaping* (McGraw-Hill).
Millman and Taub: *Pulse and Digital Circuits* (McGraw-Hill)

Bevitt: *Transistor Handbook* (Prentice Hall).
Shea: *Principles of Transistor Circuits* (Wiley).
Shea: *Transistor Circuit Engineering* (Wiley).
Williams: *Antenna Theory and Design* (Pitman).
Arguimbau: *Vacuum Tube Circuits and Transistors* (Wiley).
Hunter: *Handbook of Semiconductor Electronics* (McGraw-Hill, 1962).
Wolfendale: *The Junction Transistor and its Applications* (Heywood).
Landee, Davis and Albrecht: *Electronic Designers' Handbook* (McGraw-Hill).
Beranek: *Acoustics* (McGraw-Hill).
Zworykin and Morton: *Television* (2nd ed. Wiley).
Kerkhof and Werner: *Television* (Philips).
Mullard: *Technical Handbook.* Vols. 1 to 6.
R.C.A.: *Semiconductor Products Handbook* (H.B. 10).
Motorola: *Switching Transistor Handbook.*
Motorola: *Zener Diode and Rectifier Handbook.*
General Electric: *Silicon Controlled Rectifier Manual.*
General Electric: *Tunnel Diode Manual.*

6.355 Radio Communications

As for 6.352 (Degree Course).

6.356 Electronics

Text Books

Alley and Attwood: *Electronic Engineering* (Wiley).
Van der Ziel: *Solid State Physical Electronics* (Prentice Hall).

Reference Books

Ryder: *Electronic Fundamentals and Applications* (Pitman).
Ryder: *Engineering Electronics* (McGraw-Hill).
Joyce and Clarke: *Transistor Circuit Analysis* (Addison Wesley).
Wolfendale: *The Junction Transistor and Applications* (Heywood).
Valdes: *Physical Theory of Transistors* (McGraw-Hill).
Ridenour: *Modern Physics for the Engineer* (McGraw-Hill).
Terman: *Electronic and Radio Engineering* (4th ed. McGraw-Hill).
Mullard: *Reference Manual of Transistor Circuits.*

6.357 Electronics

Text Books

Alley and Attwood: *Electronic Engineering* (Wiley).
Joyce and Clarke: *Transistor Circuit Analysis* (Addison Wesley).

Reference Books

Millman and Taub: *Pulse and Digital Circuits* (McGraw-Hill).
Kretzmann: *Industrial Electronics Handbook* (Philips Technical Library).
Ryder: *Electronic Fundamentals and Applications* (Pitman).
Ryder: *Engineering Electronics* (McGraw-Hill).
Wolfendale: *The Junction Transistor and Applications* (Heywood).
Terman: *Electronic and Radio Engineering* (4th ed. McGraw-Hill).
Mullard: *Reference Manual of Transistor Circuits.*
Miniwatt: *Technical Data Book* (7th ed.).
R.C.A.: *Electron Tube Handbook* (H.B. 3).
R.C.A.: *Semiconductor Products Handbook* (H.B. 10).
A.W.V.: *Transistor Data Book.*

6.362 Communications B

Text Books

Starr: *Telecommunications* (Pitman).
Skilling: *Electric Transmission Lines* (McGraw-Hill).

Reference Books

Hancock: *An Introduction to the Principles of Communication Theory* (McGraw-Hill).

Fraser: *Telecommunications* (Macdonald).
Rogers: *The Theory of Networks* (Macdonald).
Moore: *Travelling Wave Engineering* (McGraw-Hill).
Kimbark: *Electrical Transmission of Power and Signals* (Wiley).
Lovering: *Radio Communication* (Longmans Green).
Glazier and Lamont: *Transmission and Propagation* (Her Majesty's Stationery Office, London, 1958).
Jordan: *Electromagnetic Waves and Radiating Systems* (Constable).
I.T. and T.: *Reference Data for Radio Engineers,* 4th Ed., 1956.
Jasik: *Antenna Engineering Handbook* (McGraw-Hill, 1961).
Williams: *Antenna Theory and Design.* Vol. II (Pitman).
Hallen: *Electromagnetic Theory* (Chapman and Hall).
Russell: *Modulation and Coding in Information Systems* (Prentice Hall).
Javid and Brenner: *Analysis, Transmission and Filtering of Signals* (McGraw-Hill).

6.365 Pulse and High Frequency Techniques

Reference Books

Bronwell and Beam: *Theory and Application of Microwaves* (McGraw-Hill).
C.S.I.R.: *A Textbook of Radar* (Angus and Robertson).
Millman and Taub: *Pulse and Digital Circuits* (McGraw-Hill).
Chance et al.: *Waveforms* M.I.T. Series Vol. 19 (McGraw-Hill).
Fink: *Radar Engineering* (McGraw-Hill).
Harvard: *Very High Frequency Techniques,* Vols. I and II (McGraw-Hill).
M.I.T.: *Principles of Radar* (3rd Ed. McGraw-Hill).
Ramo and Whinnery: *Fields and Waves in Modern Radio* (Wiley).
Strauss: *Wave Generation and Shaping* (McGraw-Hill).

6.372 Applied Electronics

Text Books

Millman and Taub: *Pulse and Digital Circuits* (McGraw-Hill).
Joyce and Clarke: *Transistor Circuit Analysis* (Addison Wesley).

Reference Books

Arguimbau: *Vacuum Tube Circuits and Transistors* (Wiley).
Martin: *Electronic Circuits* (Prentice Hall).
Landee, Davis and Albrecht: *Electronic Designer's Handbook* (McGraw-Hill).
Shea: *Transistor Circuit Engineering* (Wiley).
Wolfendale: *The Junction Transistor and its Applications* (Heywood).
Hunter: *Handbook of Semiconductor Electronics* (McGraw-Hill, 1962).

6.401S Control Systems

Text Book

Bower and Schultheiss: *Introduction to Servomechanising* (Wiley).

Reference Books

Chestnut and Mayer: *Servomechanism and Regulating System Design.* Vol. I (Wiley).
Brown and Campbell: *Principles of Servomechanisms* (Wiley).
West: *Servomechanisms* (E.U.P.).
Raven: *Automatic Control Engineering* (McGraw-Hill).
Stockdale: *Servomechanisms* (Pitman).

6.451 Utilization and Control of Electric Plant

Text Books

Fitzgerald and Kingsley: *Electric Machinery* (McGraw-Hill).
Gibson and Tuteur: *Control System Components* (McGraw-Hill).

Reference Books

UTILIZATION SECTION:—

Draper: *Electrical Machines* (Longmans).
Taylor: *Performance and Design of A.C. Commutator Motors* (Pitman).
White and Woodson: *Electromechanical Energy Conversion* (Wiley).
Kimbark: *Power System Stability*. Vol. III (Wiley).
Clarke: *Circuit Analysis of A.C. Power Systems*. Vol. I. (Wiley).
Tustin: *Direct Current Machines for Control Systems* (Sporn).
Veinott: *Theory and Design of Small Induction Motors* (McGraw-Hill).

CONTROL SECTION:—

Bower and Schultheiss: *Introduction to the Design of Servomechanisms*. (Wiley).
Chestnut and Mayer: *Servomechanisms and Regulating System Design*. Vol. I, 2nd Ed. & Vol. II (Wiley).
Warfield: *Introduction to Electronic Analog Computers* (Prentice Hall).
Wass: *An Introduction to Electronic Analogue Computers* (Pergamon).
Gille, Pelegrin and Decaulne: *Feedback Control Systems* (McGraw-Hill).
Truxall: *Control Engineering Handbook* (McGraw-Hill).
Jackson: *Analog Computation* (Wiley).

6.501 Electrical Engineering (Honours)

Reference Books

Hohn: *Elementary Matrix Algebra* (Macmillan).
Chow and Cassignol: *Linear Signal Flow Graphs and Applications* (Wiley).
Soroka: *Analog Methods in Computation and Simulation* (McGraw-Hill).
Karplus: *Analog Simulation* (McGraw-Hill).

6.502 Electrical Engineering (Honours)

Reference Books

Caldwell: *Switching Circuits and Logical Design* (Wiley).
Reitz and Milford: *Foundations of Electromagnetic Theory* (Addison Wesley, 1960).
Cowling: *Magneto Hydrodynamics* (Interscience).
Spiegel: *Theory and Problems of Vector Analysis* (Interscience).
Marcus: *Switching Circuits for Engineers* (Prentice Hall).
Lee: *Statistical Theory of Communication* (Wiley).

SERVICING SUBJECTS

6.801 and 6.802 Electrical Engineering

Text Book

Fitzgerald and Higginbotham: *Basic Electrical Engineering* (2nd ed. McGraw-Hill).

DIPLOMA AND CONVERSION COURSES

6.101 Electric Circuit Theory

As for 6.101 (Degree Course).

6.152 and 6.13B Electric Circuit Theory

Text Book

Lepage and Seely: *General Network Analysis* (McGraw-Hill).

Reference Books

Cheng: *Analysis of Linear Systems* (Addison Wesley).
Scott: *Linear Circuits, Parts I and II* (Addison Wesley).
Fich and Potter: *Theory of A.C. Circuits* (Prentice Hall).
Ley, Lutz and Rehberg: *Linear Circuit Analysis* (McGraw-Hill).
Rogers: *The Theory of Networks* (Macdonald).

6.23B Electric Power Engineering

As for 6.201S-6.251 (Degree Course)

6.303 Electronics

As for 6.301S-6.351 (Degree Course).

6.255 Power Systems

As for 6.202S-6.252 (Degree Course) with the following additions:—

Reference Books

Say: *Magnetic Amplifiers and Saturable Reactors* (Pitman).
Tustin: *D.C. Machines for Control Systems* (Sporn).
Blume: *Transformer Engineering* (Wiley).

6.265 Electric Machines

As for 6.212S-6.262 (Degree Course).

6.354 Radio Engineering

As for 6.302S (Degree Course).

6.355 Radio Communications

As for 6.302S (Degree Course).

6.365 Pulse and High Frequency Techniques

As for 6.365 (Degree Course).

6.001A Electrical Engineering

As for 6.001S (Degree Course): *Electronics and Physical Electronics Sections only.*

6.001B Electrical Engineering

As for 6.001S (Degree Course): *Measurement Section only.*

6.001C Electrical Engineering

As for 6.001S (Degree Course): *Control Systems and Circuit Theory Sections only.*

SCHOOL OF MECHANICAL ENGINEERING

5.001 Engineering I

A. Descriptive Geometry

Reference Book

Abbott: *Practical Geometry and Engineering Graphics.*

B. Engineering Drawing

Text Books

Union Store: *Exercises in Engineering Drawing,* 2nd ed.
Institution of Engineers, Australia: *Australian Standard Engineering Drawing Practice* (c.z.1).

C. Mechanical Technology

Text Book

De Garmo: *Materials and Processes in Manufacturing* (Macmillan).

D. Engineering Mechanics

See School of Civil Engineering.

MECHANICAL ENGINEERING DESIGN

5.101/1 Mechanical Engineering Design

Text Books

Matousek: *Engineering Design.*
Shigley: *Mechanical Engineering Design.*

Reference Books

Aust. Standard Engineering Drawing Practice, 1951.
Faires: *Design of Machine Elements.*
Marks: *Mechanical Engineer's Handbook.*
Phelan: *Fundamentals of Mechanical Design.*
Kent: *Mechanical Engineer's Handbook—Design and Production.*
B.S. 1916, Part 1, 1953: *Limits and Fits for Engineering.*
B.S. 1916, Part 2, 1953: *Guide to the Selection of Fits.*
Hall, Holowenko, Laughlin: *Machine Design.*
Oberg and Jones: *Machinery Handbook.*
B.S. 2517, 1959: *Definitions for Use in Mechanical Engineering.*

FOR REVISION AND ADDITIONAL INFORMATION STUDENTS MAY CONSULT:

Timoshenko and Goodier: *Theory of Elasticity.*
Timoshenko and Young: *Strength of Materials,* 4th ed.
Laughner and Hargan, Editors: *Handbook of Fastening and Joining of Metal Parts.*
Lyman and Gerlach, Editors: *Metals Handbook.*

5.101/2 Mechanical Engineering Design

Text Books

A.S. No. CB.2: *1960, SAA Crane and Hoist Code.*
B.S. 436, 1940: *Machine Cut Helical and Spur Gears.*
Matousek: *Engineering Design.*
B.S. 721, 1963: *Specification of Worm Gearing.*
Shigley: *Mechanical Engineering Design.*

Reference Books

Faires: *Design of Machine Elements.*
Aust. Standard Engineering Drawing Practice, 1951.
Merritt: *Gears.*
Marks: *Mechanical Engineer's Handbook.*
Phelan: *Fundamentals of Mechanical Design.*
Kent: *Mechanical Engineer's Handbook, Design and Production.*
B.S. 1916, Part 1, 1953: *Limits and Fits for Engineering.*
B.S. 1916, Part 2, 1953: *Guide to the Selection of Fits.*
B.S. 721, 1937: *Machine Cut Gears — Worm Gearing.*
Regulations under Scaffolding and Lifts Act, 1912-1958.

5.101S Mechanical Engineering Design

The text and reference books are the same as for 5.101/1 and 5.101/2.

5.102 Mechanical Engineering Design

Text Books

Phelan: *Fundamentals of Mechanical Design.*
Matousek: *Engineering Design.*
Purday: *Diesel Engine Designing.*

Reference Books

Aust. Standard Engineering Drawing Practice, 1951.
Faires: *Design of Machine Elements.*
Hall, Holowenko, Laughlin: *Machine Design.*
B.S. 2517, 1959: *Definitions for Use in Mechanical Engineering.*
Ricardo: *High-speed Internal Combustion Engines.*
Mackerle: *The Air-cooled Engine.*
B.S. 649, 1958: *Diesel Engines for General Purposes.*
Marks: *Mechanical Engineer's Handbook.*
Kent: *Mechanical Engineer's Handbook — Design and Production.*
Oberg and Jones: *Machinery's Handbook.*
B.S. 1916, Part 1, 1953: *Limits and Fits for Engineering.*
B.S. 1916, Part 2, 1953: *Guide to the Selection of Fits.*

5.103S Mechanical Engineering Design

Text Books

Shigley: *Mechanical Engineering Design.*
Matousek: *Engineering Design.*
Pippenger and Koff: *Fluid Power Controls.*

Reference Books

These are the same as those shown for 5.101/1, with the following additions:
Marin: *Mechanical Behaviour of Engineering Materials.*
Spotts: *Mechanical Design Analysis.*

MECHANICAL TECHNOLOGY

5.201 and 5.202S Mechanical Technology

Text Books

De Garmo: *Materials and Processes in Manufacturing.*
For 5.202S only: Davis: *Industrial Organization and Management* (Harper, 1956).

Reference Books

Wright-Baker: *Modern Workshop Technology.*
Town: *Machine Shop Technology.*

5.203 and 5.204S Mechanical Technology

Text Book

De Garmo: *Materials and Processes in Manufacturing.*

Reference Books

Wright-Baker: *Modern Workshop Technology.*
Town: *Machine Shop Technology.*
Crane: *Plastic Working in Metals.*

5.203 Mechanical Technology (Old Course)

Text Book

Wright-Baker: *Modern Workshop Technology.*

Reference Book

Town: *Machine Shop Technology.*

APPLIED MECHANICS AND THEORY OF MACHINES

5.301 and 5.301S Engineering Mechanics

Text Book

Beer and Johnston: *Mechanics for Engineers,* Vector edition.

Reference Books

Timoshenko and Young: *Engineering Mechanics.*
Higdon and Stiles: *Engineering Mechanics.*

5.302 and 5.302S Theory of Machines

Text Book

Hirschhorn: *Kinematics and Dynamics of Plane Mechanisms.*

Reference Books

Mabie and Ocvirk: *Mechanisms and Dynamics of Machinery.*
Rosenauer and Willis: *Kinematics of Mechanisms.*
Holowenko: *Dynamics of Machinery.*
Rothbart: *Cams.*
Buckingham: *Analytical Mechanics of Gears.*

5.303 Mechanical Vibrations

Text Book

Church: *Mechanical Vibrations.*

Reference Books

Den Hartog: *Mechanical Vibrations.*
Burton: *Vibration and Impact.*

5.304S Theory of Machines

Text Book

Church: *Mechanical Vibrations.*

Reference Books

Den Hartog: *Mechanical Vibrations.*
Burton: *Vibration and Impact.*
Holowenko: *Dynamics of Machinery.*
Mabie and Ocvirk: *Mechanisms and Dynamics of Machinery.*
Tse, Morse and Henkel: *Mechanical Vibrations*

5.305S Theory of Machines

Text Books

Church: *Mechanical Vibrations.*
Holowenko: *Dynamics of Machinery.*
Hirschhorn: *Kinematics and Dynamics of Plane Mechanisms.*

Reference Books

Den Hartog: *Mechanical Vibrations.*
Burton: *Vibrations and Impact.*
Mabie and Ocvirk: *Mechanisms and Dynamics of Machinery.*
Tse, Morse and Henkel: *Mechanical Vibrations.*

AUTOMATIC CONTROL ENGINEERING

5.321 and 5.321S Automatic Control Engineering

Reference Books

Eckman: *Automatic Process Control.*
Raven: *Automatic Control Engineering.*
Young: *An Introduction to Process Control System Design.*

5.322S Automatic Control Engineering (Honours)

Text Book

Raven: *Automatic Control Engineering.*

Reference Books

Eckman: *Automatic Process Control.*
Chestnut and Mayer: *Servomechanisms and Regulating System Design,* Vol. I.
Nixon: *Principles of Automatic Control.*
Ahrendt and Taplin: *Automatic Feedback Control.*
Young: *An Introduction to Process Control System Design.*

NUMERICAL ANALYSIS

5.401S Numerical Analysis

Reference Books

Redish: *An Introduction to Computation Methods.*
Mickley, Sherwood and Reed: *Applied Mathematics in Chemical Engineering.*
Stanton: *Numerical Methods for Science and Engineering.*
Salvadori and Baron: *Numerical Methods in Engineering.*

FLUID MECHANICS

5.501 and 5.501S Fluid Mechanics

Text Books

Barna: *Fluid Mechanics for Engineers or*
Streeter: *Fluid Mechanics,* 3rd ed. *or*
Vennard: *Elementary Fluid Mechanics,* 4th ed.

Reference Book

B.S. 1042: *Flow Measurement.*

5.502 and 5.502S Fluid Mechanics

Text Books

Barna: *Fluid Mechanics for Engineers,* or
Shepherd: *Principles of Turbomachinery.*

Reference Books

Shapiro: *Dynamics and Thermodynamics of Compressible Fluid Flow,* Vol. I, Parts 1 and 2.
Addison: *Centrifugal and Axial Flow Pumps.*
Streeter: *Fluid Mechanics,* 3rd ed.
Francis: *Fluid Mechanics.*
Zucrow: *Aircraft Propulsion,* Vol. I.

5.503 Fluid Mechanics

Reference Books

Barna: *Fluid Mechanics for Engineers.*
Binder: *Advanced Fluid Mechanics,* Vols. 1 and 2.
Brown: *Hydroelectric Practice,* Vol. 2.
Davis: *Handbook of Applied Hydraulics.*
Jaeger: *Engineering Fluid Mechanics.*
Rouse: *Engineering Hydraulics.*
Shapiro: *Dynamics and Thermodynamics of Compressible Fluid Flow,* Vol. I, Parts 1 and 2.
Shepherd: *Introduction to the Gas Turbine.*
Cambel and Jennings: *Gas Dynamics.*
Zucrow: *Aircraft Propulsion,* Vol. 1.
Vallentine: *Applied Hydrodynamics.*
Nechleba: *Hydraulic Turbines.*
Eskinazi: *Principles of Fluid Mechanics.*

5.601S Mechanical Engineering

Reference Books

To be prescribed by the Lecturers.

THERMODYNAMICS

5.701 and 5.701S Thermodynamics

Text Book

Rogers and Mayhew: *Engineering Thermodynamics, Work and Heat Transfer.*

Reference Books

Jones and Hawkins: *Engineering Thermodynamics.*
Mooney: *Introduction to Thermodynamics and Heat Transfer.*
Lee and Sears: *Thermodynamics.*
Van Wylen: *Thermodynamics.*
Beckwith and Buck: *Mechanical Measurements.*
Moore: *Theory and Application of Mechanical Engineering Measurements.*

5.702 and 5.702S Thermodynamics

Text Book

Rogers and Mayhew: *Engineering Thermodynamics, Work and Heat Transfer.*

Reference Books

Lee and Sears: *Thermodynamics.*
Van Wylen: *Thermodynamics.*
Giedt: *Principles of Engineering Heat Transfer.*
Soo: *Thermodynamics of Engineering Science.*
Shepherd: *Introduction to the Gas Turbine.*
Kearton: *Steam Turbine Theory and Practice.*

5.703 and 5.703S Thermodynamics

Reference Books

Rogers and Mayhew: *Engineering Thermodynamics, Work and Heat Transfer.*
Gaffert: *Steam Power Stations.*
Stoecker: *Refrigeration and Air Conditioning.*
Cohen and Rogers: *Gas Turbine Theory.*
Threlkeld: *Thermal Environmental Engineering.*
Eckert and Drake: *Heat and Mass Transfer.*
Adams: *Elements of Internal Combustion Turbine Theory.*
Hall: *Reactor Heat Transfer.*
Openshaw Taylor: *Nuclear Reactors for Power Generation.*

AERONAUTICAL ENGINEERING

5.811 Aerodynamics

Text Books

Houghton and Brock: *Aerodynamics for Engineering Students or*
Streeter: *Fluid Dynamics or*
Kuethe and Schetzer: *Foundations of Aerodynamics,* 2nd ed.

Reference Books

Air Registration Board: *British Civil Airworthiness Requirements.*
Royal Aeronautical Society: *Aerodynamics and Performance Data Sheets.*
Vallentine: *Applied Hydraulics.*

5.812 Aerodynamics

Text Books

Perkins and Hage: *Aeroplane Performance Stability and Control.*
Bonney: *Engineering Supersonic Aerodynamics.*

Reference Books

Air Registration Board: *British Civil Airworthiness Requirements.*
Royal Aeronautical Society: *Aerodynamics and Performance Data Sheets.*
Vallentine: *Applied Hydraulics.*

5.821 Aircraft Materials and Structures

Text Books

Peery: *Aircraft Structures or*
Niles and Newell: *Airplane Structures,* Vol. I.

Reference Book

Timoshenko: *Strength of Materials,* Vol. I.

5.822 Aircraft Materials and Structures

Text Book

Peery: *Aircraft Structures or*

Reference Book

Timoshenko: *Strength of Materials.* Vol. II

5.823 Aircraft Materials and Structures

Text Books

Peery: *Aircraft Structures.*
Timoshenko and Goodier: *Theory of Elasticity.*

Reference Books

Timoshenko and Gere: *Theory of Elastic Stability.*
Kuhn: *Stress in Aircraft and Shell Structures.*
Bruhn: *Analysis and Design of Aircraft Structures.*
Royal Aeronautical Society: *Structures Data Sheets.*
Royal Aeronautical Society: *Handbooks of Aeronautics,* Nos. 1 and 2.
Williams: *Theory of Aircraft Structures.*

5.831 Aircraft Propulsion

Reference Books

Shepherd: *Introduction to the Gas Turbine.*
Hesse: *Jet Propulsion.*
Judge: *Aircraft Engines.*
Liston: *Aircraft Engine Design.*
Zucrow: *Gas Turbines and Jet Propulsion.*

NAVAL ARCHITECTURE

5.901 Naval Architecture

Text Book

Rossell and Chapman: *Principles of Naval Architecture,* Vol. I.

Reference Books

De Rooij: *Practical Shipbuilding.*
Halliburton: *Mould Loft Work.*

5.902 Naval Architecture

Text Books

Rossell and Chapman: *Principles of Naval Architecture,* Vols. I and II.
Arnott: *Design and Construction of Steel Merchant Ships.*

Reference Books

Wah: *A Guide for the Analysis of Ship Structures.*
Robb: *Theory of Naval Architecture.*
De Rooij: *Practical Shipbuilding.*
Lloyd's Register of Shipping: *Rules and Regulations for the Construction and Classification of Steel Ships.*

5.903 Naval Architecture

Text Book

Robb: *Theory of Naval Architecture.*

Reference Books

Wah: *A Guide for the Analysis of Ship Structures.*
Van Lammeren: *Resistance, Propulsion and Steering of Ships.*
Bullen: *The Ventilation of Ships.*
Schokker, Neuerburg and Vossnack: *The Design of Merchant Ships.*

5.904 Naval Architecture

Text Book

Manning: *The Theory and Technique of Ship Design.*

Reference Books

Schokker, Neuerburg, and Vossnack: *The Design of Merchant Ships.*
The Commonwealth of Australia: *Navigation Act.*
Ministry of Transport: *Instruction as to the Survey of Passenger Steamships,* Vols. I and II.
Ministry of Transport: *Instructions as to the Tonnage Measurement of Ships.*
Ministry of Transport: *Measurements of Vessels for the Panama Canal.*

DEPARTMENT OF INDUSTRIAL ENGINEERING

18.111S and 18.111 Industrial Administration

Text Books

Buffa: *Modern Production Management* (Wiley, 1961).
Factories, Shops and Industries Act 43 (Govt. Printing Office, 1962).

Reference Book

Carson: *Production Handbook* (Ronald Press, New York).

18.211S and 18.221 Production Control

Text Books

Moore: *Production Control* (McGraw-Hill).
Bowman and Fetter: *Analysis for Production Management* (Irwin, 1957).

18.311S and 18.321 Methods Engineering

Text Books

Barnes: *Motion and Time Study* (Wiley) 4th ed. *or*
Niebel: *Motion and Time Study* (Irwin, Illinois) 3rd ed.

Reference Books

Carson: *Production Handbook* (Ronald Press) 2nd ed.
Maynard: *Industrial Engineering Handbook* (McGraw-Hill, 1956).
Ryan: *Work and Effort* (Ronald Press).
Quick, Duncan and Malcolm: *Work Factor Time Standards* (McGraw-Hill).

18.411S and 18.421 Design for Production I

Text Books

Niebel and Baldwin: *Designing for Production* (Irwin).
B.S. 308: *Engineering Drawing Practice.*
B.S. 1609: *1949 Press Tool Sets.*

Reference Books

Van Doren: *Industrial Design* (McGraw-Hill).
Knoblaugh: *Model Making for Industrial Design* (McGraw-Hill).
Begeman and Amstead: *Manufacturing Processes* (Wiley).

18.412S and 18.422 Design for Production II

Text Books

Parker: *Drawings and Dimension* (Pitman, 1956).
B.S. 1916 Parts 1 and 2: *Limits and Fits for Engineering.*
B.S. 308: *1953 Engineering Drawing Practice.*

Reference Books

Ministry of Supply: *Dimensional Analysis of Engineering Design.* (H.M.S.O., London, 1948).
Tary and Johnson: *Process Engineering for Manufacturing* (Prentice Hall).

18.511S and 18.521 Industrial Marketing

Text Book

Alexander, Cross and Cunningham: *Industrial Marketing* (Irwin).

Reference Books

Alexander, Surface and Alderson: *Marketing,* 3rd ed.
Ferber: *Statistical Techniques in Market Research* (McGraw-Hill).

18.611S Engineering Economic Analysis

Text Books

Barish: *Economic Analysis* (McGraw-Hill).
De Garmo: *Engineering Economy* (Macmillan, N.Y.).

Reference Books

Rautenstrauch and Villers: *The Economics of Industrial Management* (Funk and Wagnalls, N.Y., 1957) 2nd ed.
Edwards and Townsend: *Business Enterprise* (Macmillan, 1958).
Dean: *Managerial Economics* (Prentice Hall, 1951).
Stigler: *The Theory of Price* (Macmillan, N.Y.) Revised ed., 1952.
Sasieni, Yaspan and Friedman: *Introduction to Operations Research* (Wiley).

18.621 Engineering Economics

Text Books

Barish: *Economic Analysis* (McGraw-Hill).
De Garmo: *Engineering Economy* (Macmillan, N.Y.).

Reference Books

Robnett, Hill and Beckett: *Accounting — A Management Approach* (Irwin).
Keller: *Management Accounting for Profit Control* (McGraw-Hill).
Stigler: *The Theory of Price* (Macmillan, 1952).
Dean: *Managerial Economics* (Prentice Hall, 1951).
Grant: *Engineering Economic Analysis* (McGraw-Hill).
Sasieni, Yaspan and Friedman: *Introduction to Operations Research* (Wiley).

STUDENT'S TIMETABLE

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9-10					
10-11					
11-12					
12-1					
1-2					
2-3					
3-4					
4-5					
5-6					
6-7					
7-8					
8-9					

NOTES