The New South Wales

UNIVERSITY of TECHNOLOGY

CALENDAR, 1950

CALENDAR

OF THE

NEW SOUTH WALES UNIVERSITY OF TECHNOLOGY

1950

27038—1

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NEW SOUTH WALES UNIVERSITY OF TECHNOLOGY.

ALMANAC FOR 1950.

Date.	Two Term Day Course.	Three Term Day Course.	Three Term Part-Time Day Course.
1950.			
Feb. 20 ...	Enrolments begin for all courses.		
Feb. 28 ...	.....	.....	First term begins.
Mar. 6 ...	First term begins.	First term begins.	.....
Apr. 7–10	Easter Public Holidays—Good Friday and Easter Monday.		
Apr. 25 ...	Anzac Day—Public Holiday.		
May 20 ...	First term ends.	First term ends.	First term ends.
May 29 ...	Second term begins.	Second term begins.	Second term begins.
June 12 ...	King's Birthday—Public Holiday.		
Aug. 7 ...	Bank Holiday.		
Aug. 26 ...	Second term ends.	Second term ends.	Second term ends.
Sept. 4 ...	Examinations begin.	Examinations begin.	Third term begins.
Sept. 16 ...	Examinations end.	Examinations end.	.....
Sept. 25 ...	Industrial training begins.	Third term begins.	.....
Oct. 2 ...	Labour Day—Public Holiday.		
Nov. 18 ...	.....	Third term ends.	.....
Nov. 25 ...	.....	.....	Third term ends.
Nov. 27 ...	Deferred Examinations begin.	Examinations begin.	Examinations begin.
Dec. 15 ...	Examinations end.	Examinations end.	Examinations end.
1951.			
Feb. 19 ...	Enrolments begin for all courses.		
Feb. 26 ...	.....	.....	First term begins.
Mar. 5 ...	First term begins.	First term begins.	.....

	Two Term Day Course.	Three Term Day Course.	Three Term Part-time Day Course.
First Term ...	11 weeks.	11 weeks.	12 weeks.
Vacation	1 week.	1 week.	1 week.
Second Term ...	13 weeks.	13 weeks.	13 weeks.
Vacation	1 week.	1 week.	1 week.
Examinations ...	2 weeks.	2 weeks.	.....
Vacation	.....	1 week.	.....
Third Term ...	.....	8 weeks.	12 weeks.
Vacation	.....	1 week.	.....
Examinations ...	.....	3 weeks.	3 weeks.

Day courses are conducted between 9 a.m. and 5 p.m., Mondays to Fridays. For 1950 the two term day course applies for Engineering courses V, VI, VII, VIII, in first, second and third years. The three term day course applies to the first year of Courses II and III in Applied Chemistry and Chemical Engineering, and the Architecture course. The three term part-time day course applies to the second year of Courses II and III in Applied Chemistry and Chemical Engineering.

Annual examinations are held at the end of second term in subjects which are given only in the first two terms. Other annual examinations are held at the end of third term.

LOCATION OF STAFF.

At the present time members of the University staff are located at the Sydney Technical College.

DIRECTOR	Room 101, First Floor, Main Administrative Building.
REGISTRAR	Room 107, First Floor, Main Administrative Building.
PROFESSOR BROWN	Room 104, First Floor, Main Administrative Building.
PROFESSOR ASTBURY	Second Floor, Main Administrative Building.
PROFESSORS BAXTER AND ALEXANDER	Chemistry Building.
PROFESSOR PHILLIPS	Principal's Building.
PROFESSOR TOWNDROW	Architecture Building.
SECRETARY TO COUNCIL	Room 103, First Floor, Main Administrative Building.

The New South Wales University of Technology

HISTORY AND OBJECTIVES.

Incorporated by New South Wales Act of Parliament in April, 1949, the N.S.W. University of Technology was established to meet the urgent demand in Australia for increasing numbers of technologists and applied scientists, and to provide them with the means of advanced training and research.

In the words of the Act, the objects of the University are:—

(*a*) The provision of facilities for higher specialised instruction and advanced training in the various branches of technology and science in their application to industry and commerce; and

(*b*) the aiding by research and other suitable means of the advancement, development and practical application of science to industry and commerce.

Under the same Act, a Governing Council of the New South Wales University of Technology has been formed, ultimately to consist of thirty members. The Council is representative of Parliament, industry and commerce, the trade unions, technical education, professional bodies, the University of Sydney, and of the University's own teaching staff and its undergraduates and graduates. The present membership of the Council is listed in the Calendar.

The Governing Council under the authority given to it by the Act—

(*a*) may provide courses in applied science, engineering, technology, commerce, industrial organisation and such other related courses as it deems fit, and may, after examination, confer the several degrees of Bachelor, Master and Doctor, and such other degrees and such certificates in the nature of degrees or otherwise as it thinks fit;

(*b*) may from time to time appoint deans, professors, lecturers and other officers and employees of the University;

(*c*) shall have the entire control and management of the affairs, concerns and property of the University; and

(*d*) may act in all matters concerning the University in such manner as appears to it best calculated to promote the objects and interests of the University.

Courses Already in Operation.

Erection of the first building of the University was commenced in February, 1950, but actually, by availing itself of existing Technical Education facilities, the University instituted its professional degree courses in Mining, Civil, Electrical and Mechanical Engineering on 1st March, 1948. This initial step was made possible by the work of the Developmental Council, appointed in August, 1947, by the Minister of Education, the Hon. R. J. Heffron, M.L.A.

The degree courses mentioned, which are each of four years' duration, afford the student laboratory and lecture room training at the University of Technology for half the year, from March to September, and practical experience of a planned nature in industry for the remainder of the year.

Courses in Applied Chemistry and Chemical Engineering were added on 7th March, 1949, and on the same day the first post-graduate course—that of Electronic Engineering—was commenced. Further post-graduate courses are planned, and a degree course in Architecture will be introduced this year.

Degree courses in operation are similar in content and laboratory- and lecture-time to those of universities and higher technological institutions providing advanced scientific study and training overseas. Courses are reviewed and approved by advisory panels, whose members represent the related technological field, including executives of major industries, chief engineers and educationists from recognised tertiary institutions.

Emphasis is laid on two features in the planning of University of Technology courses. The first is the provision of practical experience in industry to the student, supplementing the laboratory and lecture room work at the University. This practical work, for example, in the case of engineering students, amounts to five months per year, and is supervised and organised to meet the needs of each year in each course of study.

Secondly, in all faculties, compulsory courses will be provided in the study of language and literature, history, economics and psychology. These courses are designed to prevent excessive specialisation by the student, and to give the technological expert a wide understanding of human affairs.

The University will also offer the customary club and social features of university life—sport and societies dealing with literature, art, music and public questions.

Facilities will be available to students already in employment and enrolled in appropriate courses at Technical Colleges, to transfer at certain stages to degree courses at the University of Technology. Conversion courses, the first of which commences this year, will permit those who hold such qualifications from Technical Colleges and from other Universities to resume their studies and to secure the degree or higher degrees of the New South Wales University of Technology.

Special investigations may be carried out on any problem of technology or applied science, at the request of any authority, institution, association or person; and in respect of any such investigation the Council of the University may charge such fees therefor and agree to such conditions in relation thereto as it thinks fit. Plant and machinery have been ordered for the equipment of the University's first research centre. The necessary building, with a floor space of 21,000 square feet, has been secured and is being re-designed to serve the requirements of this centre.

Several industrial undertakings and Government departments are co-operating with the University by their recognition of its courses as a means of training their industrial cadets in the theory and practice of their profession. To this end, they have selected employees as students to attend degree courses, paying their fees and the ordinary cadet rates payable during their periods in industry. The attendance of such students is also counted as part of their service for seniority grading and salary purposes.

In addition to the above, a number of scholarships have been granted, with liberal living allowances, particularly from the coal-mining and the metal trades industries.

Power to decentralise the University's activities, both in its co-operation with industry and in its teaching services, is given to the Council, which is authorised to establish and maintain branches, departments or colleges at Newcastle, Wollongong, Broken Hill, or such other places in the State of New South Wales as it may approve.

TECHNICAL EDUCATION AND NEW SOUTH WALES UNIVERSITY OF TECHNOLOGY ACT, 1949.

PART III.

THE NEW SOUTH WALES UNIVERSITY OF TECHNOLOGY.

DIVISION 1.—Preliminary.

Commencement.

14. This Part of this Act shall, except where otherwise expressly provided, commence upon a day to be appointed by the Governor and notified by proclamation published in the Gazette.

Definitions.

15. In this Part of this Act, unless the context or subject matter otherwise indicates or requires—

"By-laws" means by-laws made under this Part of this Act.

"Council" means the Council of the University.

"Prescribed" means prescribed by this Part of this Act or by the regulations.

"Regulations" means regulations made under this Part of this Act.

"University" means the New South Wales University of Technology.

DIVISION 2.—Incorporation of the University and Establishment of a Council thereof.

New South Wales University of Technology.

16. (1) There shall be a New South Wales University of Technology consisting of the Council, the professors and such other classes of persons giving instruction within the University as may be prescribed and the graduate and under-graduate members thereof.

(2) The University shall be a body corporate under the name of "The New South Wales University of Technology" with perpetual succession and a common seal, and shall be capable by that name of suing and being sued, and of doing and suffering all such other acts and things as bodies corporate may by law do and suffer.

(3) The University shall, subject to this Part of this Act and the regulations, have power to take, purchase, hold, grant, alienate, demise or otherwise dispose of real and personal property:

Provided that the University shall not, except with the approval of the Governor, alienate, mortgage, charge or demise any real property.

Common Seal.

17. (1) The common seal of the University shall be kept in such custody as the Council directs, and shall not be used except upon resolution of the Council.

(2) All courts, judges and persons acting judicially shall take judicial notice of the common seal of the University affixed to any document, and shall presume that it was duly affixed.

Objects of the University.

18. The objects of the University shall include the following:—

(a) to provide facilities for higher specialised instruction and advanced training in the various branches of technology and science in their application to industry and commerce; and

(b) to aid by research and other suitable means the advancement, development, and practical application of science to industry and commerce.

The Council.

19. (1) There shall be a Council of the University which shall have and may exercise and discharge the powers, authorities, duties and functions conferred and imposed upon the Council by or under this Part of this Act.

(2) The Council shall consist of not more than thirty members who shall be appointed by the Governor.

Of the members so appointed—

(a) five shall be appointed on the nomination of the Minister, being persons who, in the opinion of the Minister, by their knowledge and experience can advance the full development of the University;

(b) one shall be a member of the Legislative Council elected by that Council;

(c) one shall be a member of the Legislative Assembly elected by that Assembly;

(d) four shall be appointed on the nomination of the Minister to represent persons engaged in the professions;

(e) two shall be officers within the meaning of the Public Service Act, 1902, as amended by subsequent Acts, directly concerned with and engaged in the administration of technical education and shall be appointed on the nomination of the Minister;

(f) five shall be appointed on the nomination of the Minister to represent industrial and commercial interests;

(g) three shall be appointed on the nomination of the Minister to represent trade unions and employee organisations;

(h) one shall be appointed upon the nomination of the Senate of the University of Sydney;

(i) one shall be a person having the qualifications as prescribed by the by-laws elected in the manner prescribed by the by-laws, by undergraduates within the University;

(j) one shall be a person having the qualifications as prescribed by the by-laws, elected in the manner prescribed by the by-laws, by the graduates of the University;

(k) one shall be a person elected, in the manner prescribed by the by-laws, by the professors and such other classes of persons giving instruction within the University as may be so prescribed;

(l) one shall be the person for the time being holding the office of Director of the University;

(m) not more than four shall be persons elected in the manner prescribed by the by-laws to represent such principal faculties as may be so prescribed.

(3) The person or persons to be nominated by the Minister for appointment pursuant to paragraph (d), (f) or (g) of subsection two of this section shall, in respect of each such paragraph, be selected by him from a panel of such number of names as may be prescribed submitted to him for the purpose by such person or class or classes of persons or body or bodies of persons as may be prescribed in relation to that paragraph.

The regulations may prescribe—

(a) the time within which any such panel of names shall be submitted to the Minister;

(b) where any such panel of names is to be submitted by more than one prescribed class or body of persons, the number of names which each such class or body is entitled to include in such panel.

(4) If for any reason a panel of names is not submitted to the Minister in accordance with this section or the regulations or is not submitted within the time prescribed with respect thereto, the Minister may nominate such person or persons as he thinks fit and such person or persons shall be deemed to have been validly nominated in accordance with subsection three of this section and the regulations.

(5) (a) Members of the Council, other than the Director of the University, shall, subject to this Part of this Act, hold office for such period not exceeding four years as may be prescribed. Different periods may be prescribed in respect of the different classes of members.

The Director of the University shall hold office while he remains Director.

(b) The regulations may provide for the retirement in rotation of members of any particular class and for that purpose may provide that, on the first appointment of members of any such class

after the introduction of rotational retirement, such number as may be prescribed of the members of that class shall be appointed for a less period than that prescribed pursuant to paragraph (a) of this subsection with respect to members of that class.

(c) All retiring members shall, unless otherwise disqualified, be eligible for reappointment.

(6) Where a casual vacancy occurs in the office of a member of the Council the Governor may appoint a person to the vacant office. The person so appointed shall have the like prescribed qualification (if any) as that of the member whose office has become vacant and shall, subject to this Part of this Act, hold office for the residue of his predecessor's term of office.

(7) The provisions of the Public Service Act, 1902, as amended by subsequent Acts, shall not apply to or in respect of the appointment by the Governor of any member of the Council, and any member so appointed shall not, in his capacity as such member, be subject to the provisions of such Act during his term of office.

Vacation of Office.

20. A member of the Council shall be deemed to have vacated his office if he—

(a) dies;

(b) resigns his office by writing under his hand addressed to the Governor;

(c) becomes bankrupt, compounds with his creditors or makes any assignment of his salary or estate for their benefit;

(d) becomes an insane person or patient or an incapable person within the meaning of the Lunacy Act, 1898-1947;

(e) absents himself from four consecutive meetings of the Council without leave of the Council; or

(f) in the case of a member elected by either House of Parliament—ceases to be a member of that House.

President and Vice-President.

21. (1) (a) The first President of the University shall be appointed by the Minister and shall hold office for a period of one year. The person so appointed shall be a member of the Council.

(b) Whenever a vacancy in the office of President occurs, the Council shall elect one of its number to be President of the University.

(c) The President, other than the first President, shall hold office for such period and on such terms and conditions as may be prescribed by the by-laws.

(2) (a) The Council shall, at its first meeting and thereafter whenever a vacancy in the office of Vice-President occurs, elect one of its number to be Vice-President of the University.

(b) The Vice-President shall hold office for such period and on such terms and conditions as may be prescribed by the by-laws.

Chairman.

22. At every meeting of the Council the President or, in his absence, the Vice-President shall preside as chairman, but if the President and Vice-President are both absent, the members present shall elect a person from among their number to preside as chairman.

Questions How Decided.

23. (1) All questions which come before the Council shall be decided at any meeting duly convened, at which a quorum is present, by a majority of the votes of the members present.

(2) The chairman at any such meeting shall have a vote; and in case of an equality of votes a second or casting vote.

(3) At any such meeting ten members shall form a quorum.

Validity of Acts and Proceedings.

24. (1) No act or proceeding of the Council or any committee of the Council, or of the Director or any person acting pursuant to any direction of the Council shall be invalidated or prejudiced by reason only of the fact that at the time when such act or proceeding was done, taken or commenced there was a vacancy or vacancies, not exceeding twelve in number, in the office or offices of any member or members of the Council.

(2) All acts and proceedings of the Council or any committee of the Council, or of the Director or any person acting pursuant to any direction of the Council shall, notwithstanding the subsequent discovery of any defect in the appointment, nomination or election of any member of the Council, or that any such member was disqualified from acting as or incapable of being a member of the Council, be as valid as if such member had been duly appointed, nominated or elected and was qualified to act as or capable of being a member and had acted as a member of the Council and as if the Council had been properly and fully constituted.

DIVISION 3.—Administration.

Powers of the Council.

25. Subject to this Part of this Act and to the regulations and by-laws, the Council—

(a) may provide courses in applied science, engineering, technology, commerce, industrial organisation and such other related courses as it deems fit and may, after examination, confer the several degrees of Bachelor, Master and Doctor, and such other degrees and such certificates in the nature of degrees or otherwise as it thinks fit;

(b) may from time to time appoint deans, professors, lecturers and other officers and employees of the University;

(c) shall have the entire control and management of the affairs, concerns and property of the University; and

(d) may act in all matters concerning the University in such manner as appears to it best calculated to promote the objects and interests of the University:

Provided that no appointment of a dean, professor, lecturer or other officer or employee shall be made pursuant to this section before the day appointed and notified pursuant to subsection three of section thirty-three of this Act.

Director.

26. (1) There shall be a Director of the University who shall be the chief executive officer of the Council.

(2) The Director shall have and may exercise and discharge such powers, authorities, duties and functions as may be prescribed in the regulations and by-laws.

(3) The Director shall be appointed in the manner prescribed and shall hold office for such period and upon such terms and conditions as may be prescribed.

Delegation to Committees, etc.

27. (1) The Council may constitute and appoint such committees as it thinks fit and may delegate all or any of its powers, authorities and functions (except this power of delegation and the power to make by-laws) to any such committee or to any member of the Council, or to any officer or officers of the University.

(2) Every delegation under this section shall be revocable by resolution of the Council and no delegation shall prevent the exercise or discharge by the Council of any of its powers, authorities, duties or functions.

Ad Eundem and Honorary Degrees.

28. (1) Where any person has obtained in any university or other educational establishment recognised by the by-laws of the University in force for the time being any degree or diploma corresponding or equivalent, in the opinion of the Council, to any degree which the Council is now or may hereafter be empowered to confer after examination, the Council may confer such latter degree upon such person without examination.

(2) The persons upon whom degrees are conferred, under the provisions of subsection one of this section, shall be entitled to the same rights and privileges as appertain to those who have taken the same degrees in the ordinary course in the University.

(3) By-laws may be made for or with respect to the conferring of honorary degrees or other distinctions on approved persons.

Power to Establish and Maintain Branches, Departments, or Colleges.

29. (1) The Council may establish and maintain branches, departments or colleges of the University at Newcastle, Wollongong, Broken Hill or such other place in the State as the Council deems fit.

Council May Authorise Educational Establishments to Issue Certificates.

(2) (a) The Council may authorise any college or educational establishment, whether incorporated or not, engaged in the promotion of applied science and technology, to issue to candidates for any degree or diploma, certificates to the effect that the candidate for any such degree or diploma has completed such course of instruction therefor as the Council by by-law prescribes.

(b) Any person who presents to the Council any such certificate may be admitted as a candidate for the degree or diploma to which it has reference.

Evidence of Degrees Conferred.

30. All degrees conferred by the University shall be evidenced by a certificate under the common seal of the University and be signed by the President and the Director.

Fees.

31. The Council may by by-law make provision for the payment by students of the University of reasonable fees for entrance to the University, attendance at lectures, conferring of degrees and other University charges, except in the case of any student who is granted any fellowship, scholarship, exhibition, bursary or similar benefit, to the extent to which he is thereby exempted from payment of fees.

Technological and Scientific Investigation.

32. (1) The Council may carry out special investigations in any technological or scientific matter at the request of any authority, institution, association, firm or person, and in respect of any such investigation may charge such fees therefor and agree to such conditions in relation thereto as it thinks fit.

(2) The Council may publish information relating to any matter investigated by it pursuant to the provisions of subsection one of this section or otherwise:

Provided that no such publication shall be made in contravention of any condition agreed to pursuant to the said subsection.

Transitional Provisions—Appointments.

33. (1) (a) During the period commencing on the date of commencement of this Part of this Act and ending on the appointed day the provisions of this subsection shall have effect.

(b) All deans, professors, lecturers and other officers and employees necessary to enable the Council to exercise and discharge the powers, authorities, duties and functions conferred and imposed upon it by this Part of this Act shall be appointed under and subject to the provisions of the Public Service Act, 1902, as amended by subsequent Acts; and every such dean, professor, lecturer or other officer or employee shall be subject to the said Act, as so amended, during his tenure of office or employment; and the permanent head of the Department of Technical Education shall in relation to such deans, professors, lecturers and other officers and employees be the permanent head within the meaning of the said Act, as so amended.

(2) Any person appointed under subsection one of this section and in office immediately before the appointed day who is not appointed by the Council to the staff of the University on that day shall be entitled, if he is under the age of sixty years, to be appointed on the recommendation of the Public Service Board to some office or position in the Public Service not lower in salary than that which he held under the said subsection immediately before the appointed day.

(3) In this section "appointed day" means a day to be appointed by the Governor and notified by proclamation published in the Gazette. The day so appointed and notified shall not be earlier than one month after the date of the publication of such proclamation in the Gazette.

Use of Services of Officers and Employees of the Public Service.

34. For the purpose of exercising and discharging the powers, authorities, duties and functions conferred and imposed on the Council by this Part of this Act the Council may, with the approval of the Minister of the Department concerned and of the Public Service Board, on such terms as may be arranged, make use of the services of any of the officers and employees of any Government Department.

Saving of Rights.

35. (1) Where a person who is appointed by the Council to the staff of the University was immediately before his appointment an officer within the meaning of the Public Service Act, 1902, or an employee within the meaning of the Superannuation Act, 1916, he shall—

(a) retain any rights accrued or accruing under either of those Acts;

(b) continue to contribute to any fund or account and shall be entitled to receive any deferred or extended leave and any payment, pension or gratuity as if he were an officer or employee within the meaning of the Public Service Act, 1902, or the Superannuation Act, 1916, as the case may be, and for such purpose his service with the University shall be deemed to be service for the purposes of such Acts;

(c) in the event of his ceasing to be employed by the University (otherwise than on account of misconduct or disgraceful or improper conduct) be entitled, if he is under the age of sixty years, to be appointed upon the recommendation of the Public Service Board to some office in the Public Service not lower in classification and salary than that which he held immediately before his appointment to the staff of the University.

(2) This section shall commence upon the day appointed and notified pursuant to subsection three of section thirty-three of this Act.

Amendment of Act No. 28, 1916, Sch. III.

36. (1) The Superannuation Act, 1916-1948, is amended by inserting at the end of Schedule Three thereto the following words:—

The New South Wales University of Technology.

(2) This section shall commence upon the day appointed and notified pursuant to subsection three of section thirty-three of this Act.

By-laws.

37. (1) The Council may make by-laws, not inconsistent with this Part of this Act or the regulations, with respect to all matters pertaining to the University.

(2) Without prejudice to the generality of subsection one of this section the Council may make by-laws with respect to—

(a) the management, good government, and discipline of the University;

(b) the method of election of members of the Council (other than the members referred to in paragraphs (b) and (c) of subsection two of section nineteen of this Act) who are to be elected;

(c) the manner and time of convening, holding and adjourning the meetings of the Council; the manner of voting at such meetings, including postal voting or voting by proxy; the powers and duties of the chairman thereof; the conduct and record of the business; the appointment of committees of the Council, and the quorum, powers and duties of such committees;

(d) the number, stipend, manner of appointment and dismissal of deans, professors, lecturers, examiners, and other officers and servants of the University;
(e) the entrance standards for students;
(f) the examinations for and the granting of degrees, diplomas, certificates and honours;
(g) the examinations for and the granting of fellowships, scholarships, exhibitions, bursaries, and prizes;
(h) the admission of students of other universities and technical colleges to any corresponding status or of graduates of other universities or technical colleges to any corresponding degree or diploma without examination;
(i) generally, all other matters authorised by this Part of this Act or necessary or convenient for giving effect to this Part of this Act.

(3) Every by-law made by the Council shall be sealed with the common seal of the University, shall be submitted for the consideration and approval of the Governor, and when so approved shall—

(a) be published in the Gazette;
(b) take effect from the date of publication or from a later date to be specified in the by-law.

(4) A copy of every such by-law shall be laid before each House of Parliament within fourteen sitting days after the publication thereof in the Gazette if Parliament is in session, and if not, then within fourteen sitting days after the commencement of the next session.

(5) Any such by-law may be proved in any court by the production of a verified copy under the seal of the University or by the production of a document purporting to be a copy of such by-law and to be printed by the Government Printer.

DIVISION 4.—Finance.

New South Wales University of Technology Account.

38. (1) The University shall have an account which shall be called the "New South Wales University of Technology Account" (in this section referred to as the "Account").

(2) There shall be paid to the credit of the Account—

(a) all moneys received by the University by way of fees, charges, gifts, bequests or otherwise;
(b) all moneys made available to the University or the Council in accordance with the provisions of this Division.

(3) All expenditure incurred by the University (including the repayment of moneys borrowed by or advanced to the University in accordance with this Division) shall be paid from the Account.

Colonial Treasurer to Meet Certain Costs.

39. (1) Any expenditure incurred by the University with the approval of the Governor given on the recommendation of the Colonial Treasurer is in this section referred to as approved expenditure.

(2) The Colonial Treasurer shall, in each year, pay to the University the amount by which the approved expenditure exceeds the income from all sources of the University or so much of such income as is capable of being applied for the purpose of meeting approved expenditure.

(3) Any moneys payable by the Colonial Treasurer under this section shall be paid out of moneys provided by Parliament.

Advances by Colonial Treasurer.

40. The Colonial Treasurer may for the temporary accommodation of the University advance such moneys to the Council as the Governor may approve upon such terms and conditions as to repayment and interest as may be agreed upon.

Power of Council to Borrow.

41. The Council may borrow money for—

(a) the purpose of carrying out or performing any of its powers, authorities, duties and functions;

(b) the renewal of loans; or

(c) the discharge or partial discharge of any indebtedness to the Colonial Treasurer or to any bank,

within such limits, to such extent and upon such conditions as to security or otherwise as the Governor upon the recommendation of the Colonial Treasurer may approve.

Accounts To Be Rendered.

42. The Council shall cause to be kept proper books of account in relation to the funds of the University and shall, as soon as practicable after the thirtieth day of June in each year, prepare and transmit to the Minister for presentation to Parliament a statement of accounts in a form approved by the Auditor-General exhibiting a true and correct view of the financial position and transactions of the University.

Audit.

43. The accounts of the University shall be audited by the Auditor-General, who shall have, in respect thereof, all the powers conferred on the Auditor-General by any law now or hereafter in force relating to the audit of public accounts; and the Audit Act, 1902, and any Acts amending the same, shall apply to the members of the Council and to the officers and employees of the University in the same manner as it applies to accounting officers of public departments.

DIVISION 5.—General.

No Religious Test.

44. No religious test shall be administered to any person in order to entitle him to be admitted as a student of the University, or to hold office therein, or to graduate thereat, or to enjoy any benefit, advantage or privilege thereof.

Power to Accept Gifts, etc.

45. (1) The University shall have power to acquire by gift, bequest or devise any property for the purposes of this Part of this Act, and to agree to and carry out the conditions of any such gift, bequest or devise.

(2) The rule of law relating to perpetuities shall not apply to any condition of a gift, bequest or devise to which the University has agreed.

Council to Co-operate with Other Bodies.

46. In the exercise of its powers, authorities, duties and functions under this Part of this Act the Council shall, so far as is practicable, co-operate with the University of Sydney, the Commonwealth Scientific and Industrial Research Organisation, the Department of Technical Education, and other Commonwealth and State institutions devoted to science and research.

Report of Proceedings.

47. (1) As soon as practicable after the thirtieth day of June in each year, the Council shall prepare and furnish to the Minister a report upon the proceedings of the University during the period of twelve months immediately preceding that day. Such report shall include a summary of the work, researches and investigations carried out by the University during such period.

(2) A copy of such report shall be laid before both Houses of Parliament as soon as practicable after it has been received by the Minister.

Regulations.

48. (1) The Governor may make regulations not inconsistent with this Part of this Act prescribing all matters which by this Part of this Act are required or permitted to be prescribed or which are necessary or convenient to be prescribed in relation to any matter within the powers and functions of the University and the Council and generally for carrying out or giving effect to the objects of the University and to this Part of this Act.

(2) The Regulations shall—

(a) be published in the Gazette;

(b) take effect from the date of publication or from a later date to be specified therein;

(c) be laid before both Houses of Parliament within fourteen sitting days after the publication thereof if Parliament is in session, and if not, then within fourteen sitting days after the commencement of the next session.

If either House of Parliament passes a resolution of which notice has been given at any time within fifteen sitting days after such regulations have been laid before such House disallowing any regulation or part thereof, such regulation or part shall thereupon cease to have effect.

PART IV.

Acquisition of Land.

49. (1) For the purposes of this Act, the Governor may, under the Public Works Act, 1912, as amended by subsequent Acts, resume or appropriate any land and the Minister may, under the said Act as so amended, purchase any land.

(2) (a) Where any land has been appropriated or resumed pursuant to this section the Governor may, by notification published in the Gazette, notify that the land so resumed or appropriated and specified in such notification is vested in The New South Wales University of Technology.

(b) Thereupon the land so specified shall vest in the said University.

(3) For the purposes of the Public Works Act, 1912, as amended by subsequent Acts, any such resumption, appropriation or purchase shall be deemed to be for an authorised work, and the Minister shall be deemed to be the Constructing Authority:

Provided that sections thirty-four, thirty-five, thirty-six and thirty-seven of the Public Works Act, 1912, as amended by subsequent Acts, shall not apply to any such resumption, appropriation or purchase, but section thirty-eight of such Act shall, mutatis mutandis, apply to and in respect of any contracts relating to any such resumption, appropriation or purchase.

Power to Rescind Resumptions. Cf. Act No. 7, 1912, s. 4c.

50. (1) The Governor may, by notification in the Gazette, rescind in whole or in part any notification of resumption made in pursuance of section forty-nine of this Act.

(2) Upon the publication of any notification of rescission the land described in such notification shall revest in the person who was entitled thereto immediately before the resumption for his estate, interest or right immediately before such resumption, but subject to any interest in or equity binding upon such land created by the Constructing Authority since such resumption; and the land shall be subject to all trusts, obligations, estates, interests, contracts, charges, rates, rights-of-way or other easements from which it was freed and discharged by such resumption as if the land had not been resumed and shall also be subject to any interests in or equities binding on the compensation moneys created since the resumption.

(3) On the lodgment with the Registrar-General of a copy of a notification in the Gazette rescinding a notification of resumption of land under the provisions of the Real Property Act, 1900, the Registrar-General shall cancel any entry or notification in the register book made by him pursuant to section 46A of the Real Property Act, 1900, in so far as it relates to the land the notification of the resumption of which has been rescinded, and for the purpose of any dealing with such land the entry or notification made pursuant to section 46A of the Real Property Act, 1900, shall be deemed never to have been made.

(4) The person in whom any land is revested under this section shall be entitled to be compensated by the Constructing Authority for any loss or damage actually suffered by him as a direct consequence of the resumption and its rescission other than compensation in respect of the value of the land.

(5) Any claim for compensation arising under this section shall be heard and determined in like manner and subject to the like conditions as a claim for compensation by reason of the acquisition of land under the Public Works Act, 1912, as amended by subsequent Acts, and the provisions of the Land and Valuation Court Act, 1921, as amended by subsequent Acts, shall, mutatis mutandis, apply to and in respect of the hearing and determination of any such claim.

REGULATIONS.

Interpretation.

1. In these Regulations, "Act" means the Technical Education and New South Wales University of Technology Act, 1949.

Incorporation of the University.

2. For the purposes of subsection one of section sixteen of the Act, "lecturers and fellows of the University" are hereby prescribed as classes of persons giving instruction within the University.

Submission to Minister of Panels of Names Relating to the Appointment of Certain Members of the Council of the University.

3. (1) The persons to be nominated by the Minister for appointment—

(a) pursuant to paragraph (d) of subsection two of section nineteen of the Act shall be selected by him from a panel of twenty-one names submitted to him by the organisations specified in Part A of the Schedule hereto;

(b) pursuant to paragraph (f) of the same subsection shall be selected by him from a panel of twenty-two names submitted to him by the organisations specified in Part B of the Schedule hereto;

(c) pursuant to paragraph (g) of the same subsection shall be selected by him from a panel of four names submitted to him by the organisations specified in Part C of the Schedule hereto.

(2) The number of names which each such organisation is entitled to include in the appropriate panel shall be the number specified in the said Schedule opposite the name of such organisation.

For the purposes of this Regulation the four bodies grouped together at the end of Part B of the said Schedule shall be deemed to be one organisation.

(3) All names which any such organisation is entitled to include in a panel shall, in respect of the first appointment of members to the Council of the University, be submitted to the Minister not later than the twenty-eighth day of June, one thousand nine hundred and forty-nine, and in respect of any subsequent appointment of members to that Council, be submitted to the Minister not later than the fourteenth day of June in the year in which any such appointment is to be made.

SCHEDULE.

Part A.

Representation of Persons Engaged in the Professions.

Organisation.	Number of Names.
The Institution of Engineers, Australia, Sydney Division	3
The Institution of Engineers, Australia, Newcastle Division	3
The Royal Australian Chemical Institute (N.S.W. Branch)	3
The Institute of Optometrists of New South Wales	3
The Royal Australian Institute of Architects, New South Wales Chapter	3
The Institution of Production Engineers (Sydney Section)	3
The Institute of Physics (Australian Branch, N.S.W. Division)	3

Part B.

Representation of Industrial and Commercial Interests.

Organisation.	Number of Names.
Chamber of Manufactures of New South Wales	3
Sydney Chamber of Commerce	3
Metal Trades Employers' Association	3
The Employers' Federation of New South Wales	3
Building Industry Congress of New South Wales	3
The Institute of Management	3
Primary Producers' Union	4 (Chosen conjointly.)
The Graziers' Association of New South Wales	
Farmers and Settlers' Association of New South Wales	
Wheat Growers' Union of New South Wales	

Part C

Representation of Trade Unions and Employee Organisations.

Organisation.	Number of Names.
Labor Council of New South Wales	1
Technical Teachers' Association of New South Wales	3

Period of Office.

4. (1) The members of the Council of the University, other than the Director of the University and the members elected by the Legislative Council and Legislative Assembly shall, subject to the Act, hold office for a period of four years.

(2) The member of the Council of the University elected by the Legislative Council shall, subject to the Act, hold office until his successor has been elected by the Legislative Council as hereinafter provided and has been appointed by the Governor to the Council of the University.

After the first election of a member by the Legislative Council in the year one thousand nine hundred and forty-nine each subsequent election shall be held as soon as practicable after the commencement of the term of service of the fifteen members of the Legislative Council elected at each triennial election of members of the Legislative Council held after such year.

(3) The member of the Council of the University elected by the Legislative Assembly shall, subject to the Act, hold office until his successor has been elected by the Legislative Assembly as hereinafter provided and has been appointed by the Governor to that Council.

After the first election of a member by the Legislative Assembly in the year one thousand nine hundred and forty-nine each subsequent election shall be held as soon as practicable after every general election of members of the Legislative Assembly held after such year.

The Director.

5. (1) The Director shall be the chief executive officer of the Council and shall be specially charged with the duty of promoting the interests and furthering the development of the University.

(2) The Director shall, under the Council, subject to the by-laws and to any resolution of the Council—

(a) manage and supervise the administrative, financial and other activities of the University;

(b) consult with and advise the Professorial Board, and all other University Boards, Faculties, Committees, Professors, and other Heads of Departments;

(c) exercise supervision over the discipline of the University, with power, in the case of students, to impose penalties in accordance with academic usage for breach of discipline or for misconduct of any kind;

(d) give effect to the by-laws and to any resolution or report passed or adopted by the Council;

(e) perform such other duties as may from time to time be assigned to him by the Council.

(3) Nothing in this Regulation shall affect the precedence or authority of the President or Vice-President.

The Regulations are amended—

(a) by *omitting* from clause one of Regulation four the words "elected by the Legislative Council and Legislative Assembly" and by *inserting* in lieu thereof the words "referred to in clauses two, three and four of this Regulation,";

(b) by *inserting* at the end of the same Regulation the following new clause:—

(4) The members of the Council appointed pursuant to paragraphs (i), (j), (k) and (m) of subsection two of section nineteen of the Act shall hold office for a period of two years: Provided that the members first appointed pursuant to paragraphs (i), (k) and (m) of the said subsection shall hold office for a period of one year.

BY-LAWS.

CHAPTER I.—THE PRESIDENT AND VICE-PRESIDENT.

1. (a) The President shall hold office for a period of two years from the date of his election: Provided that the first President elected by the Council shall hold office for a period of one year from the date of his election.

(b) The Vice-President shall hold office for a period of two years: Provided that the first and second Vice-Presidents shall respectively hold office for a period of one year from the date of their election.

(c) Any retiring President or Vice-President shall be eligible for re-election.

2. (a) The President and Vice-President shall, by virtue of their office, be members of any Committee constituted by any By-law or by any resolution of the Council and of any Board or Faculty within the University.

(b) The President may preside at any meeting of any such Committee, Board or Faculty and shall have all the rights and powers of the Chairman of any such Committee, Board or Faculty.

(c) If the President is absent or does not desire or is unable to act, or if the office of President is vacant, the Vice-President may preside at any such meeting and shall have the like rights and powers.

(d) In the absence of the President, or if the office of President is vacant, any powers or duties conferred or imposed upon the President by these By-laws may be exercised and discharged by the Vice-President.

(e) This By-law shall have effect notwithstanding the provisions of any other By-law.

CHAPTER II—THE COUNCIL.

Meetings and Rules of Procedure.

1. The Council shall meet on the second Monday of March, May, July, September and November in each year, and on such other days as may be necessary for the despatch of business: Provided that if the Monday so specified for the regular meeting is a public holiday the Council shall meet on the following Monday. The Council shall have power to adjourn any meeting to a later date.

2. At any time in the interval between such meetings the President or, in his absence, the Vice-President or, in the absence of both, the Director shall have power to call a special meeting for consideration of any urgent business which he may wish to submit to the Council.

3. Upon the written requisition of any five members, the President or Vice-President or Director, or in their absence, the Registrar shall convene a special meeting of the Council to be held within fourteen days after the receipt of the requisition. The written requisition shall set forth the objects for which the meeting is required.

4. Except in the case of a special meeting as aforesaid or unless otherwise decided by the Council no motion initiating any subject for discussion shall be made except in pursuance of notice given to the Secretary to the Council at any time not less than ten clear days before the meeting of the Council at which the motion is to be moved, and the Secretary shall enter all such notices in the Notice of Motion Book in the order in which they are received by him.

5. The Secretary to the Council shall transmit by post or deliver to each member of the Council a written or printed notice of the date of the next ensuing meeting of the Council, whether such meeting is an ordinary or special meeting. Such notice shall, except in any case of emergency, be so posted or delivered at least seven days previous to the meeting. Except in any case of emergency all matters to be considered at the meeting shall be stated in the said notice or in a supplementary notice transmitted by post or delivered to each member of the Council not less than three days before the meeting. The said notice or supplementary notice shall be accompanied by supporting statements in sufficient detail to allow members to consider the matters prior to the meeting.

6. In the event of a quorum of the Council not being present at any meeting within half-an-hour after the time appointed for the meeting, whether such meeting is an ordinary or special meeting, the members then present may appoint any convenient future day, of which at least seven days' notice shall be given by the Secretary to the members of the Council in the usual way. Such day may be chosen as the day of the next ordinary meeting of the Council and all business which should have been transacted at the meeting lacking a quorum shall take precedence thereat.

7. The Minutes of any preceding meeting of the Council, whether ordinary or special not previously approved as being a true record, shall be circulated to members of the Council prior to the meeting at which they are to be considered. Upon being approved as correct such Minutes shall be signed by the Chairman as being a true record.

Members Representing Principal Faculties.

8. The members to be elected pursuant to paragraph (m) of subsection two of section nineteen of the Technical Education and New South Wales University of Technology Act, 1949, shall be elected by the three principal Faculties to be chosen by the Council at its May meeting in 1950 and in 1951 and in every alternate year after 1951.

9. The election of a member by each of the Faculties so chosen shall be held at a meeting of the Faculty duly convened by the Registrar to be held in May in 1950 and in 1951 and in every alternate year after 1951.

10. The Registrar shall act as Chairman of the meeting.

11. The method of election shall be by ballot, at which the candidate polling the largest number of votes shall be declared elected. Where an equal number of votes is cast for more than one candidate and it is necessary to determine between them which of them shall be elected the Registrar shall determine the matter by lot.

In this By-law the expression "determine by lot" means determine in accordance with the following directions:—The names of the candidates concerned having been written on similar slips of paper and the slips having been folded so as to prevent identification and mixed and drawn at random, the candidate whose name is first drawn shall be the candidate elected.

Member Representing Teaching Staff.

12. The member to be elected pursuant to paragraph (k) of subsection two of section nineteen of the Technical Education and New South Wales University of Technology Act, 1949, shall be elected by the professors, persons giving full-time instruction within the University and such other persons giving instruction within the University as the Council may determine by resolution from time to time.

13. The election shall be held at a meeting of the professors and such other persons convened by the Registrar for the purpose in May in 1950 and in 1951 and in every alternate year after 1951.

14. The provisions of By-laws ten and eleven of this Chapter shall apply to and in respect of any such election.

Member Elected by Graduates.

15. The member to be elected pursuant to paragraph (j) of subsection two of section nineteen of the Technical Education and New South Wales University of Technology Act, 1949, shall be elected in May in 1953 and in every alternate year thereafter.

The election shall be held on such day in that month as the Council may appoint.

16. At least sixty days' notice of the day of election shall be given by advertisement in two or more of the daily newspapers published in Sydney, and by notice posted at the University.

17. The Registrar shall prepare a list of electors comprised of all graduates of the University, completed to the last day for receiving nominations for any election, and a copy of such list shall be exhibited at the University during the period from that date to the time of election.

18. (i) No person shall be eligible for election—

(*a*) unless he is a graduate of the University and of the full age of twenty-one years; and

(*b*) unless his name has been communicated to the Registrar in writing under the hands of two qualified voters not less than twenty-eight days before the day fixed for the election.

(*c*) if he is engaged in duties connected with the University either on the teaching staff or otherwise.

(ii) Every nomination of the person for election shall contain the written consent of such person to his nomination.

19. On the expiration of the time for receiving nominations the Registrar shall cause the name of each person so nominated and the fact of his candidature to be forthwith advertised in two or more of the daily newspapers published in Sydney, and to be posted at the University.

20. In the case of there being only one nomination the Registrar shall declare the candidate duly elected. If there are two or more candidates, the election shall be by postal ballot.

21. The election shall be conducted in the following manner:—

(*a*) At least fourteen days before the date fixed for the election the Registrar shall transmit a voting paper through the post to each graduate eligible to vote, addressed to the last known address of the graduate as noted in the records of the Registrar.

Each voting paper shall be accompanied by an envelope marked "voting paper" and by a second envelope addressed to the Registrar on the inside of which shall be printed a form of declaration to be signed by the applicant stating that he is a graduate of the University.

The envelopes addressed to the Registrar shall be numbered in consecutive numerical order, and the number appearing on such an envelope sent to each graduate eligible to vote shall be entered on the list of electors prepared by the Registrar opposite the name of the graduate to whom such envelope is sent.

(*b*) The voting papers shall contain the names of all duly nominated candidates arranged in alphabetical order. The voter shall record his vote by placing the number "1" opposite the name of the candidate for whom he desires to give his first preference vote, and shall give contingent votes for all the remaining candidates by placing the numbers "2," "3," "4" and so on, as the case may require, opposite the names of such candidates respectively so as to indicate by numerical sequence the order of his preference for them.

(*c*) Having marked his voting paper and signed the declaration, the voter shall place the voting paper without any other matter in the envelope marked "voting paper," which he shall seal and transmit to the Registrar in the envelope provided for that purpose.

All voting papers so transmitted and received at the University not later than 5 p.m. on the day of the election shall be counted in the ballot.

(*d*) The ballot shall be conducted by the Registrar who shall be assisted in the counting of votes by scrutineers to be appointed by the President. Each candidate shall be entitled to nominate one scrutineer.

(*e*) As soon as practicable after the closing of the poll the Registrar, in the presence of such of the scrutineers as choose to be present, shall proceed to the examination of the voting papers.

The method of counting the votes to ascertain the result of the election shall be as prescribed in By-law twenty-nine of this Chapter.

(*f*) Where in the final count under By-law twenty-nine of this chapter two candidates shall have an equal number of votes, the Registrar shall determine between them by lot which of them shall be elected.

In reckoning an absolute majority of votes for the purposes of the said By-law twenty-nine, the candidate so selected shall be deemed to have received an additional vote.

In this paragraph the expression "determine by lot" means determine in accordance with the following directions:—

The names of the candidates concerned having been written on similar slips of paper and the slips having been folded so as to prevent identification and mixed and drawn at random, the candidate whose name is first drawn shall be the candidate elected.

(*g*) The Registrar shall reject as informal any voting paper upon which the voter has failed to indicate the number of his preference in respect of the name of any candidate: Provided that where there are not more than two candidates a voting paper shall not be informal by reason only of the fact that the voter has recorded his vote by placing the number "1" opposite the name of one candidate and has failed to place the number "2" opposite the name of the other candidate.

Member Elected by Undergraduates.

22. The member to be elected pursuant to paragraph (*i*) of subsection two of section nineteen of the Technical Education and New South Wales University of Technology Act, 1949, shall be elected in May in 1950 and in 1951 and in every alternate year after 1951.

The election shall be held on such day in that month as the Council may determine.

23. At least sixty days' notice of the day of election shall be given by notice posted at the University and in such other places as the Council may determine.

24. (1) No person shall be eligible for election—

(*a*) (i) at the elections to be held in 1950 and 1951 unless he is a registered student of the University and of the full age of twenty-one years;

(ii) at any subsequent election unless he is a graduate of the University and of the full age of twenty-one years; and

(*b*) unless his name has been communicated to the Registrar under the hands of two qualified voters not less than twenty-eight days before the day fixed for the election.

(*c*) if he is engaged on duties connected with the University either on the teaching staff or otherwise.

(2) Every nomination of a person for election shall contain the written consent of such person to his nomination.

25. On the expiration of the time for receiving nominations the Registrar shall cause the name of each person so nominated and the fact of his candidature to be forthwith posted at the University.

26. In the case of there being only one nomination the Registrar shall declare the candidate duly elected. If there are two or more candidates, the election shall be by ballot of qualified voters voting personally.

27. The election shall be conducted in the following manner:—

(*a*) A ballot shall be taken on the day appointed for the election at the University and at such other place as the Council may determine, of which due notice shall be given.

(*b*) The ballot shall commence at 10 a.m. and close at 5 p.m. on the day appointed.

(*c*) The provisions of paragraphs (*b*), (*d*), (*e*), (*f*) and (*g*) of By-law twenty-one of this Chapter shall apply to and in respect of any such election.

28. At any election the persons qualified to vote shall be registered students proceeding to a degree.

Method of Counting Votes.

29. (1) (*a*) The Registrar shall count the total number of first preference votes given for each candidate.

(*b*) The candidate who has received the largest number of first preference votes shall, if that number constitutes an absolute majority of votes, be elected.

(*c*) If no candidate has received an absolute majority of first preference votes, the Registrar shall make a second count.

(*d*) On the second count the candidate who has received the fewest first preference votes shall be excluded, and each ballot-paper counted to him shall be counted to the candidate next in the order of the voter's preference.

(*e*) If any candidate then has an absolute majority of votes he shall be declared elected; but if no candidate then has an absolute majority of votes, the process of excluding the candidate who has the fewest votes and counting each of his ballot-papers to the continuing candidate next in the order of the voter's preference shall be repeated until one candidate has received an absolute majority of votes.

(*f*) The candidate who has received an absolute majority of votes shall be declared elected.

(2) If on any count two or more candidates have an equal number of votes, and one of them has to be excluded, that candidate amongst them who had the least number of votes at the last count at which they had not an equal number of votes, shall be excluded. And if such candidates had an equal number of votes at all preceding counts, the Registrar shall determine between them by lot which of them shall be excluded.

(3) In this By-law—

The expression "an absolute majority of votes" means a greater number than one-half of the whole number of ballot-papers counted.

The expression "continuing candidate" means a candidate not already excluded at the count.

The expression "determine by lot" means determine in accordance with the following directions:—The names of the candidates concerned having been written on similar slips of paper, and the slips having been folded so as to prevent identification and mixed and drawn at random, the candidate whose name is first drawn shall be excluded.

Chapter III—The Professorial Board.

1. The Professors and Associate Professors in the several Faculties and such other persons as Council may appoint shall form a Board, to be called the Professorial Board.

2. The members of the Professorial Board shall elect a Chairman at a duly convened meeting to be held in May in 1950 and in 1951 and in May of every alternate year after 1951.

The Chairman shall hold office for a period of two years from the first day of July following the election: Provided that the first Chairman shall hold office for a period of one year from the first day of July following his election.

If the office becomes vacant by death, resignation or otherwise before the expiration of the full term, a successor shall be elected at a duly convened meeting of the Board to be held as soon as conveniently may be, and the Chairman so elected shall hold office during the remainder of his predecessor's term of office.

3. The Registrar shall, by virtue of his office, be a member of the Professorial Board and shall act as Secretary to the Board.

4. (i) The Professorial Board shall be specially charged with the duty of furthering and co-ordinating the work of Faculties and Departments and of encouraging scholarship and research and of considering the studies and discipline of the University.

The Board shall consider and report upon all matters referred to it by the Council or by the Director.

(ii) Subject to By-laws and to any resolution of the Council the Board—

(*a*) may consider and take action upon reports submitted to it by any Faculty;

(*b*) may refer matters to Faculties for consideration and report;

(*c*) may appoint internal and external examiners after report from the Faculty or from the Dean of the Faculty concerned;

(*d*) shall, on the recommendation of the appropriate Faculties, annually prescribe all books and details of subjects for lectures or annual examinations in the University, but in any of these subjects pertaining to more than one Faculty when the recommendations of the Faculties concerned do not coincide, the Professorial Board shall, after further communication with the said Faculties, prescribe such books and details;

(*e*) may determine the conditions of competition for any post-graduate fellowship, scholarship or prize and make the awards: Provided that any conditions of competition approved by the Board for any post-graduate fellowship, scholarship or prize shall be subject to conditions, if any, with respect thereto made by the founder or donor;

(*f*) may, after report from the Faculties concerned, decide all questions of admission ad eundem gradum. The Professorial Board may by an absolute majority of its members (provided that the Faculty, if any, concerned concurs by an absolute majority of its members) recommend to the Council that a person who has obtained any degree or diploma in another University or educational establishment be admitted to a Degree in the New South Wales University of Technology without any examination;

(*g*) may submit recommendations to the Council on the invitation of the Council with respect to the selection of Professors, Lecturers and other teaching and research staff;

(*h*) may, after a report of the Faculties concerned, decide all questions of admission with advanced standing. The Professorial Board may by an absolute majority of its members (provided that the Faculty, if any, concerned concurs by an absolute majority of its members) recommend to Council that a person who has completed an approved course of study in a University or educational establishment approved by the Council be admitted with such advanced standing as may be permitted in each case to a course leading to a Degree of the New South Wales University of Technology;

(*i*) may perform the duties of a Faculty for all subjects not pertaining to any faculty and perform any function committed to it by this By-law, although any Faculty or Faculties may have failed to report;

(*j*) may submit recommendations to Council with respect to any other matter pertaining to academic standards or facilities.

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Where the Board does not approve without amendment any recommendation made by a Faculty, the Board shall, if so requested by the Faculty, transmit the recommendation to the Council.

(iii) The Board shall have such other duties and powers as may from time to time be assigned to it by the Council.

(iv) A report of the proceedings of the Board shall be circulated to members of the Council with the notice or supplementary notice of matters to be considered at the meeting of the Council next following that of the Board and shall be laid upon the table of the Council at that meeting.

(v) The Council may at any time of its own motion or at the request of a Faculty review any decision of the Board.

5. (*a*) The Director or any member of the Professorial Board may suspend any student from attendance at classes and examinations for breach of discipline or misconduct, and may impose penalties in accordance with academic usage on any student for breach of discipline or misconduct, provided that the circumstances relating to the suspension or fine shall be reported in writing by the member to the Director forthwith. This By-law shall only extend to breach of discipline or misconduct committed in or with respect to the classes or work of the Department of such member, or committed in his presence.

(*b*) On reference by the Director the Board shall investigate matters which involve any question as to breach of discipline or misconduct of any kind by any student or candidate at any University examination and may impose penalties in accordance with academic usage.

(*c*) Any person affected by a decision of any member of the Professorial Board (other than the Director) in respect of breach of discipline or misconduct may appeal to the Director, and in the case of disciplinary action by the Director, whether on appeal or otherwise, to the Council.

6. (*a*) The Professorial Board shall meet at the discretion of the Chairman or upon the written request of the President, or Director, or of three members of the Board.

(*b*) Except where otherwise provided by these By-laws, all questions which shall come before a meeting of the Professorial Board at which a quorum is present shall be decided by the majority of members present, and the Chairman shall have a vote, and in the case of an equality of votes, a casting vote.

The number of members who shall constitute a quorum of the Professorial Board shall be the product obtained by multiplying the total number of members of the Board by two-thirds, any fraction in the product being disregarded.

(*c*) All meetings shall be convened by written notice from the Registrar, specifying the time and place and agenda of the meeting.

Chapter IV—The Faculties.

1. (*a*) The Council may constitute such Faculties as it may deem fit.

(*b*) Each Faculty so constituted shall consist of the Professors and Associate Professors in the subjects of the curriculum of the Faculty concerned and of such lecturers and other persons having appropriate qualifications as the Council may appoint thereto.

(*c*) The Registrar shall, by virtue of his office, be a member of each Faculty.

2. The Dean appointed to a Faculty pursuant to the Technical Education and New South Wales University of Technology Act, 1949, shall be the Chairman thereof.

3. Each Faculty shall—

(*a*) supervise the teaching in the subjects with which the Faculty is concerned;

(*b*) be responsible, with the assistance of such examiners as the Professorial Board may from time to time appoint on the report of the Faculty or of the Dean, for the conduct of examinations in those subjects;

(*c*) take cognizance of and encourage scholarship and research in those subjects;

(*d*) consider and report upon all matters referred to it by the Council or by the Director, or by the Professorial Board.

4. Each Faculty shall consider and report to the Professorial Board upon all matters relating to the studies, lectures, examinations and Degrees of the Faculty.

5. Each Faculty shall have such other duties and powers as may from time to time be assigned to it by the Council.

6. Except where otherwise provided by these By-laws all questions which come before a meeting of a Faculty at which a quorum is present shall be decided by the majority of the members present and the Chairman shall have a vote, and in the case of an equality of votes, a casting vote.

The number of members who shall constitute a quorum of any Faculty shall be the product obtained by multiplying the total number of that Faculty by two-thirds, any fraction in the product being disregarded.

7. The Chairman of a Faculty shall be the Executive Officer of the Faculty and shall have such other duties and powers as may from time to time be assigned to him by the Council.

8. Each Faculty shall deal with all applications for information and other correspondence on subjects appropriate to such Faculty which may be brought before it by the Dean or by the Registrar.

Chapter V—Director.

1. The Director shall, by virtue of his office, be a member of every Board, Faculty and Committee within the University, and may, if he so desires, preside at any meeting of such Board, Faculty or Committee.

Nothing in this By-law shall affect the precedence or authority of the President or Vice-President.

Chapter VI—Honorary Degrees.

1. The Council may admit on Honoris Causa to any Degree of Doctor in the New South Wales University of Technology any graduate of another University who is recommended for such admission by an absolute majority of the Professorial Board and by an absolute majority of the Faculty in which the Degree is to be conferred as being a person of distinguished eminence in some branch of learning appropriate to such Faculty.

2. The Council may admit on Honoris Causa to the Degree of Doctor in an appropriate field in the New South Wales University of Technology any person considered by the Council to be distinguished by eminent public service in a particular technical field.

NEW SOUTH WALES UNIVERSITY OF TECHNOLOGY.

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JAMES NORMAN KIRBY, Managing Director, James N. Kirby Pty. Ltd.; Technical Director, Nuffield (Aust.) Pty. Ltd. and International Products Ltd.

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PERCY DRYDEN RIDDELL, former Director of Technical Education in New South Wales.

STEPHEN HENRY ROBERTS, M.A., D.Sc., Litt.D., Vice-Chancellor, The University of Sydney.

GREGORY BEDE THOMAS, LL.B., B.Sc., B.E., Barrister.

ROBERT JOSEPH WEBSTER, A.A.A., President, The Institute of Management; Chairman of Directors and Managing Director, Burlington Mills (Aust.) Limited; Managing Director, Bradford Cotton Mills Limited; President, Chamber of Manufactures of N.S.W.

FRED WILSON, F.I.O.B., Vice-President, Sydney Technical Education District Council; President, Building Industry Congress of N.S.W.; President, Federal Council, Building Industry Congress; and Director, Howie Moffatt and Co. Pty. Ltd.

Representatives yet to be elected by the teaching staff, the undergraduates and graduates of the University.

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Secretary to Council: John Stewart Fraser.

NEW SOUTH WALES UNIVERSITY OF TECHNOLOGY.

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PROFESSOR OF MINING ENGINEERING—D. W. Phillips, B.Sc. (Wales), Ph.D. (Cantab.), Dip.Met.Min., F.G.S., M.I.Min.E.

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PROFESSOR OF CHEMICAL ENGINEERING—J. P. Baxter, O.B.E., B.Sc. (B'ham), Ph.D. (B'ham), M.I.Chem.E.

SYDNEY TECHNICAL COLLEGE.

(Staff approved to conduct courses on behalf of the New South Wales University of Technology.)

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ELECTRICAL ENGINEERING—A. S. Plowman, A.S.T.C., A.M.I.E.E., M.I.E. Aust., A.Am.I.E.E.

CIVIL ENGINEERING—C. H. Munro, B.E., A.M.I.E. Aust., M.R.San.I.

CHEMISTRY AND CHEMICAL ENGINEERING—V. S. Rawson, B.Sc., A.S.T.C., Dip.Agric., F.R.I.C., F.A.C.I.

PHYSICS—G. H. Godfrey, M.A., B.Sc., F.Inst.P.

MATHEMATICS—G. Bosson, M.Sc.

HUMANITIES—W. R. Crisp, B.A.

L. M. Haynes, B.A.

(Other Lecturing Staff associated with these officers is listed in the Handbook of the Department of Technical Education.)

GENERAL INFORMATION.

Location.

The temporary accommodation for the New South Wales University of Technology is in the buildings of the Department of Technical Education, Broadway, Sydney.

The offices of the Director and the Registrar are in the Administrative Building of the Department of Technical Education, Mary Ann Street, Broadway, Sydney.

Degrees.

The University provides undergraduate courses leading to Bachelor Degrees in Science, Engineering, and Architecture.

Post-graduate courses are also provided, leading to the degrees of Master and Doctor in Science and Engineering.

Some special, short, intensive post-graduate courses will be provided which will not lead to higher degrees.

Examinations.

In assessing students' progress in the University courses, consideration will be given to work in laboratory, and class exercises and any term or other tests given throughout the year, as well as to the annual examination results.

Students are required to attend lectures punctually and diligently, and to complete all practical work prescribed for the year and course in which they are enrolled. In general, no exemptions from subjects or examinations are granted.

No students will be permitted to attend lectures or to sit for examination in any subject in any year until he has passed in all subjects of the previous year, unless special permission has been granted by the faculty in which he is enrolled. Such permission must be applied for, and, if allowed, will be for one subject only in any year. The student must then, during the subsequent year, pass the examination in the subject for which the special permission has been granted. A student availing himself of the provisions of this section will not be eligible for any prizes or scholarships at the annual examinations.

Fees.

The fee for each year of Courses V, VI, VII and VIII is £27. For any year of Courses II, III and XI in which full-time daily attendance is required, the fee will be £27. For any year of Courses II, III and XI in which part-day, part-evening attendance is required, the fee is £18.

Where part of any course is taken by alternative part-day, part-evening courses at the Sydney Technical College, the fees charged will be those fixed by the Department of Technical Education.

Fees for post-graduate courses will be according to a scale to be fixed by the Council of the University.

Practical Training.

Every student must complete satisfactorily the course of approved practical training each year as prescribed for the course in which he is enrolled.

The staff of the University will assist students to obtain employment either as sponsored students or as trainees employed on a temporary basis in order to gain the necessary practical experience.

Private students may make their own arrangements for practical training during their course. Such employment and training must be of a standard approved by the University.

Undergraduate Courses of Study.

The following courses are available in Applied Science, Engineering and Architecture. Other courses will be introduced in later years as the work of the University expands. In most of these courses, leading to a Bachelor's Degree, options or electives in professional subjects will be available in the final year, thus enabling the student to select a schedule of subjects best adapted to his special interests, abilities and objectives.

In order to qualify for continued attendance at the New South Wales University of Technology, students must be regular in attendance at all lecture and laboratory work.

In the following list each Course is indicated by its name and the Roman numeral associated with it.

Applied Science.

Applied Chemistry	Course II.
Chemical Engineering	Course III.

These courses lead to the degree of Bachelor of Science (B.Sc.).

Engineering.

Mechanical Engineering	Course V.
Electrical Engineering	Course VI.
Mining Engineering	Course VII.
Civil Engineering	Course VIII.

These courses lead to the degree of Bachelor of Engineering (B.E.).

Architecture.

Architecture .. .. Course XI.

This course leads to the degree of Bachelor of Architecture (B. Arch.).

The courses of the New South Wales University of Technology aim to provide—

(*a*) a thorough training in the fundamental sciences of mathematics, physics and chemistry;

(*b*) a sound training in the professional aspects of the course chosen and such subjects in allied professional fields as are considered necessary;

(*c*) a close link with industry and the practical aspects of the profession throughout the course;

(*d*) a study of the art of expression, both written and oral, and of selected general subjects which aim to extend the student's understanding of himself and his environment.

Conversion Courses for Diplomates of the New South Wales Department of Technical Education.

Holders of a diploma from the New South Wales Department of Technical Education may be admitted with advanced standing to the appropriate degree course of the New South Wales University of Technology according to their academic record and professional experience.

Diplomates who desire to seek admission with advanced standing to any of the courses now in operation must submit in writing full details of their academic careers and professional experience. Each case will be dealt with on its merits and the applicant notified of the minimum requirements to be met before a degree will be granted. All inquiries should be addressed to the Registrar, New South Wales University of Technology, Broadway, Sydney, before 31st January.

Applicants must furnish the following information:—

Full name and address.

Date of birth.

Details of Matriculation, Leaving Certificate or other entrance examinations, with dates.

Details of academic career and awards granted, with dates.

Professional experience and trade experience.

Research work undertaken and technical articles published.

Course in which the applicant wishes to graduate.

SCHOLARSHIPS AND CADETSHIPS.

Many industrial organisations and Government Departments are sponsoring students in the New South Wales University of Technology. Students are employed as cadets and have their fees paid and receive the cadet rate of pay during training. Particulars of Government Cadetships can be obtained from the Secretary, Public Service Board, 19 O'Connell Street, Sydney.

Mining Scholarships.

Fifteen scholarships tenable in Mining Engineering are offered each year. Twelve of these are given by the Joint Coal Board and three by the Combined Colliery Proprietors' Association.

The values of the scholarships are as follows:—

While living at home—

1st year	£156 per annum.
2nd year	£182 per annum.
3rd year	£208 per annum.
4th year	£234 per annum.

While living away from home—

1st year	£208 per annum.
2nd year	£234 per annum.
3rd year	£260 per annum.
4th year	£286 per annum.

Payment is made in equal fortnightly instalments. In addition, an allowance of £35 per annum is provided for fees and books, and students' membership fees for University Associations and Societies are paid.

Particulars and application forms for these scholarships can be obtained from the Vocational Guidance Office, Broadway, Sydney.

Commonwealth Universities Commission.

Students attending full-time courses at the New South Wales University of Technology are eligible for financial assistance from the Commonwealth Universities Commission. Particulars and application forms may be obtained from the Secretary, Universities Commission, Grace Building, York Street, Sydney.

State Bursaries and Exhibitions.

A number of exhibitions and bursaries are awarded by the New South Wales Government on the results of the Leaving Certificate Examination and the final examination of the Preparatory Diploma Course of the Department of Technical Education. The award of an exhibition exempts the student from payment of fees. A bursary similarly exempts the student from payment of fees and includes an allowance for living expenses and books.

John Heine Memorial Scholarship.

The Metal Trades Employers' Association offers a scholarship at the New South Wales University of Technology on behalf of the John Heine Memorial Foundation.

This scholarship will have a total value of £250. It will be tenable for two years, thus enabling recipients to undertake the last two years and proceed to the Bachelor's Degree in a selected course in the Faculty of Engineering; or, alternatively, to undertake the last three years and proceed to the Bachelor's Degree in a selected and approved course in the Faculty of Applied Science.

The total endowment of £250 is to be allotted as under:—

In the Faculty of Engineering—

1st year of tenure (3rd year of course)	£100
2nd year of tenure (4th year of course)	£150
Total (2 years)	£250

Or

In the Faculty of Applied Science—

1st year of tenure (2nd year of course)	£50
2nd year of tenure (3rd year of course)	£50
3rd year of tenure (4th year of course)	£150
Total (3 years)	£250

REQUIREMENTS FOR ADMISSION.

1. Candidates for any degree of the New South Wales University of Technology must satisfy the conditions for admission set out hereunder *before* entering upon the prescribed courses for a degree.

Candidates who have satisfactorily met the conditions for admission shall be classed as "registered students" of the University after enrolment.

2. (i) Applicants for entry to undergraduate courses leading to a degree may satisfy entrance requirements by passing the New South Wales Leaving Certificate, or equivalent examination in at least five subjects, of which one must be English and one other must be Mathematics I, or Mathematics II, or General Mathematics, three other subjects being chosen from the following groups, at least one of the three being from Group A:—

Group A.—Latin, French, Greek, German, Italian, Hebrew, Chinese, Japanese, Russian, Dutch, Geology, Geography, Agriculture, Economics, Modern History, Ancient History, Combined Physics and Chemistry, Physics, Chemistry, Physiology, Biology, Botany, or Zoology.

Group B.—Mechanics, Theory and Practice of Music, General Mathematics, Mathematics I, or Mathematics II.

(It should be noted that a number of subjects taken for the Leaving Certificate are *not* approved subjects for admission to the University of Technology.)

(ii) *General Requirements.*

The following general provisions apply:—

(A) Candidates must meet the requirements set out in section 2 (i) above at one examination provided that—

(*a*) neither Physics nor Chemistry be taken along with the combined subject Physics and Chemistry;

(*b*) neither Botany nor Zoology be taken with Biology;

(*c*) neither Botany nor Zoology nor Biology be taken with Physiology;

(*d*) neither Mathematics I nor Mathematics II be taken with General Mathematics;

(*e*) a candidate who offers Mathematics and elects to take General Mathematics may not sit for Mathematics I or Mathematics II; a candidate who offers Mathematics and does not elect to take General Mathematics *must take both* Mathematics I and Mathematics II; a pass in either Mathematics I or Mathematics II will count as a pass in one subject; a pass in both papers will count as passes in two subjects;

(*f*) Theory and Practice of Music is accepted only from March, 1946;

(*g*) Ancient History may not be taken with Modern History, and, further, Ancient History is accepted only in cases where the pass was obtained at an examination held in 1945 or subsequent years;

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

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

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

(iii) *Examinations.*

Candidates may qualify for entry at the Leaving Certificate Examination held by the Department of Education, or the Matriculation Examination conducted by The University of Sydney, or the examinations conducted by the Department of Technical Education for entrance to Diploma Courses.

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 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.

The Qualifying Examination is conducted by the Department of Technical Education in November-December for students attending Diploma Preparatory Classes, and the Qualifying (deferred) Examination in February. Entries must be lodged at the Technical College, Ultimo, or other participating Technical Colleges throughout the State for the Qualifying (deferred) Examination before the middle of January.

Candidates who have satisfactorily met the matriculation requirements of The University of Sydney, but who have not obtained the requisite pass in Mathematics as prescribed for entrance to the New South Wales University of Technology, will be permitted to complete their qualifications to enter the University of Technology by passing in Mathematics only, at a subsequent Matriculation, Leaving Certificate, or Qualifying Examination.

3. Notwithstanding By-law 2 above, candidates may be accepted as "registered students" of the University of Technology under the following conditions, subject to the approval of the Committee of Admissions:—

(i) Any person who has satisfied the examination requirements for entrance to the Diploma Courses of the Department of Technical Education, New South Wales, since and including the qualifying examinations of the Department of Technical Education held at the end of 1940 may be admitted as a "registered student" of the University of Technology, but this provision shall not apply to examinations held later than March, 1951.

(ii) Any person who holds a Diploma from the New South Wales Department of Technical Education, or any other Technical College which may from time to time be recognised by the University of Technology, may be admitted to the University of Technology as a "registered student" with such status as the Committee may determine, provided that, in the opinion of the Committee, the applicant's qualifications are sufficient for entry into the Faculty nominated.

(iii) Persons of other than Australian education may be admitted as "registered students" of the University of Technology after examination as directed by the Committee, provided they give evidence that satisfies the Committee that they are of good fame and character.

(iv) The Committee may admit as "registered students" in any Faculty with such status as the Committee may determine in the circumstances—

(*a*) A graduate of any approved University.

(*b*) An applicant who presents a certificate from any University, showing that he is qualified for entrance to that University, and who, in addition, satisfies the Committee that he has met the requirements of the University of Technology, provided that, in the opinion of the Committee there is an acceptable correspondence between the qualifying conditions relied upon by the applicant and the conditions laid down for ordinary entrance to the nominated Faculty of the New South Wales University of Technology.

4. Any person qualified to enter a degree course in the University of Technology in terms of the preceding By-laws shall become a "registered student" of the University of Technology after he has signed his name in the Student Register in the presence of the Registrar or other person appointed for the purpose by the Council, and has paid the first term fee.

5. (i) The Committee may in special cases declare any person qualified to enter a Faculty as a "provisional registered student" although he has not complied with the requirements set out above, and in so doing may prescribe the completion of certain requirements before confirming the person's standing as a "registered student." Students who satisfactorily complete these requirements will be permitted to count the courses so passed as qualifying for degree purposes.

(ii) Persons over the age of twenty-five years may be admitted to provisional status provided that—

(*a*) they have a meritorious pass at the Leaving Certificate Examination or an equivalent examination and have passed in at least five subjects at such examination, or

(*b*) they have satisfactorily completed an approved course of systematic study extending over at least three years after passing the Intermediate Certificate Examination, or

(*c*) they satisfy the Committee that they have reached a standard of education sufficient to enable them profitably to pursue the first year of the proposed course.

(iii) Any applicant for provisional status may be required to take such examination as the Committee may prescribe before such status is granted.

6. Any person desirous of attending lectures at the University of Technology may be granted permission to do so by the Committee without satisfying the requirements for admission and without being a "registered student," on payment of such fee as the Council may from time to time direct, but such person shall not necessarily have the privileges of "registered students" and shall not be eligible to proceed to a degree.

ADMISSION WITH ADVANCED STANDING.

It is possible for certain students to enter courses with advanced standing. Students who have completed a prescribed amount of part-time study in approved courses conducted by the Department of Technical Education may be granted exemption, on application, from one or more years of the degree courses.

Applied Science Courses.

Students who have completed one or more years of a diploma course in the Department of Technical Education in Chemistry or Chemical Engineering may be considered for exemption from parts of the degree courses in these subjects, but may be required to complete certain additional subjects before being admitted to such degree courses. Application for admission with advanced standing should be made in writing. Full details of subjects already completed should be indicated. A special two-year part-time course of study is conducted by the Department of Technical Education to cover the work normally given in the first-year full-time courses in Applied Chemistry and Chemical Engineering. Students who complete this special course may be granted exemption from the first year of the degree course in these subjects.

Engineering Courses.

Students who are in Diploma Courses conducted by the Department of Technical Education, and who have completed the subjects indicated below, may be considered for exemption from the first year of the Engineering Degree Courses of the N.S.W. University of Technology.

> Diploma Mathematics I and II, Chemistry 1A and 1B, Mechanical Engineering I and II, Diploma Physics I, Engineering Drawing and Descriptive Geometry, Materials and Structures I, Mechanical Engineering and Materials Laboratory I, Workshop Processes and Practice I, Course in English Expression and Scientific Method.

Students of the Department of Technical Education who have been granted exemptions from the first year of the University Degree Courses may be permitted to undertake additional special part-time study in the Department of Technical Education (normally extending for two more years) and then gain exemption from the second year of the Degree Course. This period of special part-time study will not be the normal Diploma Course, but will be in specified subjects, as set out below.

Exemption Courses for Part-time Students—Second Year Engineering.

(A) MECHANICAL ENGINEERING, COURSE V.

Based on the Mechanical Engineering Diploma Stages I and II.

Year 2a:

	Hours per week.	
Diploma Physics II	3	
Applied Mathematics III	2	
Materials and Structure II (1st Term)	2	
Engineering Design I	3	
Workshop Processes and Practice II	1	
	11	(1 term)
	9	(2 terms)

Year 2b:

Applied Mathematics IV	2
Engineering Design IIA (1st and 2nd Terms)	5
Mechanical Engineering IIIE and F (3rd Term)	2¼
Mechanical Engineering IIIE and F, Tutorial (3rd Term)	1¼
*G1, G2, G10, G11, G20, Humanities	2½
	9½ (2 terms)
	8 (1 term)

(B) ELECTRICAL ENGINEERING, COURSE VI.

(i) Based on the Electrical Engineering Diploma Stages I and II.

Year 2a:

	Hours per week.	
Diploma Physics II	3	
Diploma Mathematics III	2	
Materials and Structures II (1st Term)	2	
Engineering Design I	3	
C4a-ba: Technology for Engineers	2½	
	12½	(1 term)
	10½	(2 terms)

Year 2b:

Diploma Mathematics IV	2
Engineering Design IIA (1st and 2nd Terms)	5
Mechanical Engineering IIIE and F (3rd Term)	2¼
Mechanical Engineering IIIE and F Tutorial (3rd Term)	1¼
Electrical Engineering II	2½
*G1, G2, G10, G11, G20, Humanities	2½
	12 (2 terms.)
	10½ (1 term.)

(ii) Based on the Radio Engineering Diploma Stages I and II.

Year 2a:

	Hours per week.
Diploma Mathematics III	2
Mechanical Engineering II	1
Materials and Structures I	1
Mechanical and Materials Laboratory I	2
C4a-b: Technology for Engineers	2½
Engineering Design I	3
	11½

Year 2b:

Diploma Mathematics IV	2	
Engineering Design IIA (1st and 2nd Terms)	5	
Mechanical Engineering IIIE and F (3rd Term)	2¼	
Mechanical Engineering IIIE and F Tutorial (3rd Term)	1¼	
Materials and Structures II (1st Term)	2	
Electrical Engineering II	2½	
*G1, G2, G10, G11, G20, Humanities	2½	
	14	(1 term.)
	12	(1 term.)
	10½	(1 term.)

(C) MINING ENGINEERING, COURSE VII.

Based on the Mechanical Engineering Diploma Stages I and II.

Year 2a:

	Hours per week.
Diploma Physics II	3
Applied Mathematics III	2
Materials and Structures II (1st Term)	2
Engineering Design I	3
Geology for Engineers	2
	12 (1 term.)
	10 (2 terms.)

Year 2b:

	Hours per week
Applied Mathematics IV	2
Engineering Design IIA (1st and 2nd Terms)	5
Mechanical Engineering IIIE and F (3rd Term)	2¼
Mechanical Engineering IIIE and F Tutorial (3rd Term)	1¼
*Mining (1st and 2nd Terms)	2
*G1, G2, G10, G11, G20, Humanities	2½
	11½ (2 terms.)
	8 (1 term.)

(D) CIVIL ENGINEERING, COURSE VIII.

Based on the Civil Engineering Diploma Stages I and II.

Year 2a:

	Hours per week.	
Physics II	3	
Applied Mathematics III	2	
Materials and Structures II (1st Term)	2	
Engineering Design I	3	
Geology for Engineers	2	
	12	(1 term.)
	10	(2 terms.)

Year 2b:

Applied Mathematics IV	2	
Engineering Design IIA (1st and 2nd Terms)	5	
Mechanical Engineering IIIE and F (3rd Term)	2¼	
Mechanical Engineering IIIE and F Tutorial (3rd Term)	1¼	
*G1, G2, G10, G11, G20, Humanities	2½	
	9½	(2 terms.)
	8	(1 term.)

*These subjects are not normal diploma subjects, but are provided specially for students seeking admission to the New South Wales University of Technology with advanced standing.

APPLIED CHEMISTRY AND CHEMICAL ENGINEERING COURSES.

ALTERNATIVE PART DAY—PART EVENING STUDY.

Exemption from the first year full day course in these two subjects may be granted to students under certain circumstances if they complete the following special two years' part day-part evening courses given by the Department of Technical Education. Year 1A is the same as the existing Stage I Diploma Course in Chemistry and Chemical Engineering, with the addition of Humanities G1 and G10 covering Scientific Method, and Language and Literature. Year 1B is a special course to cover the remaining ground normally covered in the full day first year of the degree course. On the completion of years 1A and 1B, students may enter the second year of the degree courses II or III.

Year 1A—Courses II and III.

(37 weeks of 2 half days and 2 evenings per week.)

1.10	Physics	1¾ — 1½
2.20A	Inorganic Chemistry	1½ — 4½
10.10A	Mathematics	2 — 0
G10	Language and Literature	1¼ — 0
G1	Scientific Method	
		6½ — 6

Year 1B—*Courses II and III.*

(37 weeks of 2 half days and 2 evenings per week.)

		Term 1.	Term 2.	Term 3.
2.20B	Inorganic Chemistry ..	1 — 0	—	—
2.30	Physical Chemistry . ..	—	—	1 — 2
2.40	Organic Chemistry	1 — 3	1 — 3	1 — 2
5.15	Drawing and Materials ..	0 — 3	1 — 3	1 — 3
5.93	Workshop Processes and Practice	0 — 2	0 — 2	—
	or			
1.90	Laboratory Arts			
10.10B	Mathematics	2 — 0	2 — 0	2 — 0
G11	Language and Literature			
G2	History of Science and Technology	1½ — 0	1½ — 0	1½ — 0
G20	Human Relations			
		5½ — 8	5½ — 8	6½ — 7

APPLIED CHEMISTRY (COURSE II).

ALTERNATIVE PART TIME COURSE.

Students who are in suitable employment may be granted permission to do the last year full time course in two years of part day-part evening study as follows:—

Year 4A.

(37 weeks of 2 half days and 2 evenings per week.)

2.33	Physical Chemistry	1 — 2
2.42	Organic Chemistry	1 — 2
2.91	Chemical Microscopy and Metallography ..	1 — 1½
3.11	Unit Operations and Equipment	1 — 0
4.11	General Metallurgy	
	Science Elective Subject	3
G4	Contemporary Civilisation	1 — 0
		13½

Note.—The times represent hours per week. The first is lecture time; the second laboratory time.

Year 4B.

(37 weeks of 2 half days and 2 evenings per week.)

	A maximum of three Professional Elective Subjects	11
G13	Language and Literature	1
G22	Human Relations	1
		13

CHEMICAL ENGINEERING (COURSE III).

ALTERNATIVE PART TIME COURSE.

Students who are in suitable employment may be granted permission to do the last year full time course in two years of part day-part evening study as follows:—

Year 4A.

(37 weeks of 2 half days and 2 evenings per week.)

		Term 1.	Term 2.	Term 3.
2.34	Physical Chemistry ..	1 — 2	1 — 2	—
3.11	Unit Operations and Equipment	1½ — 0	1½ — 0	—
3.20	Fuel Economy ..	..	..	0 — 2½
3.30	Chemical Engineering Design	0 — 3	0 — 3	0 — 3
4.10	Metallography and Heat Treatment	—	—	1 — 1½
6.94	Electrochemical Technology	1 — 1½	1 — 1½	1 — 1½
8.53	Fluid Mechanics	—	—	2½ — 0
G4	Contemporary Civilisation	1 — 0	1 — 0	1 — 0
		7 — 6½	7 — 6½	8 — 6

Year 4B.

(37 weeks of 2 half days and 2 evenings per week.)

3.31	Chemical Engineering Design	0 — 3
3.40	Chemical Engineering	2 — 6½
G13	Language and Literature	1 — 0
G22	Human Relations	1 — 0
		4 — 9½

SYLLABUSES FOR UNDERGRADUATE COURSES.

In March, 1950, the first, second and third years of the Engineering Courses V, VI, VII and VIII will be available. The fourth year of these courses will begin in March, 1951.

The first and second years of Courses II and III in Applied Chemistry and Chemical Engineering and the first year of course IX in Architecture will also be available in March, 1950.

The first year syllabuses for Engineering Courses V, VI, VII and VIII are identical, as also are the syllabuses for the first two years of Courses II and III in Applied Chemistry and Chemical Engineering. A student, therefore, may change his course of study in the Engineering Faculty at any time before the beginning of the second year, or may change from Applied Chemistry to Chemical Engineering, or vice versa, before the beginning of third year.

A student wishing to change his course of study must make written application to do so. The decision of the University in such cases must be accepted as final.

Subject Numbering System.

Subjects are numbered and grouped according to the Department under which instruction is given. A course is a programme of study made up of subjects selected from the several Departments, and leads to a degree in a given field of science or engineering. The Arabic numerals for the subjects correspond to the Roman numerals of the Courses in the same Department, except in special cases.

Department.	Subject Numbers.
Physics	1.00 to 1.99
Chemistry	2.00 to 2.99
Chemical Engineering	3.00 to 3.99
Metallurgy	4.00 to 4.99
Mechanical Engineering	5.00 to 5.99
Electrical Engineering	6.00 to 6.99
Mining Engineering	7.00 to 7.99
Civil Engineering	8.00 to 8.99
General Science	9.00 to 9.99
Mathematics	10.00 to 10.99
Architecture	11.00 to 11.99
Humanities	G1 to G99

The time given to each subject is shown in two parts, the first figure representing lecture hours per week, the second, laboratory or practical work in hours per week. These times represent the average distribution over the term or year, but may be varied from time to time according to the nature of the work. Lecture time may not always be used for formal instruction, but may be devoted to discussions, assignments in the library, film presentation, or other means of instruction.

Faculty of Applied Science.

The courses in Applied Chemistry and Chemical Engineering are spread over four years as follows:—

First Year—32 weeks over 3 terms from March to November (excluding examinations and vacations) full time day study, 5 days per week.

Students may gain exemption from this year by completing a special 2 years part day-part evening course at 13 to 14 hours per week, involving 2 evenings per week and 1 full day or 2 half days per week in the Department of Technical Education.

Second and Third Years—37 weeks each, over 3 terms from February to November (excluding examinations and vacations) part day-part evening study at 13 to 14 hours per week, involving 2 evenings per week and 1 full day or 2 half days per week.

Fourth Year—36 weeks over 2 terms from February to November (excluding examinations and vacations) full time day study, 5 days per week.

Alternatively, this may be done by 2 years part day-part evening study at 13 to 14 hours per week and 1 full day or 2 half days per week.

Faculty of Engineering.

The Engineering Courses are spread over four years full day time instruction as follows:—

First Three Years—24 weeks from March to September (excluding examinations and vacations) full time study, 5 days per week, at the N.S.W. University of Technology, followed by 23 weeks in industry gaining approved practical experience.

Students may gain exemption from the first one or two years by part time study in the Department of Technical Education.

Fourth Year—32 weeks from March to November (excluding examinations and vacations) full time day attendance at the N.S.W. University of Technology.

COURSES II AND III—APPLIED CHEMISTRY AND CHEMICAL ENGINEERING.

The needs of the chemical industry for men competent to develop, design and operate new processes and to improve existing ones, make essential two different types of training. One need involves a general and fundamental education based on science for those who seek a career in some field in which a sound knowledge of chemistry is important; the other requires a training which provides knowledge of the engineering principles basic to design, construction and operation of plant and equipment and of the underlying chemical reactions.

Training of the first type is provided by the course in Applied Chemistry, in which students receive thorough instruction in the principles of inorganic, analytical, organic and physical chemistry, supplemented by instruction in mathematics and physics and other scientific subjects. In the last few years of the course, the student is given the opportunity of electing the subjects he wishes to take so as to enable him to extend his knowledge in fields of special interest.

Training of the second type is provided by the course in Chemical Engineering, which is planned to afford students broad training in the fundamentals of science, chemistry and engineering. The work in chemistry, physics and mathematics is the same as given to Applied Chemistry students over the first few years, so that students may delay making their choice as to which course to complete until they are about to enter the third year. Thereafter, the student in Chemical Engineering is given work in mechanical and electrical engineering to supply the fundamentals which he needs in the engineering aspect, and in chemical engineering and industrial chemistry as distictly professional subjects—designed, however, to develop capacity for original thought.

The courses in Applied Chemistry and Chemical Engineering are closely linked with practical training in industry. They are arranged so that two years in the middle of the courses are spent in combined academic study and works practice. In order to ensure sufficient time for study and reading, a maximum of two evenings per week is stipulated, the remainder of the study time each week being spread over two half days.

The proposed syllabuses for the second half of each of these courses may be modified before they are put into effect in 1951 and 1952.

COURSES II AND III—APPLIED CHEMISTRY AND CHEMICAL ENGINEERING.

Common First and Second Year Courses.

COMMON FIRST YEAR.

(32 weeks' day course.)

		Term 1. (11 weeks.)	Term 2. (13 weeks.)	Term 3. (8 weeks.)
1.10	Physics	3 — 3	3 — 3	—
2.20	Inorganic Chemistry ..	3 — 6½	2 — 4	3 — 4
2.30	Physical Chemistry ..	—	—	2 — 2½
2.40	Organic Chemistry ..	—	1 — 2	3 — 6
5.15	Drawing and Materials	1½ — 3	1½ — 3	0 — 5
*5.93	Workshop Processes and Practice	—	0 — 2½	0 — 2½
*1.90	Laboratory Arts ..			
10.10	Mathematics	6 — 0	6 — 0	—
G1	Scientific Method			
G10	Language and Literature			
G11	Language and Literature	4 — 0	4 — 0	—
G20	Human Relations			
G2	History of Science of Technology			
		17½ — 12½	17½ — 14½	8 — 20

*Students may choose either Workshop Processes and Practice or Laboratory Arts. The former must be taken by students intending to follow Chemical Engineering (Course III); the latter by those intending to follow Applied Chemistry (Course II).

COMMON SECOND YEAR.

(37 weeks of 2 half days and 2 evenings per week.)

		Term 1.	Term 2.	Term 3.
1.11	Physics	1 — 2	1 — 2	1 — 2
2.21	Inorganic Chemistry ..	3 — 0	—	—
2.31	Physical Chemistry ..	—	1 — 2	1 — 2
2.50	Quantitative Analysis	1 — 4½	1 — 4½	1 — 4½
2.90	Chemical Computations	—	1 — 0	2 — 0
10.12	Mathematics	2 — 0	1 — 0	—
		7 — 6½	5 — 8½	5 — 8½

COURSE II—APPLIED CHEMISTRY.

THIRD YEAR.

(37 weeks of 2 half days and 2 evenings per week.)

		½ Year.	½ Year.
2.32	Physical Chemistry	1 — 0	1 — 3
2.41	Organic Chemistry	1 — 2	1 — 2
2.51	Quantitative Analysis ..	1 — 3	1 — 3
3.10	Industrial Chemistry	1½ — 4	1½ — 1
		4½ — 9	4½ — 9

FOURTH YEAR.

(36 weeks' day course.)

First Half Year.

2.33	Physical Chemistry	2 — 4
2.42	Organic Chemistry	2 — 4
2.91	Chemical Microscopy and Metallography	2 — 3
3.11	Unit Operations	1 — 0
4.11	General Metallurgy	1 — 0
	Science Elective Subject	2 — 4
G3, G4, G12, G13, G21, G22	Humanities	6 — 0
		16 — 15

Second Half Year.

A Maximum of three Professional Elective Subjects with special investigations and study in one leading to the preparation of a thesis or report.

Elective Subjects.

Students may choose to extend the work of industrial chemistry in the inorganic, physical or organic fields following subjects 2.22, 2.33 or 2.42, or may extend the work of Quantitative Analysis (2.51) into advanced chemical analysis, or Microanalysis. One elective

subject may be taken from the general science group if desired. The range of subjects for special study includes the following and may be extended into other fields by arrangement with the head of the department.

2.22 Advanced Inorganic Industrial Chemistry.
2.35 Advanced Physical Industrial Chemistry.
2.43 Organic Industrial Chemistry.
2.44 Commercial Organic Analysis.
2.52 Advanced Chemical Analysis.
2.60 Commercial and Food Analysis.
2.92 Microanalysis.
4.91 Fire Assaying.

General Science Subjects.

Geology.
Physics.
Mathematics.
Botany.
Physiology.
Zoology.
Biochemistry.
Biology.
Entomology.
Mineralogy.
Microbiology.

COURSE III—CHEMICAL ENGINEERING.

FIRST AND SECOND YEARS COMMON WITH COURSES II (SEE PAGE 57).

THIRD YEAR.

(37 weeks of 2 half days and 2 evenings per week.)

		½ Year.	½ Year.
2.32	Physical Chemistry	1 — 0	1 — 3
2.41	Organic Chemistry	1 — 2	1 — 2
3.10	Industrial Chemistry	1½ — 4	1½ — 1
5.23	Mechanical Engineering ..	1 — 1	1 — 1
8.12	Materials and Structures ..	1 — 1	1 — 1
		5½ — 8	5½ — 8

FOURTH YEAR.

(36 weeks' day course.)

First Half Year

2.34	Physical Chemistry	1½ —	2½
3.11	Unit Operations and Equipment ..	2 —	0
3.20	Fuel Economy	5 —	0
3.30	Chemical Engineering Design ..	0 —	6
4.10	Metallography and Heat Treatment	1 —	1½
6.94	Electrochemical Technology ..	2 —	3
8.53	Fluid Mechanics	1½ —	0
G3, G4, G12, G13, G21, G22	General Studies	3 —	0
		16 —	13

Second Half Year.

3.31	Chemical Engineering Design ..	0 —	6
3.40	Chemical Engineering	6 —	15
		6 —	21

The student will be expected to undertake special work of an investigatory nature and to carry out a detailed study of some particular aspect of the work leading to the preparation of a thesis or report.

COURSE V. MECHANICAL ENGINEERING.

The Course in Mechanical Engineering is planned to provide a sufficient foundation of basic science applied to engineering methods and techniques, to prepare the graduate to enter any industry dealing with heat, power, materials and machinery. The Course does not attempt to teach current commercial practice nor specialized knowledge of the product of any one industry. On the contrary, undergraduates are expected to obtain their practical experience by direct service in industry.

During the first two years the fundamental subjects which are the basis of the student's later professional work are studied, viz., mathematics, chemistry, physics and applied mechanics, a thorough knowledge of which is essential in all branches of mechanical engineering. The student is also trained in elements of the more

important mechanical processes in order that he may acquire the knowledge of modern machine tools, foundry practice, forging and welding, necessary for the successful designer of machinery. This knowledge is further enlarged by five month periods in industry between the various academic sessions.

The professional work of the third and fourth years includes the study of the mechanics of fluids and of rigid and elastic bodies with applications to design. The study of thermodynamics is applied to heat engineering, and to the analysis and design of power plants, turbines, steam and internal combustion engines, industrial heating, and to refrigeration and air conditioning systems. Engineering processes are considered in relation to design for production; and work on metrology, gauges and fixtures, tool design and tolerances and inspection is introduced.

In general, instruction by lectures is paralleled by laboratory work in which the student is given opportunity, not only to familiarize himself with materials, engines and machinery, but also to develop his ability to apply theory to the analysis of their characteristics.

The professional elective subjects in the fourth year permit students to choose a broad phase of mechanical engineering as a special study. In this way the student learns to use libraries and technical journals, and is made to realize how fully the knowledge he has gained during his course is used in engineering development and practice. The preparation of a thesis on the elective chosen provides a training in report writing and in technical exposition.

COURSE V—MECHANICAL ENGINEERING.

First Year.

(Common for Courses V, VI, VII and VIII.)

(24 weeks—day course.)

First Term.

1.10	Physics	3	—	3
2.10	Chemistry	3	—	3
5.10	Descriptive Geometry	2	—	3
5.11	Engineering Drawing and Materials	1½	—	3
5.90	Workshop Processes and Practice	0	—	2½
10.10	Mathematics	6	—	0
G1	Scientific Method	1	—	0
G10	Language and Literature	1	—	0
		17½	—	14½

Second Term

1.10	Physics	3	—	3
2.10	Chemistry	3	—	3
*5.10	Descriptive Geometry	2	—	3
*8.20	Mechanics and Graphics			
5.11	Engineering Drawing and Materials	1½	—	3
5.90	Workshop Processes and Practice	0	—	2½
10.10	Mathematics	6	—	0
G1	Scientific Method	1	—	0
G10	Language and Literature	1	—	0
		17½	—	14½

*Time to be divided by mutual arrangement between the departments of Mechanical and Civil Engineering. Approximately half the time will be allocated to each of the two phases of the work in lectures and drawing office.

SECOND YEAR.

(24 weeks—day course.)

First Term.

1.11	Physics	2	—	2½
3.90	Engineering Chemistry	1½	—	2
5.20	Mechanical Engineering	2	—	2
5.91	Engineering Processes	2	—	2
8.10	Strength of Materials	1½	—	2½
8.21	Structural Drawing and Design	2	—	3
10.11	Mathematics	5	—	0
G11	Language and Literature	2	—	0
G2	History of Science and Technology			
G20	Human Relations			
		18	—	14

Second Term.

1.11	Physics	2	—	2½
4.90	Engineering Metallurgy	1½	—	2
5.12	Mechanical Drawing and Design	1½	—	3½
5.20	Mechanical Engineering	2	—	2
5.91	Engineering Processes	2	—	2
8.10	Strength of Materials	1½	—	2½
10.11	Mathematics	5	—	0
G11	Language and Literature	2	—	0
G2	History of Science and Technology			
G20	Human Relations			
		17½	—	14½

Third Year.

(24 weeks—day course.)

First Term.

5.13	Engineering Design	2 — 3
5.21	Mechanical Engineering	4 — 3
5.50	Fluid Mechanics	2 — 3
6.90	Electrical Engineering	2 — 3
8.22	Structures	1½ — 2
8.80	Engineering Computations ..	0 — 1½
G3	Contemporary Civilisation ..	1 — 0
G12	Language and Literature	1 — 0
G21	Human Relations	1 — 0
		14½ — 15½

Second Term.

5.13	Engineering Design	2 — 4½
5.21	Mechanical Engineering	4 — 3
5.51	Hydraulic Machines	2 — 3
6.90	Electrical Engineering	2 — 3
8.22	Structures	0 — 2
8.80	Engineering Computations ..	0 — 1½
G3	Contemporary Civilisation ..	1 — 0
G12	Language and Literature	1 — 0
G21	Human Relations	1 — 0
		13 — 17

Fourth Year.

(32 weeks—day course.)

First Term.

5.14	Engineering Design	1½ — 3
5.92	Production Engineering Design ..	3 — 3
6.92	Electrical Engineering	1½ — 2½
8.30	Surveying	2 — 2
	Seminars	2
	A maximum of two Professional Elective Subjects	6
G4	Contemporary Civilisation ..	1 — 0
G13	Language and Literature	1 — 0
G22	Human Relations	1 — 0
		29½

Second Term.

5.14	Engineering Design	0	—	3½
5.22	Mechanical Engineering Practice	2	—	3
5.92	Production Engineering Design ..	3	—	3
8.30	Surveying	2	—	2
	Seminars		2	
	A maximum of two Professional Elective Subjects		6	
G4	Contemporary Civilisation ..	1	—	0
G13	Language and Literature	1	—	0
G22	Human Relations	1	—	0
			29½	

N.B.—A Survey Camp of one week's duration will be conducted between second and third terms.

THIRD TERM.

Wholly devoted to directed laboratory and research work on one Professional Elective Subject, with special reading and study associated with the preparation of a thesis.

Professional Elective Subjects.

5.30 Steam Engineering.
5.31 Internal Combustion and Hot Air Engines.
5.32 Refrigeration, Air Conditioning and Ventilation.
5.33 Industrial Heating.
5.52 Hydraulic Machinery.
6.93 Electric Power Generation and Utilization.

Other specialised branches as announced from time to time, or by special arrangements with the Head of the Department.

Work will be carried out individually under a tutor system. Specialists from industry will be called in from time to time to give special talks and to ensure that students are kept well abreast of current developments and problems.

COURSE VI. ELECTRICAL ENGINEERING.

In preparation for a career in any branch of Electrical Engineering, the student must develop a working mastery of the basic sciences of mathematics and physics, emphasizing mechanics, thermodynamics and especially electricity and magnetism. On these is built his fundamental professional work on principles of electrical engineering and associated applications. He also needs the elements of chemistry and economics.

There are three main branches of Electrical Engineering, viz.:— Electric Power, Line Communications, and Electronics and High Frequency. By allowing the student to choose his major elective subjects in his fourth year the curriculum is made flexible enough to meet the needs of individual students, while still ensuring that all students get a fundamental training in the elements of all three phases in their first three years.

The student who is interested mainly in electrical machinery, power generation, transmission and distribution in preparation for work with heavy apparatus manufacturers, public power utilities, and users of heavy electrical equipment would logically choose subjects 6.21, 6.22 and 6.31. For line communication work associated with telegraph and telephone public utilities, the student would normally choose 6.34 and two others from 6.21, 6.31, 6.32, 6.33. On the electronic and high frequency side associated with radio, radar, valve design and manufacture, the choice would probably be 6.31, 6.32, 6.33. Other combinations of subjects can be made, however, to suit requirements and complete flexibility of choice has been the aim.

The professional elective subjects provide a wide range from which the student can choose to make a special study for reading, research and finally for the preparation of a thesis. The purpose of providing a large range of professional elective subjects, each covering a broad phase of electrical engineering, is primarily to provide the incentive to accomplishment which comes from emphasis on that portion of the electrical engineering field which arouses a student's special interest.

COURSE VI—ELECTRICAL ENGINEERING.

First Year.

(Common for Courses V, VI, VII and VIII.)

(24 weeks—day course.)

First Term.

1.10	Physics	3	—	3
2.10	Chemistry	3	—	3
5.10	Descriptive Geometry	2	—	3
5.11	Engineering Drawing and Materials	1½	—	3
5.90	Workshop Processes and Practice	0	—	2½
10.10	Mathematics	6	—	0
G1	Scientific Method	1	—	0
G10	Language and Literature	1	—	0
		17½	—	14½

Second Term

1.10	Physics	3	3
2.10	Chemistry	3	3
*5.10	Descriptive Geometry	2	3
*8.20	Mechanics and Graphics		
5.11	Engineering Drawing and Materials	1½	3
5.90	Workshop Processes and Practice	0	2½
10.10	Mathematics	6	0
G1	Scientific Method	1	0
G10	Language and Literature	1	0
		17½	14½

*Time to be divided by mutual arrangements between the departments of Mechanical and Civil Engineering. Approximately half the time will be allocated to each of the two phases of the work in lectures and drawing office.

SECOND YEAR.

(24 weeks—day course.)

First Term.

1.11	Physics	2	2½
3.90	Engineering Chemistry	1½	2
5.20	Mechanical Engineering	2	2
6.10	Electric Circuit Theory	2	2
8.10	Strength of Materials	1½	2½
8.21	Structural Drawing and Design	2	3
10.11	Mathematics	5	0
G11	Language and Literature	2	0
G2	History of Science and Technology		
G20	Human Relations		
		18	14

Second Term.

1.11	Physics	2	2½
4.90	Engineering Metallurgy	1½	2
5.12	Mechanical Drawing and Design	1½	3½
5.20	Mechanical Engineering	2	2
6.10	Electric Circuit Theory	2	2
8.10	Strength of Materials	1½	2½
10.11	Mathematics	5	0
G11	Language and Literature	2	0
G2	History of Science and Technology		
G20	Human Relations		
		17½	14½

THIRD YEAR.

(24 weeks—day course.)

First Term.

5.21	Mechanical Engineering	4	—	3
5.50	Fluid Mechanics	2	—	3
6.11	Electric Circuit Theory	3	—	0
6.20	Electric Power Engineering ..	3	—	3
6.30	Electronics and High Frequency	2	—	3
10.20	Mathematics	1	—	0
G3	Contemporary Civilisation ..	1	—	0
G12	Language and Literature	1	—	0
G21	Human Relations	1	—	0
		18	—	12

Second Term.

5.21	Mechanical Engineering	4	—	3
6.11	Electric Circuit Theory	3	—	0
6.20	Electric Power Engineering ..	3	—	6
6.30	Electronics and High Frequency	3	—	3
10.20	Mathematics	1	—	0
G3	Contemporary Civilisation ..	1	—	0
G12	Language and Literature	1	—	0
G21	Human Relations	1	—	0
		17	—	12

FOURTH YEAR.

(32 weeks—day course.)

First Two Terms.

5.91	Engineering Processes	2	—	2
	Three Major Elective Subjects ..		18	
	One Profesisonal Elective Subject		3	
G4	Contemporary Civilisation ..	1	—	0
G13	Language and Literature	1	—	0
G22	Human Relations	1	—	0
			28	

Third Term.

Wholly devoted to directed laboratory and research work on one professional elective subject, with special reading and study associated with the preparation of a thesis.

Major Elective Subjects.

6.21	Electric Power Utilization ..	3	—	3
6.22	Power Generation and Transmission	3	—	3
6.31	Industrial Electronics	3	—	3
6.32	High Frequency Engineering ..	3	—	3
6.33	High Frequency Design	3	—	3
6.34	Line Communication Engineering	3	—	3

Professional Elective Subjects.

5.30 Steam Engineering.
6.35 Ultra High Frequency Applications.
6.36 Telephone and Telegraph Systems.
6.37 Measurements (High Frequency).
6.40 Illumination Engineering.
6.41 Protection Engineering.
6.42 Electrical Control.
6.43 Applications of Modern Physics to Electrical Engineering.
6.44 Electroacoustics.
6.45 Industrial Heating.
6.50 Electrical Measurements.

Other specialised branches as announced from time to time, or by special arrangements with the Head of the Department.

Work will be carried out individually under a tutor system. Specialists from industry will be called in from time to time to give special talks and to ensure that students are kept well abreast of current developments and problems.

COURSE VII. MINING ENGINEERING.

Modern developments in the Mining industry have resulted in making increasing calls for engineering proficiency in those who are responsible for the conduct of the industry.

Such developments require that those who are being trained for the management of the industry shall receive firstly, a sound training in mechanical, electrical and some branches of civil engineering, and secondly, the application of those engineering principles to the mining of coal and other minerals. A knowledge of basic subjects of Mathematics, Physics, Chemistry, etc., is also essential in order that such auxiliary subjects as coal cleaning, preparation of minerals, gases and atmospheric conditions in mines, etc., may be properly understood. Hence in the construction of the Mining Engineering Course the object has been to produce mining engineers having a sound training in engineering subjects and well versed in the application of those engineering principles in the mining industry.

In the first two years of the course, the subjects which are taught are the basic science subjects, together with the primary engineering subjects. Mining subjects are introduced in the second year, and are developed in the third and fourth years of the course, concurrently with the engineering subjects. Subjects which are important to mining engineers, such as surveying, preparation of minerals and geology are given their proper place in the course.

The training in mining is aimed at giving students a thorough foundation in such subjects as mine ventilation; mine drainage; mine lighting; winding, haulage and transport; these subjects being common to practically all branches of mining work. The specialised application of these subjects to coal and metalliferous mining is dealt with in the last year of the course. Thus, although the course is designed to give students a sound training in mining, it also permits them to specialise in either coal or metalliferous mining.

Specialisation is taken a stage further in the fourth year of the course by the provision of elective subjects for the preparation of theses. Preparatory work for the theses will commence during the practical training period following the third year of academic studies and will be continued by reading in the first and second terms of the fourth year. The whole of the third term in the fourth year will be spent on further practical investigations and in the preparation of theses.

The students in the Mining Engineering Course are required to spend five months in each year in obtaining practical experience at mines, this training being based on a prepared programme designed to provide a comprehensive training in many aspects of mining work. The training is important in its relation to the academic training and in relation to the Mines Department's requirements of practical training for candidates for Statutory Certificates of Competency.

COURSE VII—MINING ENGINEERING.

First Year.

(Common for Courses V, VI, VII, and VIII.)

(24 weeks—day course.)

First Term.

1.10	Physics	3	3
2.10	Chemistry	3	3
5.10	Descriptive Geometry	2	3
5.11	Engineering Drawing and Materials	1½	3
5.90	Workshop Processes and Practice	0	2½
10.10	Mathematics	6	0
G1	Scientific Method	1	0
G10	Language and Literature	1	0
		17½	14½

Second Term.

1.10	Physics	3	3
2.10	Chemistry	3	3
*5.10	Descriptive Geometry	2	3
*8.20	Mechanics and Graphics		
5.11	Engineering Drawing and Materials	1½	3
5.90	Workshop Processes and Practice	0	2½
10.10	Mathematics	6	0
G1	Scientific Method	1	0
G10	Language and Literature	1	0
		17½	14½

*Time to be divided by mutual arrangement between the departments of Mechanical and Civil Engineering. Approximately half the time will be allocated to each of the two phases of the work in lectures and drawing office.

Second Year.

(24 weeks—day course.)

First Term.

1.11	Physics	2	2½
3.90	Engineering Chemistry	1½	2
5.20	Mechanical Engineering	2	2
7.10	Mining	2	0
8.10	Strength of Materials	1½	2½
8.21	Structural Drawing and Design	2	3
9.10	Geology	2	0
10.11	Mathematics	5	0
G11	Language and Literature		
G20	Human Relations	2	0
G2	History of Science and Technology		
		20	12

Second Term.

1.11	Physics	2	—	2½
4.90	Engineering Metallurgy	1½	—	2
5.12	Mechanical Drawing and Design ..	2	—	3
5.20	Mechanical Engineering	2	—	2
7.10	Mining	2	—	0
8.10	Strength of Materials	1½	—	2½
9.10	Geology	2	—	0
10.11	Mathematics	5	—	0
G11	Language and Literature			
G20	Human Relations		—	0
G2	History of Science and Technology			
		20	—	12

N.B.—Field excursions will be arranged on several Saturdays in connection with the instruction in Geology.

THIRD YEAR.

(24 weeks—day course.)

First Term.

5.50	Fluid Mechanics	2	—	3
6.90	Electrical Engineering	2	—	3
7.11	Mining	2	—	3
7.30	Metalliferous Mining	2	—	0
8.30	Surveying	2	—	2
9.11	Geology	2	—	3
G3	Contemporary Civilisation ..	1	—	0
G12	Language and Literature	1	—	0
G21	Human Relations	1	—	0
	First Aid	1	—	0
		16	—	14

Second Term.

5.51	Hydraulic Machines	2	3
6.90	Electrical Engineering	2	3
7.11	Mining	2	3
7.30	Metalliferous Mining	2	0
8.30	Surveying	2	2
9.11	Geology	2	3
G3	Contemporary Civilisation ..	1	0
G12	Language and Literature	1	0
G21	Human Relations	1	0
	First Aid	1	0
		16	14

N.B.—A Survey Camp of one week's duration will be conducted immediately after the examinations at the end of the second term and before the student commences his practical experience.

FOURTH YEAR.

(32 weeks—day course.)

First Two Terms.

6.91	Electrical Engineering in Mines ..	2	0
7.12	Mining	2	0
7.20	Coal Mining	2	3
	or		
7.31	Metalliferous Mining		
7.40	Preparation of Minerals	2	3
8.31	Surveying	1	3
8.32	Astronomy and Geodesy	1	0
9.12	Geology	1	2
G4	Contemporary Civilisation ..	1	0
G13	Language and Literature	1	0
G22	Human Relations	1	0
		14	11

N.B.—A Survey Camp of one week's duration will be conducted between second and third terms. Practical work connected with Astronomy and Geodesy will be conducted on several evenings during the course.

Third Term.

Additional time is to be spent in first and second terms on reading and preparation for thesis work. The whole of the third term will be devoted to work on some particular phase of mining and special investigations leading to the presentation of a thesis. The head of the department will discuss assignments for this work with each student during the third year.

N.B.—References to Mining Acts and Regulations will be made throughout the course in the mining lectures to which such Acts and Regulations apply.

COURSE VIII. CIVIL ENGINEERING.

Civil Engineering is very broad in its scope and utilizes many other branches of engineering in planning and building projects such as airports, highways, and modern industrial buildings. The Civil Engineer must adapt new knowledge and new skills in controlling the use of water for power, navigation and domestic and industrial uses. He must be ready to make use of new materials of construction as he designs the avenues of transportation, with their bridges, tunnels, and terminal facilities. Dealing as he does with both the forces of nature and with large projects that influence the economic and social conditions of many people, the Civil Engineer must combine fundamental knowledge of science and engineering with experience and judgment, and with personal characteristics of the highest order.

The syllabus in Civil Engineering is arranged so that all students receive training in the basic principles of mathematics and science, and in engineering applications such as Surveying, Hydraulics, Foundation Engineering, Geology, Electrical Engineering and Structural Theory and Design.

In the fourth year the student may pursue further work adapted to his special interests by electing one of the following options:—

OPTION 1. Civil Engineering Design.

Emphasis is given to structural theory and design, hydrology and soil mechanics and foundation engineering. This work can prepare men for fields of design associated with sanitary, transportation or hydraulic engineering.

OPTION 2. Civil Engineering Construction and Administration.

Emphasis is given to a broad survey of Civil Engineering activities in roads, water and sewerage schemes, and local government fields, including the planning of projects and their administrative, social and economic aspects. This is designed to prepare men for the planning of Civil Engineering projects including public works.

OPTION 3. Surveys and Investigations.

The purpose of this option is to provide for a training in the expanding field of aerial surveying, topographical surveying, photogrammetry, mapping, and model construction associated with large civil engineering projects. Associated with such work is a more detailed study of the technical subjects of soil mechanics, geology and hydrology.

COURSE VIII—CIVIL ENGINEERING.

First Year.

(Common for Courses V, VI, VII and VIII.)

(24 weeks—day course.)

First Term.

1.10	Physics	3	—	3
2.10	Chemistry	3	—	3
5.10	Descriptive Geometry	2	—	3
5.11	Engineering Drawing and Materials	1½	—	3
5.90	Workshop Processes and Practice	0	—	2½
10.10	Mathematics	6	—	0
G1	Scientific Method	1	—	0
G10	Language and Literature	1	—	0
		17½	—	14½

Second Term.

1.10	Physics	3	—	3
2.10	Chemistry	3	—	3
*5.10 *8.20	Descriptive Geometry Mechanics and Graphics	2	—	3
5.11	Engineering Drawing and Materials	1½	—	3
5.90	Workshop Processes and Practice	0	—	2½
10.10	Mathematics	6	—	0
G1	Scientific Method	1	—	0
G10	Language and Literature	1	—	0
		17½	—	14½

*Time to be divided by mutual arrangement between the departments of Mechanical and Civil Engineering. Approximately half the time will be allocated to each of the two phases of the work in lectures and drawing office.

SECOND YEAR.

(24 weeks—day course.)

First Term.

1.11	Physics	2 — 2½
3.90	Engineering Chemistry	1½ — 2
5.20	Mechanical Engineering	2 — 2
8.10	Strength of Materials	1½ — 2½
8.21	Structural Drawing and Design ..	2 — 3
9.13	Geology	2 — 2
10.11	Mathematics	5 — 0
G11 G2 G20	Language and Literature / History of Science and Technology / Human Relations	2 — 0
		18 — 14

Second Term.

1.11	Physics	2 — 2½
4.90	Engineering Metallurgy	1½ — 2
5.12	Mechanical Drawing and Design ..	2 — 3
5.20	Mechanical Engineering	2 — 2
8.10	Strength of Materials	1½ — 2½
9.13	Geology	2 — 2
10.11	Mathematics	5 — 0
G11 G2 G20	Language and Literature / History of Science and Technology / Human Relations	2 — 0
		18 — 14

N.B.—Field excursions will be arranged on several Saturdays in connection with the instruction in Geology.

THIRD YEAR.

(24 weeks—day course.)

First Term.

5.50	Fluid Mechanics	2 — 3
6.90	Electrical Engineering	2 — 3
8.11	Materials of Construction ..	2 — 2
8.22	Structures	1½ — 2
8.30	Surveying	2 — 2
8.40	Civil Engineering	2 — 0
8.80	Engineering Computations ..	0 — 1½
10.21	Mathematics	3 — 0
G3	Contemporary Civilisation ..	1 — 0
G12	Language and Literature	1 — 0
G21	Human Relations	1 — 0
		17½ — 13½

Second Term.

6.90	Electrical Engineering	2	—	3
8.11	Materials of Construction ..	2	—	2
8.22	Structures	0	—	2
8.30	Surveying	2	—	2
8.40	Civil Engineering	3	—	0
8.50	Fluid Mechanics	1	—	1½
8.52	Soil Mechanics	1	—	1½
8.80	Engineering Computations ..	0	—	1½
G3	Contemporary Civilisation ..	1	—	0
G12	Language and Literature	1	—	0
G21	Human Relations	1	—	0
		14	—	13½

N.B.—A Survey Camp of one week's duration will be conducted immediately after the examinations at the end of second term and before the student commences his practical experience.

FOURTH YEAR.

(32 weeks—day course.)

First Two Terms.

8.23	Structures	2	—	3
8.31	Surveying	1	—	2
8.41	Civil Engineering	1	—	1
8.51	Fluid Mechanics	1	—	1
8.60	Building Construction	1	—	0
8.70	History of Architecture and Structural Aesthetics	1	—	0
8.71	City Planning	1	—	0
	Professional Elective Subjects ..		10	
G4	Contemporary Civilisation ..	1	—	0
G13	Language and Literature	1	—	0
G22	Human Relations	1	—	0
			28	

N.B.—A Survey Camp of one week's duration will be conducted between second and third terms.

THIRD TERM.

Wholly devoted to directed laboratory and research work on Professional Elective Subjects, with special reading and study associated with the preparation of a thesis.

Professional Elective Subjects.

Each student is required to pursue work adapted to his special interests and abilities by electing to take one of the following options. The work in these electives will be mainly carried out on the tutor system. Specialists from industry will be called in from time to time to give special lectures and to ensure that students are kept well abreast of current developments and problems. The elective subjects listed may be added to as occasion demands. Students may be instructed to attend certain lectures given by learned societies and other educational authorities during the year.

Option 1—8.42 *Civil Engineering Design.*

Two subjects to be chosen with the approval of the Head of the Department.

(*a*) Theory and design of structures.
(*b*) Soil Mechanics and Foundation Engineering.
(*c*) Hydrology.
(*d*) Advanced Mathematics.
(*e*) Modern Foreign Language.

Option 2—8.43 *Civil Engineering Construction and Administration.*

Three subjects to be chosen with the approval of the Head of the Department.

(*a*) Construction Equipment and Methods.
(*b*) Geology.
(*c*) Powers and Duties of a Local Government Engineer.
(*d*) Management.
(*e*) Planning and Design of Civil Engineering Works.

Option 3—8.44 *Surveying and Investigations.*

The student electing this option must take the first two subjects and one other.

8.32 Astronomy and Geodesy.
8.33 Topographical Surveying, Aerial Surveying and Photogrammetry.
(*a*) Soil Mechanics and Foundation Engineering.
(*b*) Hydrology.
(*c*) Geology.

COURSE XI. ARCHITECTURE.

A course leading to a degree in Architecture (B.Arch.) is planned, but details have not yet been finalised. Information may be obtained from the Registrar.

POST-GRADUATE COURSES OF STUDY.

It is the policy of the New South Wales University of Technology to extend the range of higher technological training by providing advanced courses in the latest applications of science to industry and by extending the fundamental work in the normal undergraduate courses into more specialised and detailed study of specific professional fields.

It is planned that this aspect of the University's work will be expanded considerably as facilities and staff become available. The courses may take the form of—

(*a*) A series of lectures on subjects of general interest to the public or to technical men in industry.

(*b*) A course of lectures, with possibly laboratory work, followed by examination, for which successful students will be given a certificate.

(*c*) A course of study and research along specified lines leading to higher degrees, such as Master of Engineering or Master of Science.

Separate brochures will be issued from time to time announcing lectures and courses of the type listed under (*a*) and (*b*).

Courses leading to higher degrees are set out in this Bulletin and will be added to as facilities permit.

For 1950 candidates will be accepted for the Master of Engineering degree in the field of Electronic Engineering. The course and research work will be organised and conducted by Professor H. J. Brown, B.Sc., M.E. Experts from industry and research laboratories will assist in the course by giving lectures on topics in which they are recognised authorities. Full details of the course may be obtained from Professor Brown (Telephone MO 422, Ext. 360), New South Wales University of Technology, Broadway, Sydney.

Admission will be limited to graduates in Electrical Engineering from a recognised University. Full details are available on request. Applications for entry to the course should be made before 28th February, 1950.

Course of Study for Master of Engineering in Electronic Engineering.

The course of study is spread over two years as follows:—

1st year—Part time study in which attendance at special lectures in the evening is required for a maximum of two evenings per week. Special assignments for reading and study will be given and for work to be carried out in the student's own time. He will be continually guided and directed in his work by personal discussions.

An examination will be given at the end of the year in the form of a *viva voce* and by assessment of written assignments given during the year.

Study will be mainly in—

Advanced Mathematics.

Modern Physics.

One broad aspect of Electronics Engineering in which the student plans to carry out a more detailed plan of study and research in the second year.

Selection of the field of study is to be made after consultation and suggested topics are—

Propagation of radio waves.

Vacuum tubes and electronics.

Microwave techniques.

Antennas.

Measurements.

Industrial electronics.

Radio Communication Equipment.

Nuclear and Atomic Physics.

2nd year—Full time study and research at the University of Technology for a minimum of seven months (30th March to 30th October), in which the student is required to participate in research work and to prepare an original thesis.

Students who are already employed in approved research laboratories and are engaged on research work of a satisfactory nature may be exempted from full time attendance at the New South Wales University of Technology. Such students may present a thesis on the research work on which they are engaged, but will also be required to carry out assignments of work during the year.

Students who attend full time may be given a certain amount of teaching and demonstrating work in undergraduate courses for which they will be paid up to a maximum of £400 per annum, and this may be spread over two or more years if required, while the student is engaged in research work.

DESCRIPTION OF SUBJECTS OF INSTRUCTION.

The description of subjects given below is meant to give a general idea of the type of work dealt with under the various subdivisions of the syllabuses. A full detailed syllabus for each subject is normally prepared and held by the New South Wales University of Technology and these are available for examination by any person entitled to inspect such details.

The list given below is necessarily subject to change.

PHYSICS.

Subjects 1.00 to 1.99.

1.10 PHYSICS.

Mechanics and Properties of Matter.

Units and dimensions. Kinematics. Force, work and energy. Vector addition. Moments. Equilibrium of rigid body. Hydrostatics. Bernouilli's theorem. Simple harmonic motion. Angular motion. Moment of inertia. Elasticity. Hooke's Law. Young's modulus. Volume and shear strains. Surface tension and capillarity. Law of universal gravitation.

Light and Sound.

Reflection at plane and spherical surfaces. Refraction at plane surfaces. Deviation by prism. Converging and diverging lenses. Thin lenses in contact. The eye. Simple optical instruments. Dispersion and colour. Spectra. Photometry.

Wave-motion. Velocity of sound. Pitch, loudness and quality. Stationary waves and resonance. Vibrations of strings and pipes.

Heat.

Thermometry. Expansion of solids, liquids and gases. Mechanical equivalent of heat. Specific and latent heats. Vapour pressure and relative humidity. Transference of heat.

Magnetism and Electricity.

Elementary electrostatics. Coulomb's Law. Potential capacity. Effect of dielectric. Condensers.

Molecular theory of magnetism. Deflection and oscillation magnetometers. Terrestrial magnetism.

Magnetic effect of current. Tangent galvanometer. Heating effect. Ohm's law and its applications. Resistivity. Measurement of resistance and potential difference. Faraday's laws of electrolysis. Cells and accumulators. Mechanical force on conductor in magnetic field. Elementary electro-magnetic induction.

Practical Work.

Simple experiments on the above syllabus, graphical methods.

1.11 Physics.

Light.

Huyghen's wave principle. Two dimensional wave-motion. Interference. Interference in thin films. Measurement of wave-length by interference. Applications of interferometry. Polarisation by reflection and double refraction. Production and analysis of plane, circularly and elliptically polarised light. Optical rotation. Interference of polarised light. Strain birefringence.

Heat and Thermodynamics.

Kinetic theory of gases. Pressure of ideal gas. Equipartition of energy. First law of thermodynamics. Molecular specific heats of gases and the ratio betwen them. Mayer's equation. Adiabatic changes. Experiments of Amagat and Andrews. The critical state. Joule-Thompson effect. Carnot cycle. Second law of thermodynamics. Kelvin temperature scale. Entropy. Radiant heat. Kirchhoff's and Stefan's laws. The black body radiator. Radiation pyrometry.

Viscosity.

Poiseville's Law. Stoke's Law. Measurement of viscosity.

Magnetism and Electricity.

Gauss' theorem and its applications in electrostatics. Effect of dielectric. Attracted disc and quadrant electrometers. Magnetic induction. The magnetic circuit. Hysteresis. Kirchhoff's Laws of current distribution. Ballistic galvanometer and its uses. Self and mutual inductance. Discharge of condenser through high resistance and through inductance. Time constants. Alternating currents in series R, L and C circuits. Power factor. Thermo-electricity.

Non-linear impedances. Rectifiers. The thermionic valve. Electrical discharge through gases. Photo-electric effect. The Bohr atom. Optical and X-ray spectra. Natural and artificial radio-activity. Fundamental particles.

Practical Work.

A series of experiments illustrating the theoretical syllabus.

CHEMISTRY.

Subjects 2.00 to 2.99.

2.10 Chemistry, General.

Inorganic Chemistry.—A review of fundamentals, the elements and their classification, preparation and reactions. Atoms, molecules, formulae, valency and variable valency. Oxides, acids, bases and salts, their classification, methods of preparations and general properties. Hydracids and oxyacids, action of acids on metals. Stability of oxides, bases, and salts. Gas laws and calculations. Oxidation and reduction.

Atomic structure, number, weight, and mass number. Isotopes. Periodic classification. Electronic theory of bonds, valency. Electrovalent, covalent, and co-ordinate bonds in simple compounds. Correlation with physical chemical evidence.

Detailed treatment of various groups in the periodic table. General review of the elements.

Physical Chemistry.—A review of the kinetic theory of gases, reference to liquids and solids, diffusion, etc. Solutions, colloidal solutions, osmotic pressure and other properties, vapour pressure.

Electrolytes and non-electrolytes. Ionic and covalent compounds. Strength of acids and bases. Electrolysis of acids, bases and salts.

Law of mass action. Equilibrium and dissociation constants. Indicators and pH. Hydrolysis. Buffer solutions. Le Chateliers principle. Catalysis. Common ion effect. Solubility product. Applications.

Organic Chemistry.—Characteristics of the carbon atom and general introduction to organic chemistry, qualitative and quantitative analysis of organic compounds. Molecular and graphic formulae.

Paraffin, olefine and acetylene hydrocarbons, alcohols, ethers, aldehydes, ketones, acids, amines, esters, halogen derivatives.

Oils, fats, carbohydrates. Polymerisation. Coal tar derivatives. Aromatic hydrocarbons.

2.20 Inorganic Chemistry.

A review of fundamentals, the elements and their classification, general methods of preparation and reactions. Kinetic theory of gases, liquids and solids. Gas laws and calculations. Atomic structure, number, weight and mass number. Isotopes. Quantum numbers. Periodic classification. Atomic weight and stoichiometric calculations. Electronic structure of atoms and molecules. Detailed

treatment of molecules of acids, bases, and salts. Valency. Ionic compounds. Electrolysis of fused salts and salt solutions. Covalency and properties of covalent compounds. Physical properties of ions and molecules in solution.

Oxides, acids, bases and salts. Solubilities. Oxidation and reduction. Electronic theory. Chromium and manganese and their cogeners.

Solutions, colloidal solutions and suspensions. Rate of chemical change. Chemical equilibria. Law of mass action. Equilibrium and dissociation constants. Le Chatelier's principle. Catalysis. Reactions in solution. Precipitation reactions. Common ion effect. Solubility product.

Detailed treatment of various groups in the periodic table. The co-ordinate bond. Theory of complex salts, role of water in complex salts. Co-ordination number.

Three or more lectures introducing topics of recent development in scientific fields and intended as a stimulation to the student. These lectures will be given by specialists, *e.g.*:—

Electron microscope and application to research.

Electron diffraction and contribution to knowledge of gaseous state.

Mass spectroscope and application of isotopes as tracers in research.

Laboratory work, illustrating various principles, inorganic preparations, qualitative analysis.

2.20 (*a*) and (*b*) Inorganic Chemistry.

These two subjects cover the work normally given in 2.20 and are arranged for students who take the full time day course (2.20) in two part time years. The first part, 2.20 (*a*), covers most of the work. The second part, 2.20 (*b*), goes a little further into the structure of the nucleus, atomic particles, complex molecules of acids, bases, and salts, and includes all the work on theory of complex salts and the role of water in complex salts.

2.21 Inorganic Chemistry.

More detailed work following 2.20. A systematic survey of complex salts, molecular structure and the elements of the periodic table. Typical group reactions and properties, stability with respect to valency and atomic number, stabilisation by co-ordination or complex salt formations, anomalous salts, acidity or amphoteric properties. Radioactivity including artificial disintegration.

2.22 Advanced Inorganic Industrial Chemistry.

Advanced study and investigation on modern inorganic chemistry. The wave mechanical picture of the atom, recent developments in atomic theory, including natural and artificial radioactivity and the use of tracer elements. Modern valency theory, the modern view of the covalent bond. Bond energies, bond lengths. Recent developments such as resonance and hydrogen bonding. Properties of covalent, ionic and metallic linkage. Results of modern physical methods such as x-rays, infra red spectroscopy, dipole moments, etc., elucidation of molecular structures.

The Lowry-Bronsted theory of acids and bases. Chemical reactions in non-aqueous media. Equilibria in inorganic reactions, the application of free energies and oxidation potentials.

Further treatment of the chemistry of the rarer elements of the periodic table.

Organo-metal chemistry of arsenic, antimony and other metals.

Recent developments in the stereo-chemistry of metals. Co-ordination compounds, application to analysis, specificity of organic groups for metals. Special reactions in micro-chemistry.

Specialist lecturers will be brought in for some of the above work.

2.30 Physical Chemistry.

An introduction to physical chemistry by a consideration of the kinetic theory of gases, with particular reference to probable distributions of energy and intra- and inter-molecular forces.

Nature of gaseous state; empirical gas laws; theory of ideal gases.

Deviation of real gases from ideal behaviour; deduction of their properties.

Critical conditions; corresponding states.

2.31 Physical Chemistry.

An extension of the kinetic approach to other states of matter and to rate processes, and an introduction to thermo-dynamic method through the phase rule.

Condensed States of Matter.—Classification and general properties of solids and liquids. Formation and characteristics of these states through a consideration of internal and external forces.

Phase Equilibria.—Study of solid—liquid—vapour relationships using the thermodynamic approach of the phase rule. (To be applied where relevant in the following sections.)

Solutions.—Ideal and real solutions and their general physical properties in relation to molecular characteristics.

Kinetics and Equilibria.—Order of reaction. Rate processes and their determinants. Elementary kinetic treatment of activity.

Homogeneous and heterogeneous equilibria as balanced rate processes.

2.32 Physical Chemistry.

The further development of the thermodynamic method and the application of both kinetic and thermodynamic methods to various systems.

Thermodynamics.—The laws of thermodynamics and their physical, chemical and statistical interpretations. General requirements of equilibria. Thermodynamic functions and their applications.

Electrolytes.—General physical and chemical properties, with special reference to conductance and potentials.

Surface Chemistry.—Interfacial forces and properties, and their application to rate processes.

Colloidal State.—Kinetic and thermodynamic treatment.

2.33 Physical Chemistry. (For Applied Chemistry Students.)

The application of the principles of physical chemistry to industrial practice, with emphasis on control and development.

2.34 Physical Chemistry. (For Chemical Engineering Students.)

The application of the principles of physical chemistry to industrial practice, with emphasis on production development and design.

2.35 Advanced Physical Industrial Chemistry.

This course is designed to further develop those students who elect to specialise in Physical Chemistry.

2.40 Organic Chemistry.

Characteristics of the carbon atom and a general introduction to organic chemistry, elements in organic compounds, their detection qualitatively and methods for their quantitative estimation. Molecular and graphic formulae.

Chemistry of the chief classes of organic compounds. Saturated hydrocarbons, olefine series, acetylene series, aromatic hydrocarbons, alcohols, ether, aldehydes and ketones, acids, esters, amines and amides, halogen derivatives, oils and fats.

Optical activity and stereochemistry. Carbohydrates (introduction). Polymerisation.

2.41 Organic Chemistry.

A more detailed study following on 2.40. Treatment of reactions as unit processes. A survey of organic chemical types. The hydrocarbons; halogenation; nitration and nitro-compounds; sulphonation, sulphonic acids and their derivatives; phenols and alcohols; amines, diazotisation and coupling; dyestuffs, colour and dying; azoxy-hydrazo- and nitroso-compounds; oxidation and reduction; aromatic carbonyl compounds and quinones; aromatic acids and derivatives; hetrocyclic compounds (introduction); polymerisation and high polymers; survey of types of isomerism in carbon compounds, structural and stereoisomerism; the carbohydrates; fats and oils.

2.42 Organic Chemistry.

Electronic theory of organic chemical reactions. Reactions of organic compounds. Terpenes—aliphatic, mono and dicyclic. Heterocyclic compounds. Carbohydrates. Higher molecular compounds and polymerisation.

2.43 Organic Industrial Chemistry.

Advanced industrial organic chemistry, covering special processes and uses of organic compounds in industry. Students will be allocated assignments for reading and study.

2.44 Commercial Organic Analysis.

A course providing detailed theoretical background to the subjects mentioned below.

Practical work illustrating instrumentation analysis and some attention to colorimetric and micro-analytical procedures. Subjects for practical work will be drawn from:—

Fixed oils, volatile oils and their constituents.

Soaps, detergents and surface active agents, disinfectants and antiseptics, drugs and galemicals; plastics and plasticisers; application of organic reagents to inorganic and organic analysis; industrial poisons, hazards, etc., enzymes, vitamins and hormones.

2.50 Quantitative Analysis.

Laboratory rules. Instruction in the use and maintenance of apparatus. The balance, its care and use. Calibration of weights. Record of results. Notes on sampling and its technique. Solution of sample. The technique of gravimetric analysis. Theoretical considerations in quantitative analysis, the concept of solubility product, mechanism of precipitate formation with discussion of super-saturation, co-precipitation, post-precipitation and adsorption.

Washing of precipitate and peptisation. Volumetric analysis. Calibration of apparatus—methods of use. Reference to Australian Standards publications. Acidimetry and alkalinity. Hydrogen ion activity and its measurement. Dissociation constants of weak acids and bases and simple calculations of pH values in such solutions. Use and range of indicators for various types of acid-base titrations. Titration curves and buffer action. Oxidation and reduction from electronic aspect—simple treatment of oxidation-reduction potentials. Importance of pH on these potentials. Redox indicators. Precipitation reactions in quantitative analysis—adsorption indicators and their limitations. Specific topics such as water analysis, fuel and gas analysis as time permits.

The theoretical treatment will be accompanied by a course of practical exercises to illustrate the important techniques in quantitative analysis and the use of the reagents discussed.

2.51 Quantitative Analysis.

Following on the general principles of procedure given in 2.50, this course surveys the field of the analytical chemistry of the individual elements and discusses current methods found in commercial practice. Methods of sampling amplified—application of statistics to results. Chemical analysis of iron and steel products, non-ferrous alloys, ores, fertilisers, water, gas and fuel.

More advanced treatment of redox potentials and the use of specific oxidation and reduction reagents and indicators. The use of organic reagents in analytical work. Instrumental analysis. The use of visible ultra-violet and infra-red spectrophotometers, absorptiometers of various kinds. Electro deposition of metals.

2.52 Advanced Chemical Analysis.

More advanced work on chemical analysis and industrial methods especially in relation to material of an unusual or difficult nature. Special topics will be selected for discussion in seminars and these assignments will be accompanied by practical work to be carried out on an investigational basis. Instrumental analysis will be treated from the standpoint of application to specific problems and will be complementary to the more theoretical discussion in Applied Physical Chemistry.

2.60 Commercial and Food Analysis.

Oils and Fats, Soap. Disinfectants. Milk and milk products. Butter. Baking chemicals, Vinegar, Essences, Coffee, Tea, Beer, Sugars, Bread and Flour, Preservative and Colours. Matters in Food and Drugs.

Interpretation of the various State Pure Food Regulations. Australian Standards Specifications.

2.90 Chemical Computations.

This course is intended to follow up the normal mathematics course given to students in Applied Chemistry and Chemical Engineering and sets out to apply the work given in mathematics to such problems as arise in Physical Chemistry and Advanced Chemical Engineering subjects. It also aims to inculcate into students the proper method of presenting results, especially those of Chemical Analysis and Physical Chemistry. It deals with a number of topics which may be classified as:—

(i) The application of algebraic equations to problems in Physical Chemistry and analysis and the solution of such equations by the Newton method.

(ii) Partial differentiation: the use of partial molar quantities in chemistry. The determination of maximum error in a quantity knowing the maximum errors in each of the contributing factors.

(iii) Measurements, observations and errors and a discussion of the statistics of measurement.

(iv) The graphical representation of experimental data.

(v) Applications of the integral calculus to problems in Chemistry.

(vi) Differential equations and their applications in Chemistry.

2.91 Chemical Microscopy and Metallography.

The microscope, its construction, care and use. Instruction in the practical applications of the microscope to industrial and commercial conditions, including starches, fibres, textiles, micro-chemical analysis and building materials.

Lectures on melting and freezing point, determinations and curves, equilibrium diagram of the iron-carbon system, eutectic points, transition points, etc., preparation, etching and examination and microphotographing of specimens. Typical binary alloys. Solid solutions. More extensive work on micro-analysis and ultra-microscopic examination and metallography.

2.92 Micro-analysis.

(*a*) *Inorganic.*—Lectures and practical in fundamental theories and principles of co-ordination and chelate compounds, adsorption complexes, etc. Applications of organic reagents to inorganic analysis.

Microscopic identification of metals.

(*b*) *Organic.*—Physico-chemical determinations of boiling point, density, molecular weight, etc.

Analysis of organic compounds—determination of the elements C and H, N (Dumas and Kjeldahl), S, P, As and halogens, etc.; carboxyl, methoxyl and acetyl.

Semi-microtechniques in preparation and purification—nitrator, sulphonation, oxidation and reduction. Organic reagents in organic analysis.

Chromatography.

CHEMICAL ENGINEERING.

Subjects 3.00 to 3.99.

3.10 Industrial Chemistry.

Inorganic.—This subject aims to treat the most important aspects of heavy industrial chemistry from the point of view of process, modern and possible future developments and their effect on Australian conditions. The industries treated will include:—Acid-Sulphuric, Hydrochloric, nitric; Fertilizers; Alkali-Salt, soda ash, caustic soda, chlorine; Stoichiometry-dissolution problems chiefly; Ceramic—Cement, refractories, glass; Electrochemical—calcium carbide, calcium cyanide, silicon carbide, alundum, aluminium and magnesium.

Organic.—Organic Industrial Chemistry is treated from the Unit Process viewpoint excepting certain industries, which are preferably based on Unit operations, e.g., Petroleum, paper, etc.

Unit processes which may be discussed are set out as follows, and the industries which are suggsted as examples are placed in brackets after the appropriate process.

Nitration (Nitrobenzene, T.N.T.), Sulphonation (benzene sulphonic acid), Hydrogenation (methanol, Fischer-Tropsch, edible oils, hydrogenation of coal, petroleum), Halogenation (Chlorobenzene, chloral), Hydrolysis (soap phenol), Esterification (acetate and viscose rayon, alkyd resins), Oxidation (acetaldehyde, phthalic anhydride), alkylation (synthetic motor fuels, tertiary alkyl phenols), Polymerisation (thermosetting and thermoplastic resins, synthetic elastomers), Pyrolysis (wood, coal, shale, oil), Fermentation (beer, butanol, acetone).

Practical work comprises the pilot scale preparation of compounds to illustrate the above chemical processes.

Factory inspection trips will be organised to selected industries to supplement and illustrate the work given in lectures.

3.11 Unit Operations and Equipment.

The aim of this subject is to treat representative pieces of equipment used for carrying out selected operations in Industrial Processes. Linked with 3.10 it enables a student to dissect any manufacturing

procedure into the fundamental processes and operations and thereby obtain a ready and complete understanding of the manufacture.

Subjects studied will include:—Crushing, grinding and distintegration. Screening and grading. Conveyors and elevators. Filtration. Thickness and centrifugals. Driers. Crystallisers. Evaporators. Propulsion and cleaning of gases. Vacuum producing devices. Pumps and blow cases. Factory inspection trips are arranged during the course.

3.20 Fuel Economy.

Descriptive survey of solid, liquid and gaseous fuels. Combustion theory and calculations. Fluid flow, fluids and gases. Heat transfer. Industrial and metallurgical furnaces. Steam boilers and steam generation. Combustion calculations involving stoichometry. Heat transfer calculations. Practical tests on furnace or heat exchanger.

3.30 Chemical Engineering Design.

Review of basic requirements—flow-sheets, design procedure, elementary stress analysis, and pressure vessels.

From chemical engineering viewpoint, power transmission, stirrers, glands, piping, pump linings, conveyors.

Distillation equipment.

Heat exchangers.

3.31 Chemical Engineering Design.

Design of further chemical equipment, *e.g.*, absorption towers, flowmeter.

Plant characteristics and automatic control. Corrosion.

Plant cost.

The plant designed is chosen to illustrate as far as possible basic principles.

The student will be assessed on the design of a typical chemical plant.

3.40 Chemical Engineering.

The purpose of this subject is to integrate and apply the scientific and engineering principles treated previously in the course to the problems of development, management and economics in the chemical industries.

The treatment may include the following:—

1. Unit Operations—diffusional operations such as drying, evaporation, humidity and air conditioning, distillation, gas absorption.

2. Factory Location—considering such points as land, raw materials, power, labour pool, markets, long range developments, and specialty factors of plants and localities.
3. Factory Organisation—Duties and obligations of Manager and Production Executive—liaison between branches, staff relationships, comfort, welfare, awards—Department of Labour and Industry regulations, Safety control.
4. Chemical Plant Layout and Construction—Layout of plant using line drawings, cardboard cut-out silhouettes and solid models.

   Construction of buildings, types suitable for selected industries and localities—installation of services, lighting, ventilation, internal transport, change rooms, etc.
5. Economics—types of companies, methods of formation, study of selected investments on the Stock Exchange. The effect of Australian Legislation on the present existence and future development of companies—the effect of Empire and Foreign trade on local industry—in general, factors which will influence the trend of development of Australian Industry.
6. Seminars on selected subjects to be delivered by students to develop and encourage confidence in presenting their views on industrial problems before their seniors.

The practical work associated with this subject will aim to illustrate the lectures given, *e.g.*, in Unit Operations, and will include, as well, a lengthy investigation on some industrial processes preferably with a research character.

3.90 Engineering Chemistry.

For Engineering students who have completed first year chemistry. A general description of the applications of chemistry to engineering.

Corrosion, electrochemical theory, stray current, corrosion and its prevention. Hydrogen evolution and oxygen absorption types. Heated metal surfaces and metals in neutral solutions. Differential aeration effect, pitting, pickling of steel, rust protection, paint, lacquer, corrosion resisting surfaces, etc. Corrosion resisting alloys, stainless steels, monel metal, etc.

Refractory materials, properties, acids, neutral and basic types. Insulating bricks.

Paints and varnishes, components. Paints for special purposes, acid proof, heat resisting, rubber base paints, cement and concrete paint, marine paint.

Fuels, ignition temperatures, flash point, spontaneous combustion. Calorific value and its measurement. Types, solid, liquid, gaseous. Charcoal, coal, coke, powdered coal. Petroleum, and its products.

Shale oil and tar products. Alcohol. Natural gas, coal and coke oven gas, water and carburetted water gas, producer gas and blast furnace gas. Gas works and coke oven practice. Method of controlling quality.

Lubricating oils, laws of solid, fluid and boundary friction, wedge theory of oil film. Mineral, vegetable and animal oils. Semi-fluid lubricants, greases. Solid lubricants, graphite, talc, white lead. Properties of lubricants, specific gravity, flash and fire points, viscosity. Spheres of application.

Building and insulating materials. Limes, cements, ceramics, rubber, compressed fibres, plastics, bitumen, oils for insulation.

METALLURGY.

Subjects 4.00 to 4.99.

4.10 Metallography and Heat Treatment.

Introduction to metallography methods, macro and micro examination, selection, cutting and preparation of specimens, other methods of testing. Photomicroscopy.

Ferrous Metallography.—Metallography of steel, the iron carbon diagram, lattice structure and phase. Heat treatment of steel, annealing, normalising, spheroidising, hardening and tempering, "S" curves. Alloy steels, effects of alloying elements, low alloy steels, plain and complex, special steels. Cast irons, plain carbon, effect of carbon content, silicon content, alloy cast irons. Surface hardening of steel, carburising, nitriding.

Non-Ferrous Metallography.—Alloys of copper, brasses, bronzes, other alloys. Alloys of aluminium and magnesium. Alloys of zinc, tin and lead. Bearing metals. Powder metallurgy, pressing and sintering, porous bearings, refractory metals, production of metal powder.

Practical Work.—Polishing, etching, and micro-examination of typical samples of plain carbon steel. Heat treatment of plain carbon steel and examination of samples. Polishing, etching and micro-examination of specimens of non-ferrous alloys.

4.11 General Metallurgy.

This subject sets out to provide students in Applied Chemistry with some knowledge of fuels, furnaces, refractories and pyrometry which will be of use in their studies of Industrial Chemistry.

Fuels.—Types—classification—particular applications of each type—examples of solid, liquid and gaseous installations. Examples of combustion.

Calculations (*vide* Lewis and Radasch: Industrial Stoichiometry. Hougen and Watson: Industrial Chemical Calculations).

Furnaces.—Classification—principles of operation and construction —examples to include reverberatory, open hearth, electric steel furnaces, glass furnaces, kilns, roasting furnaces.

Pyrometry.—Types available to industry—description, operation and use of Thermo-electric, optical and radiation pyrometers.

Refractories.—Classification, composition and properties of principal types—application to industrial furnaces.

4.90 Engineering Metallurgy.

For engineering students who do not expect to practice Metallurgy as a profession. Comparison of atomic structures, ionic, covalent and metal structures. General structural properties of metals, grain size and control. Plastic deformation, slip planes, coldwork and work hardening, hot work, internal stresses and their removal. Physical metallurgy, types of equilibrium diagrams for the main types of binary alloys. Non-ferrous metals, copper and its alloys. Tin, lead, antimony and white metals; zinc, nickel, chromium, manganese tungsten, cobalt, vanadium, molybdenum. The manufacture of ferrous metals, iron ores, products of the steel and iron industry. The blast furnace, pig iron, foundry cupolas. Steel by open hearth, Bessemer and electric furnace methods. Wrought iron and tool steel.

The physical metallurgy of iron and steel. The iron-carbon equilibrium diagram. Structure and physical properties of carbon steel. Heat treatment of iron and steel, quenching, tempering, annealing, normalising, case hardening and other methods of hardening. Cast iron.

Alloy steels, chief alloying elements, manganese steels, chromium, nickel and chrome, vanadium or chrome molybdenum types. High speed tool steels, silicon steels, stainless steels.

Metallographic preparation of specimens, etching reagents, use of microscope.

4.91 Fire Assaying.

Lectures covering appliances, sampling, fluxes, cupellation, losses, slag, parting, etc. Discussions of the practical methods and topics, such as methods of fire assaying, apparatus and equipment, chemicals used in assaying, preparation and properties of assay alloys of lead. Setting, lighting and care of furnace fires. Silicates, fusion of silica. Determination of silver content with litharge and red lead. Fluxing applied to auriferous quartz, semi-silicous and basic ores. Oxidising and reducing ores, sampling and mixing, detection of impurities. Assay of ores and methods of coping with impurities. Scorification assay of ores. Assay of metallurgical products. Bullion assays. Preparation of assay silver. Gold and silver in cyanide solutions. Making bone ash and other cupels. Assay of Telluride ores and platinum metals in ores. Tin in tin ores and concentrates, also gold and silver if present.

MECHANICAL ENGINEERING.

Subjects 5.00 to 5.99.

5.10 Descriptive Geometry.

Fundamental concepts of descriptive geometry, including reference systems, representation of point, line and plane; fundamental problems of position, of perpendicularity and of measurement. Construction of curves from plane geometry. Various surfaces and solids, their sections, developments and intersections in solid geometry. Application of descriptive geometry to certain problems arising in engineering practice. Especial emphasis on ability to visualise problems and processes involved in their solution.

5.11 Engineering Drawing and Materials.

Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning. Orthographic, isometric and dimetric projections. Lectures on engineering materials and practice, properties and uses of the common engineering materials. In the drawing office the student will be required to do a reproduction on white paper to a scale of full size and to a reduced scale in orthographic projection of a machine part or simple assembly given to the student in isometric projection, and to do a tracing of this in ink on tracing paper. He will also be required to make dimensional freehand drawings of five of the machine parts enumerated below and to make accurate detail drawings and/or assembly drawings from the freehand sketches as a basis.

Machine parts and elements:—

Valves (stop, check, safety, gate).

Cocks (water, gauge, glass assembly, etc.).

Bearings (plummer block, oil ring, ball bearing, etc.).

Couplings (rigid, flexible, Oldham, Universal Joint).

Clutches (cone, disc, dog).

Pumps (gear type, semi-rotary, small piston pump).

Pistons (I.C. piston and piston rod assembly).

5.12 Mechanical Drawing and Design.

Design procedures, loadings and factors of safety standards. Stresses in bolts. Design examples involving simple stresses. Design of shafts and bearings, belt drives and pulleys (leather, V pivot drives), friction clutch, springs (safety valve, etc.) and screws (valve or similar).

Design work associated with the above will be carried out in the drawing office.

5.13 Engineering Design.

Design of gears (spur, bevel, worm) and load lifting appliances.

Design in the drawing office of a complete crane trolley. Students will work in groups of two or three.

5.14 Engineering Design.

Design of machine elements with due consideration to acceleration effects. Design of reciprocating mechanisms.

Students will work in groups of two or three in the drawing office on one of the following assignments:—

Air Compressor.
Internal Combustion Engine.
Steam Engine.

5.15 Engineering Drawing and Materials.

Special course for students in Applied Chemistry and Chemical Engineering, including 5.11 plus work on flow sheets.

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

Measurement and dimensioning. Flow sheets, British standard symbols, lettered blocks, examples from process description. Rudiments of freehand perspective, simple sketches of apparatus and familiar objects. Mechanical drawing, standard sheets, scales, projections of simple solids in elevation, plan, end elevation. Sections and cross hatching, progressive examples in drawing, details, assemblies and arrangements.

Lectures on engineering materials and practice, properties and uses of the common engineering materials, relative costs. Heat treatment. Screw threads, bolted joints, riveted joints, welded joints, keys, cotters and shaft couplings, bearings, power transmission via belts, chains and gears. Pumping systems and other pipe systems.

5.20 Mechanical Engineering.

(A.) Kinematics of Machines.

Quadric cycle chain and inversions.

Translational and Rotational Motion.

Work, Power and Energy.

Precession.

Instantaneous Motion of a Body.

Determination of Velocities of Points on Mechanisms by means of instantaneous centres.

Vector velocity diagrams for mechanisms.

Determination of accelerations of points on mechanisms—Vector acceleration diagrams.

Determination of Piston Velocity and Acceleration—Graphical and Analytical methods.

Relationship between piston effort, crank effort and turning moment diagrams.

Cams and cam followers for various types of motion.

Construction of cam profiles.

(B.) An elementary course in the study of heat engines based mainly on descriptive matter with an initiation into the mathematical treatment. Units and definitions. The working fluid and its properties. Steam Boilers. Furnaces, Fans, and Grates. The Reciprocating steam engine. Indicators and Brakes. Valves, Valve motions and Gears. The steam cycle in the Reciprocating engine. Actual and ideal cycles. The Condensing Plant.

Elementary Thermodynamics of Gases. Combustion of Fuels. Ideal cycles and Ideal Efficiences for Internal Combustion Engines. Actual cycles and actual thermal efficiencies of Internal Combustion Engines. Charging and Exhausting the Cylinder. Ignition of the Charge. Cooling systems and Starting.

Performance Characteristics and Testing of Heat Engine Plant covering both steam and Internal Combustion Engines.

5.21 Mechanical Engineering.

(A.) More advanced work on velocity and acceleration diagrams following on 5.20. Applications to various mechanisms. Coriolis component. Determination of piston velocity and acceleration in steam and internal combustion engines. Determination of crank effort and turning moment from indicator diagrams. Design of flywheel.

Toothed gearing, profiles of teeth, velocity ratio.

Gear wheel trains, simple, compound, and epicyclic—solution of problems.

Balancing of engines, rotating and reciprocating masses, multi-cylinder engines. Governors, stability, controlling force.

Vibrations of systems, free and forced motion, with damping, nature of damping and internal friction. Vibration isolation, torsional vibration, vibration dampers.

(B.) More detailed mathematical treatment of the design consideration associated with 5.20. Changes of heat and work in various types of expansion and compression. Application to the various theoretical cycles for steam and internal combustion engines. Reversible operations and cycles, regenerative cycles.

Heat transfer by conduction, convection, and radiation, practical considerations.

Steam engines, Rankine cycle, temperature-entropy diagrams, Mollier diagrams, indicator diagrams and actual behaviour of steam in cylinder.

Air compressors, Internal combustion engines, actual cycles, relative methods of injection, standard cycles, air standard efficiency, effect of compression ratio.

Nozzles, injectors, steam and gas turbines. Performance of steam turbines.

Refrigerators, various working substances, performance.

5.22 Mechanical Engineering Practice.

Discussion and design of mechanical systems involving applications of hydraulic, pneumatic, and electronic equipment. Consideration of simple closed cycle control systems, control problems in temperature, pressure, flow, speed and position.

5.23 Mechanical Engineering.

Special course for students in Chemical Engineering. Study of the fundamental laws and concepts of engineering thermodynamics, physical properties of gases, saturated and superheated vapours. Steam boilers and production of steam. Steam engines, internal combustion engines, air compressors, theoretical and actual cycles. Mechanical refrigeration. Fuels, refrigerants and performance of engines.

5.30 Steam Engineering.

Modern power plants, including a study of the design and installation of high pressure boiler, economizers, air preheaters, modern fuel burning furnaces and automatic combustion controls. Study of the various steam cycles and types of auxiliary drive to show their effect on station heat balance. Discussion of de-aerators, evaporators, condensers, heating, etc., including turbine and machinery foundations and layouts. Special characteristics associated with the driving of electrical generators.

5.31 Internal Combustion and Hot Air Engines.

Discussion of combustion, friction, cooling, carburetion, and other factors affecting power, efficiency, and general performance. Selection of the most suitable type of engine for various specific applications. Fuels, lubricants, ignition and supercharging. Use of instruments, with special emphasis on precision measurements. Engine design, engine dynamics, stresses, materials. Laws of similitude, properties of engine materials, design of important elements. Aircraft engines, automotive and diesel. Valve gear, superchargers and auxiliary equipment. Balancing and vibration problems.

5.32 Refrigeration, Air Conditioning and Ventilation.

Operation of various types of compressors, evaporators, condensers, and automatic controls used in commercial refrigeration systems. Heat flow problems in condensers and evaporators. Physical properties of low temperature insulants. Heat transfer through typical walls of cold storage plants. Moisture and temperature conditions necessary for the preservation of important foods. Study of the thermal, physical and toxic properties of the chief refrigerants. Ice freezing, frost formation, calculation of size of cooling towers, application of refrigeration to skating rinks, shaft sinking, breweries, petroleum and the manufacture of ice cream. Application of low-level refrigeration to the purification of industrial gases such as oxygen, nitrogen, hydrogen, methane, etc.

Study and calculation of load, direct and indirect heating systems, heating boilers and water heaters, ventilation and the fundamentals of air conditioning. Thermal balance in the human body in relation to the thermal balance in a surrounding building enclosure. Thermal relationships of the building to climate and weather. Insulation of the building to provide a suitable enclosure. Techniques of heating, heat generation and their control. Fundamental problems and techniques of cooling for comfort. Typical air conditioning equipment and controls with their application to various types of problems.

5.33 Industrial Heating.

The scientific principles underlying the various phases of furnace design and operation and the application of these principles to achieve operating improvement. Heating capacity of furnaces, economy and thermal efficiency. Strength and durability of furnaces. Combustion devices and heating elements. Control of furnace temperature. Control of furnace atmosphere. Critical comparison of fuels and of furnace types.

5.50 Fluid Mechanics.

Properties of fluids, fluid statics, manometry. Accelerated liquids in relative equilibrium, fluid dynamics, types of flow, equations of continuity and motion, energy and momentum balance, effects of viscosity, streamline and turbulent flow. Orifices and weirs. Measurement of discharge in closed conduits, quantity meters, rate of flow meters. Dimensional analysis. Dynamical similarity. Resistance of immersed and floating bodies. Flow of liquid in pipes. Syphons and nozzles.

5.51 Hydraulic Machines.

Unsteady flow of liquids in closed conduits. Impact of jets on stationary and moving vanes. Rotary motion of fluids. Pumping machinery, positive pumps, reciprocating pumps, inertia pressures in delivery and suction pipes, methods of mitigating inertia pressure.

Positive rotary pumps. Water operated lifting devices, hydraulic ram, jet pumps, air lift pump, centrifugal pumps, construction, theoretical characteristics, dynamic similarity relations, relations between specific speed, maximum efficiency and impeller type. Influence of nature of liquid on pump performance, limits of suction lift, priming devices.

General description of turbine, types, impulse, reaction; inward, radial, axial and mixed flow, operating heads.

5.52 Hydraulic Machines.

Indicating, recording and integrating instruments for flow measuring and control installations. Corrections to the Euler Theory of centrifugal pumps. The relative eddy theory. Hydraulic prime movers, turbines, types and general theory of turbine design, performance, characteristics, cavitation. Fluid couplings, fluid torque converters. Dynamic lift and propulsion. Dynamics of compressible flow. Flow of compressible viscous fluids in pipes. Axial flow pumps and fans. Blade element theory. Momentum theory. Modern boundary layer theory.

5.90 Workshop Processes and Practice.

Introduction to basic features associated with common production processes, viz.:—

Foundry—Patterns, sand and die casting, cores, limiting thickness, change of section.

Forging—Hammer and die forging, fire welding, limitations.

Welding and Riveting—Brazing, soldering, welding by oxy and electric methods, cutting, rivets and riveting.

Machine Shop Processes—Centre lathe, capstan and turrets, miller, grinder, lapping and super finish, shaper, planer, slotter, drill, hand tools.

Press and Sheet Metal Work—Shears, dies, presses.

Heat Treatment—Furnaces, controls, quenching, tempering.

Protection—Plating, spraying, painting, enamelling.

Practical—Demonstrations and practice in shops of University.

5.91 Engineering Processes.

Further instruction *re* basic features associated with common products and processes as follows:—

Mechanical aids in Foundry—conditioners and moulding machines.

Fabrication by welding, fabrication as substitute for casting and forging.

Pressed, extruded and rolled materials.

Plastic processes—moulding and machining.

Special tools and machines—automatics, multi-spindle, multi-tool gear generators, form cutting, etc.

Metrology—measurement, standards, gauges, tolerances, inspection dimensioning of drawings for production.

Practical—Demonstrations and practice in shops of University and industrial works.

5.92 Production Design.

Analysis of design for ease in production and inspection, dimensional analysis, limits and fits, preferred sizes, standardisation.

Principles of interchangeable manufacture and its relation to design.

5.93 Workshop Processes and Practice.

Special course for students in Applied Chemistry and Chemical Engineering.

Correct use of hand hack saw, files, spanners. Threading with dies and tapping of threads. Packing of glands of different types, *e.g.*, pump glands or steam gauge. Pipe alignment, packing of flanges. Drills, angles, etc., drilling, speed relation to drill diameter and speeds for different materials. Lathe work, use of independent 4 jaw chuck and universal chuck. Setting up a job in independent chuck. Plain turning in chuck and between centres. Facing. Cutting thread in lathe, tape turning. Demonstration of use of shape, plane, milling machine, face plate and angle plate, grinder.

Various jobs will be given to students as exercises in the workshops throughout the course.

ELECTRICAL ENGINEERING.

Subjects 6.00 to 6.99.

6.10 Electric Circuit Theory.

Introduction: Circuit and field problems, basic circuit parameters, units, electric conduction. Ohm's law, resistance, effect of temperature, non-linear resistances.

Electromotive Force: Sources of e.m.f. Generation of alternating and direct voltages.

D.C. Networks: Series and parallel resistances. Delta-star conversions, node and mesh equations, circuit theorems.

Magnetic Circuits: Analogy between magnetic and electric circuits. Computations, magnetic force, magnetic hysteresis, permanent magnets.

Circuit Parameters in Circuits: Inductance, mutual inductance, capacitance and resistance in d.c. and a.c. circuits. Transient and steady state solutions.

A.C. Concepts: Sine wave theory, vector representation, complex algebra.

R.L.C. Circuits in the Steady State: Circuit theorems, resonance, coupled circuits, air core transformers, equivalent circuits.

Harmonics: Production of harmonics. Solution of circuits for non-sinusoidal voltages and currents.

6.11 Electric Circuit Theory.

Harmonics and harmonic analysis.

Polyphase circuits, balanced and unbalanced, symmetrical component treatment.

Passive networks, network analysis, two and four terminal networks, electric wave filters.

Networks with active elements, analysis of circuits with vacuum tubes.

Transients in electric circuits and networks, Laplace transformer treatment.

Non-electric and mixed networks, electromechanically coupled systems.

Feedback in amplifiers, automatic control and servomechanisms.

Quasi-Stationary field problems, potential problems, field plotting, relaxation methods, computation of circuit parameters, skin effect, proximity effects, heat dissipation.

Materials used in Electrical Engineering, conductors, semiconductors, dielectrics and insulating materials.

Non-linear circuit elements, vacuum tubes, rectifiers, thermistors.

Electric transmission lines treated from both the power and the communication aspect. Overhead and underground lines. Reflection, loading, artificial lines, concentric lines, transients.

Maxwell's equations, propagation of waves along transmission lines, wave guides and in vacuo.

Magnetic circuits and forces between currents and magnetic fields.

6.20 Electric Power Engineering.

Magnetization of iron, magnetic circuits in transformers and machines. Transformers, construction, operation, theory, design, polyphase, instrument transformers. D.C. and A.C. machine construction. Machine windings. Generated e.m.f., rotating m.m.fs. in polyphase machines. Synchronous generators and motors. Induction motors, single phase motors. D.C. generators and motors, operation, applications, starting and control. Rotary converters. Transmission, overhead and underground, voltage regulation, power limits, stability, protection. Distribution, wiring rules, power factor correction. Circuit breaking devices, arc extinction. Basic devices and relay

applications in protection. Meters, indicating, recording and integrating. Illumination, light sources, visibility, requirements for effective illumination.

6.21 Electric Power Utilization.

A.C. and D.C. Motors, characteristic curves, effect of design, control, selection, applications. Industrial distribution systems. Industrial heating. Illumination. Industrial Control. More detailed study of work given in 6.20 with particular attention to the latest developments.

6.22 Power Generation and Transmission.

Alternators, circle diagrams, regulation and regulators, short circuit conditions, reactances, ventilation. Transformers, magnetizing current, harmonics, leakage reactance, parallel operation, design, insulation. Transmission, reactance and capacitance, solution of long lines, voltage control, power transmitted and limits, stability. Symmetrical components, applications to transformers, transmission lines, protection. Protection methods, overload, overvoltage. Circuit breakers, arc extinction. More detailed study following on 6.20.

6.30 Electronics and High Frequency.

(*a*) Electron Ballistics: charged particles and their motion in electrostatic and magnetic fields.

Electron Emission from Metals: thermionic emission, photoelectric emission, secondary emission.

Electrical conduction through Vacuum, Gases and Vapours: space charge limitations, occurrence of gas in electronic devices, gaseous discharge, Townsend discharge, breakdown, glow discharge, arc discharge.

High Vacuum Electron Tubes: characteristics, rating and control in high vacuum diodes and triodes, tetrodes, pentodes, beam power tubes and other multi-electrode tubes.

Gas Tubes: effect of gas in thermionic diodes, mercury arc rectifiers, ignitrons; effect of gas in thermionic triodes, thyratrons.

(*b*) Single and polyphase Rectifier Circuits: rectifier theory, smoothing and filter circuits, transformers for polyphase rectifiers, standard polyphase rectifier circuits, backfires, voltage control.

Vacuum Tubes as Class A amplifiers: considerations of voltage gain, input admittance, waveform distortion, power output and efficiency; coupled amplifiers with various types of coupling.

Amplifiers of the Class AB, Class B and Class C Type: design and operation.

Vacuum Tube Oscillators: types of oscillators and conditions for oscillation.

Modulation and Detection: the modulation process and types of modulation, radio communication.

6.31 Industrial Electronics.

Principles of electronic control. Applications to electronic control in industry. Industrial electronic heating. Rectification. Inversion. Fluorescent light sources. Industrial X-rays. Electronic servomechanisms. Carrier current communication. Telemetering. Dust precipitation.

6.32 High Frequency Engineering.

Propagation of Radio Waves: The ground wave, the space wave, the ionospheric and reflection of radio waves, propagation characteristics of radio waves of different frequencies, solar activity and meteorological conditions, noise and static.

Antennas: Radiation and directional characteristics, effect of ground, arrays, radiation resistance, directivity and gain, practical transmitting antennas, receiving antennas, special antennas.

Radio Transmitters, Receivers and Communication Systems: amplitude and frequency modulated systems, radio telephone and telegraph transmitters, broadcast and other receivers, pulse communication systems, radio relay systems.

Radio Aids to Navigation and Radar: Radar transmitting and receiving systems, radar beacons, pulse navigation systems (Loran, Gee, etc.), radio altimeters, radio ranges, airplane landing systems, radio direction finding.

Television: Television system operation, camera tubes, scanning, synchronization, blanking, frequency band and resolution, transmitters, receivers, colour television.

Sound and Sound Equipment: Characteristics of the ear, elements of acoustics, speakers, microphones, recording, distortion, sound systems and high fidelity reproduction.

6.33 High Frequency Design.

Principles of design and drawing office work associated with jobs such as—

Multimeters, public address installations, signal generators, oscillographs, small communication transmitters and receivers, special amplifiers, vacuum tube voltmeters, oscillograph time base circuits, etc.

6.34 Line Communications.

More advanced work on circuit theory following 6.11, specially applied to line communication work. Telegraph systems, manual operation, machine operation, elements of equipment and characteristics.

Carrier telegraphy, line and equipment operation. Picture transmission. Long lines and cables.

Telephone systems, general principles and electrical design of common components, circuit design, switching systems and exchanges, carrier systems. Distortion, interference, cross talk, power line interference, protection, amplifiers and repeaters.

6.35 Ultra High Frequency Applications.

Frequency modulation systems of transmission and reception. Television systems, principles, theory and practice. Navigational aids for ships and aviation, radio and radar systems, direction finding.

6.36 Telephone and Telegraph Systems.

More advanced work on 6.34 for students wishing to specialise in this field. Functions of and construction details of equipment commonly used in exchange systems, including P.A.B.X. and R.A.X. systems. Exchange system planning, including line surveys and network layout. Traffic studies and exchange trunking. Exchange building and equipment layout and cabling. Testing and routining devices and procedures; fault clearance.

6.37 Measurements (High Frequency).

Measuring techniques at high frequencies of current, voltage, frequency, impedance, radiation, aerial characteristics. Effect of frequency on measurement, high frequency, ultra high frequency, microwaves.

6.40 Illumination Engineering.

Principles of illumination engineering. Review of physics of light and colour. Visibility and illumination. Light sources, point sources with symmetrical and asymmetrical distributions, surface sources. Calculations and applications. Photochemical theory of vision, data on the visual thresholds and application to lighting design. Design of lighting systems, reflectors, glassware. Measurement and testing. Economic considerations.

6.41 Protection Engineering.

Faults in electrical systems and equipment. Behaviour of electrical systems and equipment under fault conditions. Basic principles of protective devices. Relay types. D.C. and A.C. arc extinction. Air and oil circuit breakers. Coupling protective equipment to high tension circuits. Protection of equipment. Protection of transmission lines. Calculation of fault currents.

6.42 Electrical Control.

Theory and application of electrical methods in industrial control. Study of cable circuits, relays, insulation measurements and performance, circuit analysis and grounding systems. Electronic devices for control and measurement. Phototube devices, voltage regulators, water level controls, spot welder controls. Use of impulse type control equipment. Servo mechanisms, components, synchro (magslips) and follow up links. Metadyne, amplidyne, rototrol, Ward Leonard, two-phase motors.

6.43 Application of Modern Physics to Electrical Engineering.

Atomic and Nuclear structure and fundamental particles. Radioactivity and mass-energy relations. Particle accelerators. Nature and property of X-rays. Influence of matter on X-rays and of X-rays on matter. Thermionic emission, photoelectric effect. Electron theory of matter, metals, semi-conductors and dielectrics. Production and detection of X-rays. Radiographic measurements. Industrial radiographic equipment and installations. Radiographic procedure, interpretation of radiographs. Industrial fluoroscopy. Radiography with gamma rays. X-ray diffraction and analysis. Electron diffraction and applications, the electron microscope. Dangers of X-rays and protection of personnel.

6.44 Electroacoustics.

Dynamical systems, electrical, mechanical and acoustic elements and systems of elements. Fundamental acoustic measurements. Microphones, loudspeakers. Architectural acoustics. Noise. Physiological acoustics. Supersonic developments.

6.45 Industrial Heating.

Generation of heat, heat transfer. Electric heating elements. Arc furnaces, induction furnaces. Dielectric heating methods. Heating circuit controls. Furnace drives and controls. Applications and economics.

6.50 Electrical Measurements.

Survey, study and critical analysis of commercial and precision methods (D.C. and A.C.) for measurement of electro-motive force, current, resistance, power and energy, reactive power, capacitance and inductance. Metering in general. Magnetic properties and hysteresis loss. Dielectric constant, resistivity, dielectric strength, dielectric losses, in insulating materials. Conductivity of electrolytes; *p*H measuring equipment. Electrical methods of measuring various mechanical quantities.

6.90 Electrical Engineering.

Special course for engineers not intending to follow electrical engineering as a profession. Presentation of the fundamental principles of electric and magnetic circuits and the application of these principles to the theory and performance of direct and alternating current machines.

Lighting systems and illumination, wiring code, safety precautions.

6.91 Electrical Engineering.

More advanced work following 6.90 on the operating characteristics of motors. Controller design and application, including types, methods of acceleration and retardation, protective devices. Essentials of connecting motor to load. Principles of moving fluids and solids. The application of motors, electron tubes and photo-electric cells.

6.92 Electrical Engineering in Mines.

General regulations for the use of electricity in mines, economics of generation and power supply substations. Mining switchgear, systems of supply, cables and methods of installation, electrical pumping, winding and haulage, speed control, electrical coal cutters, safety devices, signalling and lighting.

6.93 Electric Power Generation and Utilization.

Generation of electricity as it affects the prime mover, steam, hydraulic or internal combustion engine. Characteristics of electric generators and alternators, load factor, power factor, synchronisation and paralleling. Governors and flywheels. Power station layout and operation, economics of electric power generation.

6.94 Electrochemical Technology.

A general course in electricity and its applications to Chemical Engineering. Applications of electricity and magnetism to industry. Motors and their characteristics. Electrochemical processes, refining of metals, electroplating and electrotyping. Electro-thermic processes, furnaces, production of metals and other materials. Heat treatment, annealing. Electric steam generation. High frequency and electronic heating and applications. Infra red heating. Thermocouple and measurement of temperature. Electrostatic processes, precipitation, rubber and similar colloidal separation. Testing and examination devices, electrical and magnetic methods, X-ray equipment, the photo-electric cell and their applications to measurement and protection. Illumination of works, incandescent and gaseous discharge lamps, layout of illumination systems.

MINING ENGINEERING.

Subjects 7.00 to 7.99.

7.10 MINING.

(Mine Atmospheres. Dust in Mines. Mining Hygiene. Mine Lighting.)

Mine Atmospheres.

Atmospheric conditions in mines. Sources of pollution of mine air; mine gases; properties and physiological effect of various gases; sampling of mine air; air analysis; detection of gases, gas detectors.

Temperature and humidity; their causes; geothermic gradient; physiological effect of temperature and humidity; kata thermometer; effective temperature; conditioning of mine air; hot and deep mines. Environmental Surveys.

Mining Hygiene.

Miners' Diseases; silicosis; pneumoconiosis; nystagmus; sporotrichosis; ankylostomiasis; dermatitis.

Compensation and treatment; dust measurement; dust measuring instruments. Dust prevention:—Boring; cutting; loading; travelling roads; ore bins and shoots; screens. Air cleaning. Dust extraction. Dust suppression.

Mine Lighting.

Brief historical development of safety lamp; principle and construction of wire gauze. Conditions to be fulfilled in efficient safety lamp; types of flame safety lamps; electric hand lamps and cap lamps; M.L. lamps; mains lighting; discharge lighting; aids to illumination.

Lamp fuels; tests on lamp fuels; illuminating power; design and equipment of lamp rooms; safety lamp tests.

Gas detection. Flame safety lamps; special methane detectors.

7.11 MINING.

(Shaft Sinking. Explosives and Blasting. Mine Ventilation.)

Shaft Sinking.

Types of mineral deposits; prospecting, methods of boring; shothole drilling; breaking ground, types of drilling machines.

Shaft sinking. Preliminary considerations; selection of site; determination of number and size of shafts; ordinary methods of sinking and lining shafts; appliances and accessories required.

Ventilation and lighting of shafts; dealing with water from shafts.

Shaft sinking in difficult conditions; special methods of sinking; enlarging, repairing and deepening shafts. Large diameter boreholes.

Explosives and Shotfiring.

Action of explosives; types of explosives; composition and classification of explosives. Permitted explosives; tests of explosives; choice of explosives; sheathed explosives; storage of explosives.

Detonators; charging and firing shots; gases due to shotfiring; multiple shotfiring. Exploders. Arrangement of shotholes. Substitutes for explosives.

Mine Ventilation.

Quantity of air required for ventilation; measurement of quantity and pressure of air; resistance to flow of air.

Ventilation Laws; their evolution and application; equivalent orifice; motive column; evase chimney; air distribution in mines; splitting air currents; regulators. Methods of producing ventilation; brief historical review; natural ventilation; description and characteristics of centrifugal and axial flow fans. Main and auxiliary ventilation; ventilation surveys.

Laboratory.

Fan testing. Ventilation plans. Dust measurement. Gas detectors.

7.12 Mining.

(*Winding, haulage and pumping. Power transmission.*)

Winding haulage and power transmission. Ropes, chains, capels and detaching hooks; headframes, cages, guides and keps; decking arrangements; winding engines; drums; brakes; reversing; overwinding and slow banking gear. Koepe system; other systems; steam winders; valves and valve gear; indicator diagrams. Electric winding engines; control gear; characteristic curves; load balancing. Signalling systems. Skip winding.

Rails; tracks; skips; skip lubrication; ropes; horse haulage; various types of rope haulage; locomotive haulage; signalling systems; safety devices; haulage calculations.

Transmission of power; comparison of forms of power. Air compression; types of air compressors, receivers; transmission lines; pressure drop in lines; meters; air consumption of various types of motors; cost of compressed air.

Transmission and distribution of electricity; transmission loss; transformation; efficiency of transmission; design of transmission lines; cables for mining use; switchgear, installation of shaft cables and inbye cables; earthing; leakage detection and protective devices; methods of mechanical transmission of power.

Pumping.

Adit levels; direct acting and reciprocating pumps; multi-throw pumps; centrifugal and turbine pumps; megator and other recent types of pumps. Sumps and standages; drainage of flooded workings.

Surface organisation and equipment and colliery costs. General surface arrangements; location of plant; workshops and surface buildings. Colliery organisation and management; control of labour; duties and functions of officials; reports; returns and notices; labour and output; materials and stores; systems of payment. Time keeping; measurement of work; analysis of costs; estimates; overheads.

Company organisation and company law; economics of New South Wales coalfields. Trades Unions and Associations.

*7.20 Coal Mining.

(Methods of working. Ignitions of gas and coal dust. Spontaneous combustion. Mine Rescue.)

Methods of Working.

Subsidence; angle of draw for horizontal and inclined seams; prevention of surface damage; size of shaft pillar. Brief description of longwall and bord and pillar methods. Factors influencing choice of method of working.

Advancing longwall, retreating longwall; "Barry" system; panel longwall. Methods of working thin seams; thick seams; inclined seams; contiguous seams; Opencut working. Mechanical coalcutting; conveying; loading; power loading; layouts suitable for power loading.

Support of main roadways and subsidiary roadways; support of roof at coal face. Stowing. Roof control; crush and creep; hand stowing; pneumatic stowing; hydraulic stowing; mechanical stowing; caving; withdrawal of supports.

Spontaneous Combustion. Oxidation of coal; historical review of theories of cause of spontaneous combustion; factors influencing self-heating; observation and organisation in seams liable to spontaneous combustion; detection of incipient heatings.

Methods of dealing with heatings and gob fires; removal of fires; construction of seals.

Layout of workings in seams liable to spontaneous combustion. Re-opening of sealed off areas.

Other causes of underground fires; precautions and methods of dealing with fires.

Explosions, inundations, rescue and recovery work. Ignition of gas and coal dust; explosive properties of coal dust; factors affecting explosibility; nature and characteristics of gas and coal dust explosions; causes, effects and precautionary measures; research work on gas and coal dust explosions. Sources of water under pressure; precautionary measures when working under or approaching water; water blast; dams.

Outbursts of gas; causes; effects and prevention.

Rescue work; respiration; self contained breathing apparatus; smoke helmets and respirators; organisation and operation of rescue work; rescue stations and brigades; mine accidents; ambulance stations and organisation.

Laboratory.

Analysis of dusts. Explosion tests of coal dust and methane. Rescue apparatus.

*Optional for students in the Mining Engineering Course who wish to specialise in Coal Mining.

7.30 Metalliferous Mining.

(Working of unstratified deposits.)

Definition of mining terms.

Surface mining methods. (*a*) Alluvial mining; panning; long form sluicing; hydraulicing; dredging; draft mining. (*b*) Quarrying; layouts; glory-holing; methods of loading and transporting products.

Underground mining methods. Factors influencing selection of methods. (*a*) Open stope supported naturally. Open stoping; sub-level stoping; shrinkage stoping. (*b*) Open stope supported artificially. Horizontal cut and fill; inclined cut and fill; stulled and square set stoping. (*c*) Caved stopes. Block caving; sub-level caving; top slicing.

*7.31 Metalliferous Mining.

Rock drills; drill steel and steel sharpening; drill bits.

Blasting in stopes; long hole blasting; churn, calyx and diamond drilling.

Transfer of broken ore from stopes to chutes and cars.

Mine fires; fire fighting; fire protection in stopes and shafts and electrical installations.

Sampling.

Underground sampling. Procedure. Stope and development sampling; reduction of samples; computations for tonnage and assay values; books and assay plans.

Borehole sampling. Procedure; spacing of boreholes; computation for tonnage; average value.

Alluvial sampling. Borehole samples; power and hand drill drive; pipe panning; computation of bore value; computation for yardage and value.

Pit sampling. Dump sampling—reliability.

Mining Law and Valuation.

New South Wales Mining Act.

Ore reserves—proved, probable and prospective; beneficiation realisation and marketing of ores.

Mineral properties. Taxation; life; annual value; present value. Mine Accounts. Labour-day, contract and bonus work.

Organisation of mine management; mine reports.

Mine stores and storekeeping.

Laboratory.

Principally spent on additional work on—

(*a*) Metalliferous mine ventilation plans.

(*b*) Preparation of minerals.

(*c*) Laboratory work and tests for preparation of theses.

*Option for students in the Mining Engineering Course who wish to specialise in Metalliferous Mining.

7.40 Preparation of Minerals.

Object and scope of coal preparation and mineral dressing. Arrangement and types of screening, crushing and picking plants. Types of breakers. Grinding mills, tube mills, ball mills and stamps. Sizing Screens. Grizzlies, shaking and revolving screens. Flow diagrams for coal and ore mineral screening and classifying plants.

The theory of free fall in water and its application to mineral separation. Characteristics of coal and their effect on coal washing. Distribution of ash in coal. Float and sink tests. Washability curves. Principles of separation. Jig and trough washers. Upward current washers. Baum and Rheolaveur washers. Gravity washers. Chance process. Barvoys process, Loess process, Tromp process, Dreissen cyclone separator.

Water and dense media circulating and purification systems. Refuse disposal.

Pneumatic separation. Dry cleaners. Flotation. Examples of plant in operation. Electrostatic and magnetic separation. Filtering and de-watering.

CIVIL ENGINEERING.

Subjects 8.00 to 8.99.

8.10 Strength of Materials.

Stress, strain, elasticity. Riveted and welded joints, thin shells. Compound stresses. Bending moment and shear force. Theory of bending of beams, bending stresses, shear stresses; deflection of beams. Torsion, springs. Combined bending and twisting, combined bending and direct stress. Strain energy, resilience, impact loads.

Properties of materials. Tension, compression, impact hardness and fatigue testing. Factors of safety and working stresses.

8.11 Materials of Construction.

Concrete—physical and chemical properties—testing and selection of basic constituents—design and proportioning of mixes—admixtures, placing, curing and testing—methods of mixing, transporting, placing. Formwork. Aggregates, selection, treatment, transportation —plant.

Timber—types and sources of structural timbers—identification and constitution—defects, tests and selection of timber—preservation. Erection of timber structures.

Steel—basic manufacturing processes—general types used in civil engineering for specific applications—defects, testing, selection, processing. Transportation, erection.

Stone and ceramics—application of masonry to engineering structures, stone types, preparation and defects, selection.

Pipes—earthenware, cement, steel, etc., and use in civil engineering —defects, tests and selection. Methods of transporation, laying.

Chains and ropes—types, sizes and uses—tests, selection.

Elements of soil stabilization technique.

Work in the materials testing laboratory.

8.12 Materials and Structures.

Statics and applications to framed structures. Properties of materials and testing of materials. Working stresses and factors of safety. Simple stresses. Riveted joints, welded joints, thin shells, centrifugal tension. Resilience of bars under tension. Impact loads. Shear stresses on planes at right angles, stresses on oblique planes. Bending of beams, distribution of bending stresses in beams, distri bution of shear stresses in beams, deflection of beams. Torsion. Helical springs, flat springs. Combined bending and twisting, combined bending and direct stress. Buckling columns.

8.20 Mechanics and Graphics.

Graph drawing, graphs of two variables, use of functional graph paper, graphs of three variables. Graphical differentiation and integration. Simple machines, velocity ratio, mechanical advantage, efficiency, etc. Graphical statics, solution of simple framed structures by graphical and analytical methods. Introduction to the concepts of shear force, bending moment, axial thrust.

8.21 Structural Drawing and Design.

Application of work in Strength of Materials (8.10) to the design of simple structures. Design of simple built-up beam or beam system. Design of roof truss, determination of loading, member forces, etc. Design of riveted and welded joints. Theory and design of columns.

8.22 Structures (Theory and Design).

(*a*) Revision of simple theory of bending and horizontal shear. Influence lines for simple beams, curves of maximum moment and shear. Columns carrying bracket loads. Deflection of trusses by analytical and graphical methods. Theorem of reciprocal deflections. Stresses in redundant frames. Three-moment theorem and application to continuous beams, portals, etc. Torsion in rolled sections with application to runway girders.

(*b*) Design of steel structures—plate web girders, mill buildings, steel frame buildings.

(*c*) Reinforced Concrete—working stresses, elastic theory. Design of beams with single and double reinforcement.

(*d*) Drawing office work associated with (*b*) and (*c*).

8.23 Structures (Theory and Design).

(*a*) Reinforced Concrete—design of T. beams, continuous beams, columns, floor slabs.

Influence lines for truss members, panelled girders, etc. Tension coefficients, space frames, braced piers, wind loads, impact, etc. Strain energy theory. Principle of least work and applications. Relaxation methods and analysis of indeterminate structures. Elementary treatment of arches. Experimental methods of stress analysis.

(*b*) Design of retaining walls, weirs, small dams—percolation and uplift, stability of gravity walls, stream bed protection.

Timber design, properties, strength, design of joints, beams and joists, columns and struts, timber bridges.

Design of continuous reinforced concrete frames and other drawing office work associated with the above.

8.30 Surveying.

Chaining errors and corrections. Construction, adjustments and use of theodolite and level. Minor instruments, sextant, compass, abney. Levelling, traversing, contouring, control and detail surveys. Booking, reducing and plotting. Estimation of errors. Tacheometry. Plane table surveying. Areas and volumes. Circular curves. Setting out works. (One full week to be spent in survey camp.)

8.31 Surveying.

(*a*) Instruments—modern developments. Precise measurement of angles, distances and levels. Further work on tacheometry and plane table surveys. More precise work following on 8.30. Topographic surveys. Surveys for roads and railways, water supply. Underground, hydrographic, and aerial surveying. Computations for co-ordinates, triangulation, traverses, curves, subdivisions.

Mine surveying, shaft plumbing, correlation of surface and underground surveys. Surveying and prospecting. (One week to be spent in survey camp.)

8.32 Astronomy and Geodesy.

Introduction to field astronomy, the celestial sphere, spherical trigonometry, determination of time, latitude and longitude, convergence of meridians, elements of map projection and cartography. Elements of geodesy, errors and adjustments, base lines, triangulation, precise levelling. Instruments, methods, computations, figure adjustments.

8.33 Topographical Surveying, Aerial Surveying and Photogrammetry.

Review of optics, application to cameras, general principles of terrestrial photographic surveying, elementary aerial photogrammetry, stereoscopy, mosaics, plotting, and map compilation. Mathematical theory of aerial photogrammetry, rectification of aerial photographs and general study of photogrammetry and stereoscopic mapping instruments.

8.40 Civil Engineering.

(*a*) *Elements of Hydrology.*

Basic theory of occurrence and distribution of water on surface of the earth, including precipitation, run-off, infiltration, water losses and their relations, stream flow data, flood flows, etc.

(*b*) *Engineering Construction.*

Moving and transporting plant, methods. Compressed air. Minor plant. Explosives. Excavations, pile driving, coffer dams, caissons, tunnelling, foundations, piers and abutments, scaffolding, dams and weirs, job planning and progressing, economics of design.

(*c*) *Public Health Engineering.*

Filtration, sedimentation, biological aspects. Water supply schemes, pumping stations, distribution, treatment. Sewerage and sewerage treatment and disposal, refuse collection treatment and disposal, artificial swimming pools, miscellaneous applications of engineering to pubilc health problems.

(*d*) *Road Engineering.*

Elements of road design. Plant and construction methods peculiar to road work. Maintenance.

(*e*) *Aerodrome Design and Construction.*

(f) Geological Considerations.

About twelve lectures on the following topics:—Geological exploratory work; Geological aspects of quarrying and tunnelling; Geology of dam and reservoir sites; river engineering; soil erosion; underground and artesian water; geological aspects of foundation engineering; geology and petrology of road aggregates, clays, cements, etc.

Excursion Work.

One three-day excursion during the first term vacation, and one Saturday excursion during term.

8.41 Civil Engineering.

(a) Railway Engineering.

Location. Economics. Review of main features of railway engineering—permanent way, signalling, special structures. Maintenance.

(b) Harbour and River Engineering.

Tides, currents, wave actions, shore protection and general review of methods of application of general civil engineering principles and practices to harbour works.

(c) Irrigation Engineering.

Plant growth, disposal of irrigation water, investigating and planning an irrigation scheme, conveyance of water for irrigation schemes, methods of distribution and application, special appurtenances.

(d) Contracts, Specifications, Quantities, Estimates.

Elements of contract law, principles to be observed in drawing up specifications, including practical assignments. Elements of quantity surveying applied to civil engineering works, practical assignments in taking out quantities and preparing estimates.

8.42 Civil Engineering Design.

Special advanced work on civil engineering design adapted to the student's interests. This covers important problems encountered by structural designers, such as choice of type, general proportions, economics, methods of preliminary design, organisation of design procedure, influence of erection methods, with applications to structures of complicated types such as suspension bridges, arch dams, building frames and structural analysis.

and/or

Advanced studies of either theoretical or practical nature in various phases of soil engineering, stability of slopes and retaining walls; earth and masonry dams, with reference to stability, seepage, and

piping effects; bearing capacity and settlement of foundations; piles and pile groups; frost action; and special types of foundations.

and/or

Advanced work on hydrology and flood control, water power engineering, water supply and purification. Analysis of stream flow data and frequency and magnitude of flood flows and the effect of reservoirs in reducing them. Problems involved in the location, design, construction and economics of hydro-electric developments. Estimates of water power from stream flow data, hydraulic turbines, elements of design of dams, waterways, and power house, cost and value of water power.

Coupled with these the student may undertake additional mathematical studies and/or the study of a modern foreign language.

Library reading, participation in research and special lectures by experts from the relevant fields will form part of the course.

8.43 Civil Engineering Construction and Administration.

This option is designed for the student intending to enter construction work or local government work where supervision over construction work is an important part of his work. The student may take work on Construction Equipment and Methods, covering analysis of construction procedure and selection of equipment for carrying out civil engineering projects. Includes cost estimating, job planning, production capacity and operating costs for different types of construction plant and equipment, scheduling of materials, safety, and methods applicable to specific kinds of construction. It may also include a study of the problems of management and organisation for construction operations.

and/or

Advanced work on the planning and design of civil engineering works, such as railways, highways, water power, water supply and sewerage, and similar projects with particular attention to town and city planning. Includes estimates and reports, contracts and specifications, methods of economic comparison, financing of engineering projects, engineering organisation and duties and construction methods illustrated by typical projects.

The student may also take additional work in geology and soil engineering and for those interested in entering local government engineering a special course is given in powers and duties of a local government engineer. The additional geological work will include some or all of the following topics:—Geophysics as applied to Civil Engineering; studies in the geological evolution of the Australian Continent, including stratigraphical, orogenic, structural and physiographic considerations; the examination of a wide range of rock types which the Civil Engineer is likely to meet in professional practice; practical instruction in the methods of geological surveying.

Students will be required to map and analyse a small area and submit a report embodying the results of the survey. Photogeology and its applications to structural geology, route location, military geology, etc. Subsurface geological surveying and the solving of underground problems by stereographic projection.

8.44 Surveying and Investigations.

Students electing to take this option are required to take Astronomy and Geodesy (8.32) and Topographical Surveying, Aerial Surveying and Photogrammetry (8.33) together with advanced work on Soil Engineering, either theoretical or practical in nature, dealing with stability of slopes and retaining walls, earth and masonry dams, with reference to stability, seepage, and piping effects; bearing capacity and settlement of foundations; piles and pile groups; frost action; and special types of foundations.

or

Advanced work on hydrology and flood control, water power engineering, water supply and purification. Analysis of stream flow data and frequency and magnitude of flood flows and the effect of reservoirs in reducing them. Problems involved in the location, design, construction and economics of hydro-electric developments. Estimates of water power from stream flow data, hydraulic turbines, elements of design of dams, waterways and power houses, cost and value of water power.

or

Students may undertake the advanced study of geology set out in 8.43, Civil Enginering Construction and Administration.

Work in these subjects is to be of an investigatory nature as would be required in the initial planning of large civil engineering projects, starting with a topographical and aerial survey of the country involved and a survey of the geological formations, soil and rock involved in the foundation work.

8.50 Fluid Mechanics.

Flow in open channels and closed conduits, steady and unsteady, uniform and non-uniform conditions. Back water and drop down curves, critical depth, hydraulic jump. Erosion, sedimentation and transportation. Boundary layer theory, resistance of immersed bodies. Properties of various hydraulic machinery—turbines, pumps, hoists, jacks, etc. Water meters, power transmission.

8.51 Fluid Mechanics.

Equations of flow in two and three dimensions treated by vector analysis. Solution to problems of flow in two dimensions, circulation and lift, conformal transformation.

Vortex sheets solution of two dimensional flow problems. Boundary Layer Theory, Karman's integral equation and solutions.

Flow nets, percolation under dams; evaluation of velocities graphically and more accurately by computation.

Flow of compressible fluids at supersonic velocities.

Statistical methods in Theory of Turbulent flow.

Water hammer problems, problems on percolation, problems on distribution systems, problems involving boundary layer theory.

8.52 Soil Mechanics.

Physical and mechanical properties affecting soil action in engineering problems; coefficient of permeability, capillarity and compressibility and their application in practical problems relative to seepage, uplift, liquefaction and the settlement of building, located above buried compressible soil strata; shearing strength and bearing capacity and their application in problems relative to stabilities of embankments, cuts, retaining walls, shallow footings and pile foundations. Soil sampling, excavation, coffer dams, caissons, types of piles and types of foundations. Closely correlated with the related field of engineering geology.

8.53 Fluid Mechanics.

A special course for Chemical Engineers. Properties of fluids, fluid statics. Measurement of pressure. Fluids in motion, Reynold's number, pipe flow, equations of continuity, Bernoulli's Theorem. Effects of viscosity on fluids in motion. Orifices. Measurement of discharge in closed conduits, meters. The boundary layer theory. Dimensional analysis, resistance of bodies in motion, use of models. Flow in pipes, velocity distribution, losses. Unsteady flow of liquids in closed conduits. Centrifugal pumps, fans, axial flow fans and pumps.

8.60 Building Construction.

Description of stages in erection of a building and work carried out by various building tradesmen—finishing processes—modern developments in building technique—house services. Elements of heating, lighting and ventilating. Discussion of relative construction forms and materials.

8.70 History of Architecture and Structural Aesthetics.

The history of architecture with reference to style development and control by materials and structural considerations. The influence of changing demands on the development of architectural style.

Structural aesthetics. Considerations of material in relation to basic structural design. The variation of proportioning and disposition of building and structural elements to comply with aesthetic requirements. The effect of mass disposition in buildings

and structures. Functionalism. Fenestration. Texture. More general aspects of colour, form and placement in relation to design. Freehand sketching.

8.71 City Planning.

Principles of regional and city planning—Inter-relationship of various civil engineering and planning problems—Evolution of the modern city and relationships of architecture and engineering to problems of city development and civic design. Street systems—transportation—public buildings and utilities—parks and playgrounds —housing—zoning—methods of financing city improvements.

8.80 Engineering Computations.

Practical introduction to numerical, graphical and mechanical calculation and analysis as required in the engineering or applied mathematical sciences. Numerical solution of equations, including differential equations, graphical methods; nomography and the construction of graphical charts; curve fitting to empirical data, approximate methods of integration differentiation and interpolation; use and principles of construction of instruments employed in calculation; electro-mechanical analogues, relaxation methods and many kindred topics.

GENERAL SCIENCE.

Subjects 9.00 to 9.99.

9.10 Geology.

(*a*) *Physical Geology.*

Scope of the Science of Geology, Cosmology and structure of the earth's crust; Agents of Denudation; Weathering; River Action; Glaciology; Wind Erosion; Lakes; The Sea and its action; Vulcanism and Earthquakes; Diastrophism; Structures produced by Earth Movements; Principles of Physiography; Igneous Rocks and their classification; Sedimentary Rocks, terrestial, fresh water and marine deposits, their distribution, mode of formation and classification; Elementary treatment of metamorphic rocks.

(*b*) *Elementary Palaeontology and Introduction to Historical Geology.*

Outline of the scope and application of historical geology; Principles of Stratigraphy; Elementary palaeontology; Use and value of fossils; Detailed examination of fossils found in rocks of economic importance in New South Wales.

9.11 Geology.

(*a*) *Petrology, Crystallography and Mineralogy.*

Physical properties, crystal form and composition of the chief rock forming minerals.

Detailed description of important plutonic, hypabyssal and volcanic rocks; Magma differentiation.

Detailed study of sedimentary and metamorphic rocks.

Elementary crystallography.

(*b*) *Australian Geology.*

Stratigraphical orogenic, tectonic, physiographical and economic considerations. (Emphasis to be placed on New South Wales Geology.)

(*c*) *Geology of Coal and Petroleum.*

Coalfields and coal resources of Australia.

(*d*) *Principles of Ore Deposition.*

Introduction; Formation of minerals; Importance of underground water; Openings in rocks; Metasomatism; Classification of ore deposits; Form and structure of mineral deposits; Epigenetic and syngenetic deposits; Structural control of ore deposition; Ore shoots; Alteration of ore deposits near the surface; Important metalliferous deposits of Australia.

Laboratory.

Examination of hand specimens of rocks; Elementary crystallography; Microscopic examination of principal igneous, sedimentary and metamorphic rocks in thin section; Megascopic study of important ore minerals; Interpretation and preparation of geological maps and sections.

9.12 Geology (Economic Geology).

Ground-water supplies; Australian occurrences. Non-metallic mineral deposits, including structural and building materials, refractories, ceramic materials, abrasives, industrial and manufacturing materials, etc.

Photogeology and its applications.

Methods of geophysical exploration.

Note.—It will be desirable for those Mining Engineering students wishing to specialise in coalmining to receive more detailed instruction in the geology of coal, and those wishing to specialise in metalliferous mining to deal with minerals and ore deposits in more detail. The following alternative courses are arranged with this end in view.

Geology of Coal.

General considerations; details of occurrence; megascopic and microscopic features, chemical and physical properties, classification, origin and review of Australian occurrences.

or

Metalliferous Geology.

Magmas and mineral deposits; types of ore deposits, including detrital deposits, syngenetic mineral deposits of sedimentary origin, deposits formed by sublimation and evaporation, epithermal, mesothermal, hypothermal and pyrometasomatic deposits, pegmatitic and magmatic deposits.

Textures of ore deposits; metallogenetic epochs. Detailed study of main Australian ore occurrences.

Laboratory.

Examination of road metals, building stones, refractories, abrasives and other industrial materials. Determination of ores by blow-pipe tests; mineragraphy; megascopic and microscopic examination of coal; advanced mapping and its application to economic problems; photogeology; geophysical field methods.

Field Work.

A minimum of six field days will be held in each stage of the course.

9.13 Geology for Engineers.

Scope of the Science of Geology; Cosmology and structure of the earth's crust; Agents of denudation; Weathering; River action; Glaciology; Wind erosion; Lakes, The sea and its action; Underground water; Principles of Physiography; Detailed study of igneous, sedimentary, and metamorphic rocks; Magma differentiation; Vulcanism and earthquakes; Coal and petroleum; Diastrophism; Structures in igneous, sedimentary and metamorphic rocks; Elementary Palaeontology.

Laboratory.

Examination and identification of common minerals and rocks in the hand specimen. Interpretation and preparation of geological maps and traverses.

Microscopic examination of rocks in thin section; microscopic characters of important building materials.

Excursions.

Six excursions will be held on Saturdays during the session.

Localities to be visited include Bondi, Hornsby, Narrabeen, Prospect, Blue Mountains and the South Coast.

MATHEMATICS.

Subjects 10.00 to 10.99.

10.10 Mathematics.

Review and extension of matriculation algebra and trigonometry. Determinants, partial fractions, limits, convergence of infinite series, approximations.

The circular, exponential and hyperbolic functions and their inverses. Equations and limits involving these functions.

Derivatives and their applications. Indefinite and definite integrals. Approximation to the numerical value of a definite integral by Simpson's rule.

Quadrature, rectification, determination of volumes, means, moments, centroids and quadratic moments.

Partial derivatives, total differential and applications.

Taylor's and Maclaurin's expansions and their uses.

The co-ordinate geometry of the straight line and of such curves as are of technical importance, using Cartesian and polar systems of reference. Determination of linear laws and reduction of other laws to linear form. Use of logarithmic and other forms of graph paper.

First order differential equations of "variables separable" type and of "exact" type. Second order equations of the type $y'' + ay' + by = 0$.

Introduction to complex algebra.

10.10A Mathematics.

Elementary functions. Graphical solution of equations, binomial theorem for any index, approximations, geometric progressions, trigonometric functions, sinusoidal functions. Solution of easy trigonometric equations. Inverse trigonometric functions, solution of equations. Intercept and alignment charts.

Calculus. Derivatives, gradients, limits, differentiation, higher derivatives, maxima and minima, points of inflexion. Rules of differentiation. Integration, indefinite integrals, definite integrals, areas and volumes. Approximate evaluation of definite integrals. Differentiation of elementary functions and corresponding integrations.

Analytic Geometry. The straight line, various forms of equation satisfying various conditions. Logarithmic scale and use of graph paper. Equation of circle, change of origin with parallel axes. Polar co-ordinates. Elementary conics.

10.10B Mathematics.

General Mathematics and calculus. Exponential and logarithmic functions, convergence of series, differentiation, logarithmic differentiation. Differentiation and integration applied to areas and volumes.

Centroids and centres of gravity, moments of inertia, hydrostatic presure. Further work on differentiation and integration of rational algebraic fractions. Hyperbolic functions, derivatives and integrals. Integration by reducation and substitution. Differential equations of the first order, variables separable, linear equations.

10.11 Mathematics.

More advanced work on differentiation, integration, definite integrals, multiple integrals. Applications to moments and moments of inertia, curves, curvature, geometrical problems and problems taken from physics and engineering.

Partial differentiation. Differential equations and methods of solution, formulation of equations from problems in physics and engineering. Approximate solutions.

Vector analysis and solid geometry, vector algebra, use in electromagnetic theory, fluid mechanics, etc. Introduction to complex algebra and graphical representation.

Infinite series, Maclaurin's and Taylor's theorems, Harmonic analysis.

10.12 Mathematics.

More advanced work on differentiation and integration, definite integrals, multiple integrals, applications to problems in physics, and chemistry, following 10.10 or 10.10A and B.

Elementary differential equations and methods of solution, formulation of equations from problems in physics and chemistry. Partial differentiation and its use in physics and chemistry.

10.20 Mathematics for Electrical Engineers.

A course of advanced mathematics specially chosen for students in Electrical Engineering Courses. Differential equations of special types met with in electrical engineering, Bessel and similar functions. Advanced vector analysis, electromagnetic theory, solution of Maxwell's equations with boundary conditions.

Operational methods of circuit analysis, complex variable, contour integration. Engineering computations, nomography and graphical methods.

10.21 Mathematics for Civil Engineers.

A course of advanced mathematics specially chosen for students in Civil Engineering Courses. Spherical trigonometry. Finite differences, numerical integration and differentiation. Fourier analysis and solution of selected differential equations in series of Fourier type. Complex variable and conformal transformation.

HUMANITIES.

First Year.

		L.		P.
G1	Scientific Method	1	—	0
G10	Language and Literature	1	—	0

Second Year.

G2	History of Science and Technology ..	2	—	0
G11	Language and Literature			
G20	Human Relations			

Third Year.

G3	Contemporary Civilization	1	—	0
G12	Language and Literature	1	—	0
G21	Human Relations	1	—	0

Fourth Year.

G4	Contemporary Civilization	1	—	0
G13	Language and Literature	1	—	0
G22	Human Relations	1	—	0

Subjects G1 to G99.

G1. Scientific Method.

The aim of the course in Scientific Method is to provide students with a grounding in logic and scientific methodological procedure and at the same time to inculcate an appreciation of the universal nature of science.

The course commences with an examination of the development of scientific method—Aristotle, mediaeval logic, Bacon, Newton, Mill. Modern science and logic, to bring out the basic methodological issues involved, particularly in regard to induction and deduction. The place of induction and deduction in science. Material as formal logic covering terms, distribution proposition, logic relations, inference, syllogistic and hypothetical arguments. Selecting and choosing between hypotheses, verifying hypotheses, etc. Classification, definition and explanation. Observation, status of scientific laws, the nature of experiment and experimental methods.

G2. History of Science and Technology.

The aim of this course is to enable the student—

(*a*) to see the sphere of science or technology which he is entering in relation to the general perspective of scientific and technological development;

(*b*) to gain an understanding of the relation between scientific and technological development and the conditions of society.

This course is introductory to the succeeding courses on Contemporary Civilization (G3, G4). It traces the scientific and technological developments by which man has provided himself with extra-corporeal equipment and gained an ever-increasing control over his environment.

It considers:—

Primitive man of the early Stone Age, his making of tools and their effect upon his way of life.

The developments of herding and agriculture by which man proceeded with parasitic dependence on nature to co-operation with nature.

Measurement of time and space and technological development in the cradles of civilization (Egypt and Mesopotamia) to approximately the 3rd Century B.C., by which time man had developed crafts and methods of transport which, despite improvement, remained essentially the same process until the period of the modern Industrial Revolution.

The beginning of theoretical science in ancient Greece.

The Alexandrian period of scientific development.

Roman civil engineering.

The Arabian contribution to science.

The Renaissance period and the dawn of experimental science.

The foundation, progress and effects of modern experimental science.

The foundation, progress and effects of modern technological development.

The position of science and technology in contemporary civilization.

There is *no prescribed text book* as students are encouraged to read widely and selectively. Throughout the course recommendations are made to standard works treating various aspects, and students are supplied with a list of works which are available and offer helpful reading matter for the course and assignment work included as part of the course. Books on this list which are recommended are included in the general list of text books.

G3. Contemporary Civilization.

In this course an historical approach is made to Economic Theory treated in conjunction with selected aspects of Economic History.

The general aim of the course is to develop an appreciation of the practical basis of economic theory and to show how it has developed under the influence of historical situations, particularly of ideas. In this way, the close inter-connection of economic theory with life is indicated.

The treatment is critical involving analysis and comparison of material conditions, and is not merely descriptive. This serves at once to inform the student's mind and assists him to develop a critical approach and so enable him to assess economic affairs for himself without being swayed by propaganda, indoctrination or prejudice.

Emphasis in this course is based on the 18th and 19th centuries, but earlier periods are surveyed and some attempt made to evaluate 20th century developments by selecting and examining the works by those economists of the past whose contributions have significance for contemporary theories, practices and controversies.

A. *Preliminary.*

(i) Economic thought in Biblical times, Greece and Rome, leading to consideration of principles evolved during early Christian and early mediaeval eras, particularly in Europe.

(ii) The breakdown of mediaeval unity. Commercial Capitalism, Mercantilism, particularly in England: Thomas Mun.

B. *Industrial Capitalism and Political Economy.*

(i) The relationship of the Industrial Revolution and contemporaneous economic thought. The influence of Locke and Hume: connections with political theory.

(ii) The Physiocrats: Quesnay, Turgot. The French Revolution and economic thought.

C. *The Classical Tradition.*

(i) Adam Smith.

(ii) Malthus and Ricardo.

(iii) Senior and J. S. Mill.

(iv) The Labour Theory of Value: Surplus Value. The Theory of Capitalist Competition. The Theory of Economic Development.

D. *The Evolution of the Classical System.*

(i) The Classical System and European, particularly German, influences.

(ii) The Historical School. Richard Jones.

(iii) Restatement of Value Theory: implications for 20th Century Economic thought, including social democracy in Australia.

E. *20th Century Position.*

(i) American Theory. Veblen. Burnham.

(ii) English and Australian theory: Conservative, Progressive.

(iii) Disentegration of 19th Century Revolutionaries' synthesis of politics and economics.

G4. Contemporary Civilization.

This course is one in Contemporary International Relations, and is the final course of a three year sequence and will draw upon the understanding gained in the first year of the significance of science and technology in its effect upon human relations, and in the second year of the importance of the operation of economic principles.

The aim of the course in Contemporary International Relations is to give the undergraduate a broad introduction to the basic factors underlying current international relations, some training in the interpretation of news, and sufficient knowledge to be informed upon current problems and to know where to turn and how to seek information upon an aspect of this subject, should his later professional activities demand a specialist's knowledge. It will also enable the student to appreciate the conditions and problems of other peoples, so that he will have an understanding of their outlook which will help him in his professional life should he be called upon to have contact with them.

The course is practical rather than theoretical and the time is programmed for discussion of current problems on such aspects as:—

(*a*) the conditions (geographic, historic, strategic and economic) out of which the problems are arising;
(*b*) the repercussion of such problems upon Australia;
(*c*) the policies which Australia is framing;
(*d*) possible effects of current national and international problems and policies.

The course is operated on the seminar method, the students being divided into groups of no more than ten, so that at the beginning of the year each student will be allotted two problems to investigate and upon which to write a report which he will read to his group on an appointed date as a basis for class discussion.

G10. Language and Literature.

1. *Theory of Language, and History of the English Language.*

A brief survey of the most important theories of the origin and development of language, and a condensed, illustrated history of the English Language, showing some of the principal vocabulary changes, semantic changes, changes in accidence, and phonological changes.

2. *Literature, Involving Social Criticism.*

Treatment of five or six selected works of literature in various forms to illustrate a thesis that much good literature contains some degree of social criticism.

3. *Technical Exposition.*

A review of some of the chief principles to be observed in descriptive writing.

G11. Language and Literature.

1. *Standard English.*

A brief treatment of some of the standards accepted by the educated in the writing and speaking of English.

2. *Literature and the Study of Personality.*

Treatment of four or five selected works of literature in various forms to illustrate the importance of literature in the analysis and recreation of human personality.

3. *Technical Exposition.*

A review of some of the chief principles to be observed in writing reports.

G12. Language and Literature.

1. *Theory and Practice of Semantics.*

A study of the development of meaning in contemporary English, and an analysis of expressions in current controversial writings.

2. *Literature and the Study of Social Forces.*

Treatment of five or six selected works of literature in various forms to illustrate the contribution made by literature to the analysis of social forces, and to a comprehension of the most satisfactory pattern of political and social activity in particular epochs.

3. *Technical Exposition.*

A review of some of the chief principles to be observed in writing abstracts.

G13. Language and Literature.

1. *Technical Exposition.*

A review of some of the chief principles to be observed in writing reports, abstracts, descriptions, letters.

2. *Literary Analysis, and Principles of Literary Criticism.*

Treatment of five or six selected works of literature in various forms, and a revision of works already treated in previous years to illustrate some of the basic principles in literary criticism, so that graduates may assess a work on its merits as creative writing, apart from its particular subject matter.

G20. Human Relations.

The series of courses on Human Relations aim at an understanding of the dynamic inter-relationship between human beings and the value of such an understanding for successful social living in general and for harmonious industrial relations in particular.

The foundation of the course is an exposition of the fundamental principles of human conduct which will lead the student to an understanding of his own behaviour and the behaviour of his fellow men. The principles enunciated are related to practical situations and are given within a social framework.

The following topics are considered:—The subject matter of the science of Psychology and its relationship to other sciences. The nature of individual differences; the principal psychological differences. Motivation, its biological background and its social significance. The learning process—social conditioning. Intelligence—theories and measurement. Personality—definition and description.

G21. Human Relations.

Following on G20 this course is concerned with an examination of the most important social relationships which emerge from the interaction of the individual with society. This aims to lead the student to an understanding of social relationships and thus a more thorough social adjustment.

Attention is given to the following topics. Human motives and social living. Individual differences in social reactions. Group situations—group membership—attitudes (particularly formation and change)—social distance. Social change and its effect on the individual—the effect of technological development—the influence of major social movements.

G22. Human Relations.

Here the industrial situation will be taken as a segment of the total social pattern as treated in G21, and examined intensively.

The influence of human relations upon the following problems are considered. Motivation and morale in the work situation. Leadership. Monotonous work. Fatigue. Environmental influences and production (atmospheric conditions, lighting, noise, etc.). Accidents and Accident Proneness. In addition, some of the results of the Harvard Industrial Research Programme in Human Relations will be examined and discussed.

In all courses in Human Relations, the seminar technique is used as the teaching device.

TEXT BOOKS.

The following text books are prescribed for 1950.

	SUBJECT.	TEXT BOOK.
	PHYSICS—1.00 to 1.99.	
1.10	Physics	Lemon and Ference—*Analytical Experimental Physics.*
1.11	Physics	Champion and Davy—*Properties of Matter.* Mitton—*Thermodynamics.* Starling—*Electricity and Magnetism.*
	APPLIED CHEMISTRY—2.00 to 2.99.	
2.10	Chemistry	Latimer and Hildebrand—*Reference Book of Inorganic Chemistry — Principles of Chemistry*—(Combined Volume). Sydney Technical College—*First Year Practical Chemistry Notes.*
2.20	Inorganic Chemistry	Latimer and Hildebrand—*Reference Book of Inorganic Chemistry — Principles of Chemistry*—(Combined Volume). Murphy. R. K.—*A Practical Chemistry.* Sydney Technical College—*First Year Practical Chemistry Notes.* Vogel—*Textbook of Qualitative Chemical Analysis.*
2.30	Physical Chemistry .	Findlay or Palmer—*Practical Physical Chemistry.* Glasstone—*Elements of Physical Chemistry.* Alternatively—2nd choice. Getman and Daniels—*Outlines of Physical Chemistry.* *OR* Prutton and Moron—*Fundamental Principles of Physical Chemistry.*
2.40	Organic Chemistry .	Read—*Organic Chemistry.*
	CHEMICAL ENGINEERING—3.00 to 3.99.	
3.90	Engineering Chemistry.	Gyngell—*Chemistry for Engineers.* Leighou—*Chemistry of Engineering Materials.*
4.90	Engineering Metallurgy.	Rollason—*Metallurgy for Engineers.* Sydney Technical College—Notes for C: 4a-b: *Technology for Engineers.*
	MECHANICAL ENGINEERING—5.00 to 5.99.	
5.10	Descriptive Geometry.	Abbot—*Practical Geometry and Engineering Graphics.*
5.11	Engineering Drawing and Materials	*S.A.A. Australian Standard Drawing Practice.* Sydney Technical College—Lecture Notes for Mechanical Engineering I.
5.12	Mechanical Drawing and Design.	Black—*Machine Design.*
5.13	Engineering Design	*B.S.S. Spur Gears.* *B.S.S. Worm Gears.* *S.A.A. Crane and Hoist Code.*

	Subject.	Text Book.
	Mechanical Engineering—5.00 to 5.99—*continued.*	
5.15	Drawing and Materials.	*S.A.A. Australian Standard Drawing Practice.* Sydney Technical College—Notes for Mechanical Engineering I.
5.20	Mechanical Engineering.	Bevan—*Theory of Machines.* Grundy—*Heat Engines.* Sydney Technical College—Lecture Notes for Mechanical Engineering IIIA. Reference: Sydney Technical College—Lecture Notes for Mechanical Engineering II.
5.20	Mechanical Engineering.	Bevan—*Theory of Machines.* Sydney Technical College—Lecture Notes for Mechanical Engineering IIIA and IIIB. Inchley—*Theory of Heat Engines.* *OR* Lewitt—*Thermodynamics Applied to Heat Engines.* *OR* Walshaw—*Applied Thermodynamics.* *OR* Wrangham—*The Theory and Practice of Heat Engines.* Reference: Fraas—*Combustion Engines.* Pye—*Internal Combustion Engines.* Young and Pryor—*Testing of Internal Combustion Engines.*
5.50	Fluid Mechanics .	Addison—*Applied Hydraulics.* *OR* Hunsaker and Rightmire—*Engineering Applications of Fluid Mechanics.* *OR* Rouse, Hunter—*Elementary Mechanics of Fluids.*
5.51	Hydraulic Machines	Reference: Stephanoff—*Centrifugal and Axial Flow Pumps.* Wislicenus—*Fluid Mechanics of Turbo Machinery.*
	ELECTRICAL ENGINEERING—6.00 to 6.99.	
6.10	Electric Circuit Theory.	Kerchner and Corcoran—*Alternating Current Circuits.* Strong—*Electrical Engineering—Basic Analysis.* Reference: Frazier—*Elementary Electric Circuit Theory.*
6.30	Electronics and High Frequency.	Arguimbau, Lawrence & Baker—*Vacuum Tube Circuits.* Kloeffler, Royce & Gerald—*Industrial Electronics.*

MINING ENGINEERING—7.00 to 7.99.

	Subject.	Text Book.
7.10	Mining	Haldane—*Methods of Air Analysis.* Moss—*Gases, Dust and Heat in Mines.* Penman and Penman—*Principles and Practice of Mine Ventilation.* Whitaker—*Mine Lighting.* Whitaker and Willet—*Colliery Explosions and Recovery Work.* Reference: Beringer—*Underground Practice in Mining.* Peele—*Mining Engineer's Handbook.* Young—*Elements of Mining.*
7.11	Mining	Penman and Penman—*Principles and Practice of Mine Ventilation.* Reference: Same as for 7.10—Mining.

CIVIL ENGINEERING—8.00 to 8.99.

8.10	Strength of Materials	Salmon—*Materials and Structures*—Vol. 1.
8.20	Mechanics and Graphics.	Abbot—*Practical Geometry and Engineering Graphics.*
8.21	Structural Drawing and Design.	Stewart—*Design of Simple Steel Structures.*
8.40	Civil Engineering	Legget—*Geology and Engineering* *OR* Ries and Watson—*Engineering Geology.* Reference: Blythe—*Geology for Engineers.* Fox—*Engineering Geology.* Lahee—*Field Geology.* Sorsbie—*Geology for Engineers.* Reports of Scientific Societies and Geological Surveys.

GEOLOGY—9.00 to 9.99.

9.10	Geology	Emmons, Thiel, Stauffer and Allison—*Geology—Principles and Processes*—3rd Edition. *OR* Longwell, Knopf and Flint—*Physical Geology*—3rd Edition. *OR* Scott—*Introduction to Geology*—Vol. 1, 3rd Edition. Reference: Cotton—*Geomorphology.* Geikie—*Structural and Field Geology*—3rd Edition Revised. Hills—*Outlines of Structural Geology.* Holmes—*Principles of Physical Geology.* Nevin—*Structural Geology.* Shimer—*Introduction to the Study of Fossils* Woods—*Palaeontology Invertebrate.*

SUBJECT.	TEXT BOOK.
Geology—9.00 to 9.99—*continued.*	
9.11 Geology	Harker—*Petrology for Students.* Rutley—*Elements of Mineralogy.* Bateman—*Economic Mineral Deposits.* *OR* Lindgren—*Mineral Deposits.* Marshall and Raistrick—*Nature and Origin of Coal and Coal Seams.* *OR* Stutzer and Noe—*Geology of Coal.* Rogers and Kerr—*Optical Mineralogy.* *OR* Smith—*Minerals and the Microscope.* Reference: Dana—*Textbook of Mineralogy.* David—*The Geology of Australia.* Emmons—*Geology of Petroleum.* Forrester—*Field and Mining Geology.* Lahee—*Field Geology.* N.S.W. Department of Mines—*The Mineral Industry in New South Wales.* Tyrrell—*The Principles of Petrology.* Reports of Scientific Societies and Geological Surveys.
9.13 Geology	Emmons, Thiel, Stauffer and Allison—*Geology.* *OR* Longwell, Knopf and Flint—*Physical Geology*—3rd Edition. *OR* Scott—*Introduction to Geology*—Vol. 1, 3rd Edition. *Principles and Processes*—3rd Edition. *OR* Ries and Watson—*Engineering Geology.* Reference: Cotton—*Geomorphology.* Geikie—*Structural and Field Geology.* Hills—*Outlines of Structural Geology.* Holmes—*Principles of Physical Geology.* Legget—*Geology and Engineering.* Nevin—*Structural Geology.*
MATHEMATICS—10.00 to 10.99.	
10.10 Mathematics ..	Geary, Lowry and Haydon—*Advanced Mathematics for Technical Students*—Vol. 1. Ince—*Integration of Ordinary Differential Equations.* Timoshenko and Young—*Dynamics.* Weatherburn—*Advanced Vector Analysis.* Weatherburn—*Elementary Vector Analysis.* Reference: Middlemiss—*Differential and Integral Calculus.* Courant—*Differential and Integral Calculus*—Vols. 1, 2.

SUBJECT.	TEXT BOOK.
Mathematics—10.00 to 10.99—*continued.*	
10.11 Mathematics ..	Carslaw and Jaeger—*Operational Methods in Applied Mathematics.* Rutherford — Oliver and Boyd — *Vector Methods.* Reference: Sokolnikoff, I. S. and E. S.—*Higher Mathematics for Engineers and Physicists.*
10.20 Mathematics ..	Carslaw and Jaegar—*Operational Methods in Applied Mathematics.* Weatherburn-Bell—*Advanced Vector Analysis.*
10.21 Mathematics ..	Sokolnikoff, I. S. and E. S.—*Higher Mathematics for Engineers and Physicists.*
HUMANITIES—G1 to G99.	
G1 Scientific Method ..	Larrabee—*Reliable Knowledge.* Passmore—*Talking Things Over.* Stebbings—*Thinking to Some Purpose.* Thouless—*Straight and Crooked Thinking.* Reference: Latta and Macbeath—*The Elements of Logic.* Mill, J. S.—*A System of Logic.*
G2 History of Science and Technology.	Anthony, H. D.—*Science and Its Background.* Dampier, Sir W.—*A Shorter History of Science.* Taylor, Sherwood—*Science Past and Present.*
G3 Contemporary Civilisation.	Roll, Erick—*History of Economic Thought.*
G20 Human Relations ..	Anderson, J. E.—*The Psychology of Development and Personal Adjustment.* *OR* Johnson, D.—*Essentials of Psychology.* Reference: Blackburn, J.—*Psychology and the Social Pattern.* Cattell, R. B.—*Your Mind and Mine.* Mayo, E.—*Human Problems in an Industrial Civilisation.* Munn, N. L.—*Psychology.* Stagner, R.—*Psychology of Personality.*
G21 Human Relations ..	Krech and Crutchfield—*Theory and Problems of Social Psychology.* Reference: Newcomb, Harley and Others—*Readings in Social Psychology.* Sherif, M.—*An Outline of Social Psychology.* Sherif and Cantril—*The Psychology of Ego Involvement.* Whyte, F.—*Industry and Society.*

SUBJECT	TEXT BOOK.
Humanities—G1 to G99—*continued.*	
G22 Human Relations ..	Maier, W.—*Psychology for Industry.*
	Reference:
	Brown and Ghiselli—*Personnel and Industrial Psychology.*
	Mayo, E.—*Social Problems of an Industrial Civilisation.*
	Pigors, McKenney and Armstrong—*Social Problems in Labour Relations.*
	Roethlisberger and Dickson—*Management and the Worker.*
	Whitehead, T. N.—*The Industrial Worker.*
	Whitehead, T. N.—*Leadership in a Free Society.*
	Whyte, F.—*Industry and Society.*
	Industrial Fatigue Research Reports (England)—All Reports.

SUBJECTS OF INSTRUCTION.

For reference purposes the subjects of instruction given by the New South Wales University of Technology are tabulated below. The information set out is necessarily subject to change.

The number at the left is the subject number.

To the right of the subjects are noted the courses and the year in which the subjects are normally required. Then follows the approximate time distribution of the subjects between lectures and laboratory or practical exercises. In addition to the formal times set down the student is expected to spend a certain amount of time in preparation and library reading. Further, in some subjects, the lecturer may not require attendance at lectures over the full time set down, but may assign work to the students for individual study in library or laboratory without formal direction.

No.	Subject.	Course.	Year.	Time. (Hours)	
				Lecture.	Laboratory.
	PHYSICS—1.00 to 1.99.				
1.10 ...	Physics	All Courses	1	72	72
1.11 ...	Physics	All Courses	2	48	60
1.90 ...	Laboratory Arts (Glass Blowing.) ...	II	1 or 1b	...	52
	APPLIED CHEMISTRY—2.00 to 2.99.				
2.10 ...	Chemistry, General	V, VI, VII, VIII ...	1	72	72
2.20 ...	Inorganic Chemistry	II and III	1	83	156
2.20a ...	Inorganic Chemistry	II and III	1a	56	167
2.20b ...	Inorganic Chemistry	II and III	1b	12	...
2.21 ...	Inorganic Chemistry	II and III	2	36	...
2.22 ...	Inorganic Chemistry	II	4 or 4b	Professional Elective.	
2.30 ...	Physical Chemistry...	II and III	1 or 1b	16	20
2.31 ...	Physical Chemistry...	II and III	2	25	50
2.32 ...	Physical Chemistry...	II and III	3	37	54
2.33 ...	Physical Chemistry...	II	4 or 4a	36	72
2.34 ...	Physical Chemistry...	III	4 or 4a	27	45
2.35 ...	Physical Chemistry...	II	4 or 4b	Professional Elective.	
2.40 ...	Organic Chemistry ...	II and III	1 or 1b	37	74
2.41 ...	Organic Chemistry ...	II and III	3	37	74
2.42 ...	Organic Chemistry ...	II	4 or 4a	36	72
2.43 ...	Organic Chemistry ...	II	4 or 4b	Professional Elective.	
2.44 ...	Commercial and Organic Analysis.	II	4 or 4b	Professional Elective.	
2.50 ...	Quantitative Analysis	II and III	2	37	167
2.51 ...	Quantitative Analysis	II	3	37	111

No.	Subject.	Course.	Year.	Time. (Hours)	
				Lecture.	Laboratory.
	Applied Chemistry 2.00 to 2·99—*continued.*				
2.52 ...	Advanced Chemical Analysis.	II	4 or 4b	Professional Elective.	
2.60 ...	Commercial and Food Analysis.	II	4 or 4b	Professional Elective.	
2.90 ...	Chemical Computations.	II and III	2	37	...
2.91 ...	Chemical Microscopy and Metallography.	II	4 or 4a	36	54
2.92 ...	Micro Chemistry ...	II	4 or 4b	Professional Elective.	
	CHEMICAL ENGINEERING—3.00 to 3.99.				
3.10 ...	Industrial Chemistry	II and III	3	56	91
3.11 ...	Unit Operations and Equipment.	II and III	4 or 4a	37	...
3.20 ...	Fuel Economy ...	III	4 or 4a	90	...
3.30 ...	Chemical Engineering Design.	III	4 or 4a	...	108
3.31 ...	Chemical Engineering Design.	III	4 or 4b	...	108
3.40 ...	Chemical Engineering	III	4 or 4b	108	270
3.90 ...	Engineering Chemistry.	V, VI, VII, VIII ...	2	16	22
4.10 ...	Metallography and Heat Treatment.	III	4 or 4a	18	27
4.11 ...	General Metallurgy...	II	4 or 4a	37	...
4.90 ...	Engineering Metallurgy.	V, VI, VII, VIII ...	2	19	26
4.91 ...	Fire Assaying ...	II	4 or 4b	Professional Elective.	
	MECHANICAL ENGINEERING—5.00 to 5.99.				
5.10 ...	Descriptive Geometry	V, VI, VII, VIII ...	1	34	51
5.11 ...	Engineering Drawing and Materials.	V, VI, VII, VIII ...	1	36	72
5.12 ...	Mechanical Drawing and Design.	V, VI, VII, VIII ...	2	19	46
5.13 ...	Engineering Design...	V	3	48	91½
5.14 ...	Engineering Design...	V	4	16	78
5.15 ...	Drawing and Materials	II and III	1 or 1b	36	112
5.20 ...	Mechanical Engineering.	V, VI, VII, VIII ...	2	48	48
5.21 ...	Mechanical Engineering.	V, VI...	3	96	72
5.22 ...	Mechanical Engineering Practice.	V	4	26	39
5.23 ...	Mechanical Engineering.	III	3	37	37

No.	Subject.	Course.	Year.	Time. (Hours)	
				Lecture.	Laboratory.
	Mechanical Engineering—5.00 to 5.99—*continued.*				
5.30 ...	Steam Engineering ...	V, VI...	4	Professional Elective.	
5.31 ...	Internal Combustion and Hot Air Engines.	V	4	Professional Elective.	
5.32 ...	Refrigeration, Air Conditioning and Ventilation.	V	4	Professional Elective.	
5.33 ...	Industrial Heating ...	V	4	Professional Elective.	
5.50 ...	Fluid Mechanics ...	V, VI, VII, VIII ...	3 (1 term)	22	33
5.51 ...	Hydraulic Machines	V, VII	3 (1 term)	26	39
5.52 ...	Hydraulic Machinery	V	4	Professional Elective.	
5.90 ...	Workshop Processes and Practice.	V, VI, VII, VIII ...	1	...	60
5.91 ...	Engineering Processes.	V and VI	2 (V) 4 (VI)	48	48
5.92	Production Engineering Design.	V	4	72	72
5.93 ...	Workshop Processes and Practice.	II and III	1 or 1b	...	52
	ELECTRICAL ENGINEERING—6.00 to 6.99.				
6.10 ...	Electric Circuit Theory.	VI	2	48	48
6.11 ...	Electric Circuit Theory.	VI	3	72	...
6.20 ...	Electric Power Engineering.	VI	3	72	111
6.21 ...	Electric Power Utilization.	VI	4	72	72
6.22 ...	Power Generation and Transmission.	VI	4	72	72
6.30 ...	Electronics and High Frequency.	VI	3	61	72
6.31 ...	Industrial Electronics	VI	4	72	72
6.32 ...	High Frequency Engineering.	VI	4	72	72
6.33 ...	High Frequency Design.	VI	4	72	72
6.34 ...	Line Communications	VI	4	72	72
6.35 ...	Ultra High Frequency Applications.	VI	4	Professional Elective.	

No.	Subject.	Course.	Year.	Time. (Hours)	
				Lecture.	Laboratory.
	Electrical Engineering—6.00 to 6.99—*continued.*				
6.36 ...	Telephone and Telegraph Systems.	VI	4	Professional Elective.	
6.37 ...	Measurements, High Frequency.	VI	4	Professional Elective.	
6.40 ...	Illumination Engineering.	VI	4	Professional Elective.	
6.41 ...	Protection Engineering.	VI	4	Professional Elective.	
6.42 ...	Electrical Control ...	VI	4	Professional Elective.	
6.43 ...	Applications of Modern Physics to Electrical Engineering.	VI	4	Professional Elective.	
6.44 ...	Electroacoustics ...	VI	4	Professional Elective.	
6.45 ...	Industrial Heating ...	VI	4	Professional Elective.	
6.50 ...	Electrical Measurements.	VI	4	Professional Elective.	
6.90 ...	Electrical Engineering.	V, VII, VIII ...	3	48	72
6.91 ...	Electrical Engineering.	V	4 (1 term)	17	27
6.92 ...	Electrical Engineering in Mines.	VII	4	48	...
6.93 ...	Electric Power Generation and Utilization.	V	4	Professional Elective.	
6.94 ...	Electrochemical Technology.	III	4	92	...
	MINING ENGINEERING—7.00 to 7.99.				
7.10 ...	Mining	VII	2	48	...
7.11 ...	Mining	VII	3	48	72
7.12 ...	Mining	VII	4	48	...
7.20 ...	Coal Mining	VII	4	48	72
7.30 ...	Metalliferous Mining	VII	3	48	...
7.31 ...	Metalliferous Mining	VII	4	48	72
7.40 ...	Preparation of Minerals.	VII	4	48	72

No.	Subject.	Course.	Year.	Time. (Hours)	
				Lecture.	Laboratory.
	CIVIL ENGINEERING—8.00 to 8.99.				
8.10 ...	Strength of Materials	V, VI, VII, VIII ...	2	36	60
8.11 ...	Materials of Construction.	VIII	3	72	48
8.12 ...	Materials and Structures.	III	3	37	37
8.20 ...	Mechanics and Graphics.	V, VI, VII, VIII ...	1	13	20
8.21 ...	Structural Drawing and Design.	V, VI, VII, VIII ...	2	22	33
8.22 ...	Structures	V, VIII	3	17½	48
8.23 ...	Structures	VIII	4	48	72
8.30 ...	Surveying	V, VII, VIII ...	3	48	48
8.31 ...	Surveying	VII, VIII	4	24	48
8.32 ...	Astronomy and Geodesy.	VII and VIII ...	4	24 Professional Elective (VIII)	0 (VII)
8.33 ...	Topographical Surveying, Aerial Surveying and Photogrammetry.	VIII	4	Professional Elective.	
8.40 ...	Civil Engineering ...	VIII	3	62	...
8.41 ...	Civil Engineering ...	VIII	4	24	24
8.42 ...	Civil Engineering Design.	VIII	4	Professional Elective.	
8.43 ...	Civil Engineering Construction and Administration.	VIII	4	Professional Elective.	
8.44 ...	Surveying and Investigations.	VIII	4	Professional Elective.	
8.50 ...	Fluid Mechanics ...	VIII	3 (1 term)	13	20
8.51 ...	Fluid Mechanics ...	VIII	4	24	24
8.52 ...	Soil Mechanics ...	VIII	3 (1 term)	13	20
8.53 ...	Fluid Mechanics ...	III	4	36	10
8.60 ...	Building Construction	VIII	4	24	...
8.70 ...	History of Architecture and Structural Aesthetics.	VIII	4	24	...
8.71 ...	City Planning ...	VIII	4	24	...
8.80 ...	Engineering Computations.	V and VIII	3	...	36

No.	Subject.	Course.	Year.	Time. (Hours)	
				Lecture.	Laboratory.
	GENERAL SCIENCE—9.00 to 9.99.				
9.10 ...	Geology	VII	2	48	...
9.11 ...	Geology	VII	3	48	72
9.12 ...	Geology	VII	4	24	48
9.13 ...	Geology for Engineers	VIII	2	48	48
	MATHEMATICS—10.00 to 10.99.				
10.10 ...	Mathematics ...	II, III, V, VI, VII, and VIII.	1	144	...
10.10a	Mathematics ...	II and III	1a	74	...
10.10b	Mathematics ...	II and III	1b	74	...
10.11 ...	Mathematics ...	V, VI, VII, VIII ...	2	120	...
10.12 ...	Mathematics ...	II and III	2	37	...
10.20 ...	Mathematics for Electrical Engineers.	VI	3	24	...
10.21 ...	Mathematics for Civil Engineers.	VIII	3	33	...
	HUMANITIES—G1 to G99.				
G1 ...	Scientific Method ...	All Courses	1	24	...
G2 ...	History of Science and Technology.	All Courses	1 or 2	16	...
G3 ...	Contemporary Civilization.	All Courses	3	24	...
G4 ...	Contemporary Civilization.	All Courses	4	24	...
G10 ...	Language and Literature.	All Courses	1	24	...
G11 ...	Language and Literature.	All Courses	1 or 2	16	...
G12 ...	Language and Literature.	All Courses	3	24	...
G13 ...	Language and Literature.	All Courses	4	24	...
G20 ...	Human Relations ...	All Courses	2	16	...
G21 ...	Human Relations ...	All Courses	3	24	...
G22 ...	Human Relations ...	All Courses	4	24	...

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